Coronary Artery Disease Profile and Its Outcome in a Tertiary Health Care Centre of North India: A Retrospective Study

Abstract

Background- The global burden of cardio-vascular diseases (CVDs) is rising due to a predominant increase in the incidence and prevalence of the same in the developing countries. The driving aetiologies for this cascade are multiple and have various level of association, and the angiographic profile may serve a clue for the contributing factor. So, the aim of this research was to study the profile of coronary artery disease in a tertiary care hospital with respect to their coronary angiographic findings and treatment given.

Material and Methods- This was a hospital based retrospective study, which collected the data from hospital records. All the patients aged >18 years with coronary artery disease, who have undergone procedure of coronary angiography were included. Patients who had structural heart disease/valvular heart disease/congenital heart disease, previous CAD history, chronic illnesses like chronic kidney and liver disease, and malignancy were excluded. Records regarding type of disease, coronary angiography findings, treatment provided and survival were collected. The mean values of continuous variables were compared using t-tests for independent samples. The associations between discrete variables were assessed using chi-square tests of independence.

Results- A total of 5001 cases fulfilled the criteria and were included in this study. The mean age of presentation in overall study was 58.5 years and male outweigh the female population. 489 patients were in young CAD (< 40 years) group accounting for 9.8% of the total cases. Tobacco smoking was the most common risk factor and majority of patients presented with acute coronary syndrome (82.5%), out of which patients presenting with STEMI was maximum contributing event (41.8%). Smoking habit led to all three types of vessel involvement except left main disease, which was more common in hypertension. PTCA with stent placement, followed by coronary artery bypass grafting, was most common treatment offered in all disease spectrums. Survival rate was 97.4% and mortality was 2.6%.

Conclusion- The study highlights a typical spectrum of angiographic findings in CAD, with STEMI often presenting as SVD and NSTEMI/CSAP cases frequently involving TVD or LMCA. The results also highlight the need for adherence to evidence-based treatment protocols, particularly for high-risk groups such as those with TVD and LMCA disease.

Key-words: Coronary artery disease; Myocardial infarction; Angiography; Percutaneous coronary angioplasty; Coronary artery bypass grafting

Introduction

Coronary artery disease (CAD) is an emerging health problem in India; various risk factors contribute to the increased prevalence of CAD. Cardiovascular diseases and its complications account for approximately 12 million deaths annually in the India.[1] The mean age for the first presentation of acute myocardial infarction (MI) in Indians is 53 years as compared to 60- 65 years in European and North American population.[2]

Studies carried out in India, and other places suggest that Asians and Indians in particular are at an increased risk of MI at a younger age (<40 years).[3] Onset of CAD in patients

younger than 40 years of age is considered as premature coronary artery disease.[4,5] Several studies were done to analyze the risk factors of CAD such as Multinational monitoring of trends and determinants in cardiovascular disease study,[6] INTERHEART,[3] and EURO HEART ACS epidemiologic studies,[7] which have shown that certain risk factors such as family history, obesity, dyslipidemia, and use of tobacco products, are more potent predictors of outcomes in patients with CAD.

The global burden of cardio-vascular diseases (CVDs) is rising due to a predominant increase in the incidence and prevalence of the same in the developing countries. India is also following the same trend. During the past three decades, the prevalence of most of the cardiovascular risk factors including smoking, diabetes mellitus, hypertension, and dyslipidemia has increased markedly in India.[8] Ideally CVD is most commonly seen in patients with older age (Male >45 years, Female >55 years of age). In India About 25% of acute MI occurs under the age of 40 and 50% under the age of 50 years.[9] In general, MI develops 5–10 years earlier in Asian Indians than in other populations and its occurrence in patients under 40 is 5- to 10-fold higher.[10,11] Reports have shown that the risk of CAD among Asian Indians is three to four times higher than that of white Americans, six times higher than that of Chinese, and twenty times higher than that of Japanese peers.[12] The driving aetiologies for this cascade are multiple and have various level of association, and the angiographic profile may serve a clue for the contributing factor. Therefore, in our study we have decided to assess the distribution of various types of coronary artery disease with respect to their coronary angiographic findings, treatment and their in-hospital outcome.

Objective

To study the profile of coronary artery disease in a tertiary care hospital with respect to their coronary angiographic findings and treatment given.

Materials and Methods

Study Design and sample process

This was a hospital based retrospective study in the department of cardiology of our tertiary heath care system of North-India. The hospital records of past three years that is from June 2020 to June 2023 were evaluated for the appropriate data. A sample size of at least 3814 cases was calculated for 95% confidence and 80% power to predict the prevalence of types of coronary artery disease on the basis of independent variables at different time intervals.

Inclusion and exclusion criteria

All the patient aged >18 years with coronary artery disease admitted in cardiology emergency or attending cardiology OPD of our hospital, and have undergone procedure of coronary angiography in the same setting. Patients who had structural heart disease/valvular heart disease/congenital heart disease or previous CAD history were excluded. Similarly chronic illnesses like chronic kidney and liver disease, and malignancy patients were also excluded.

Data collection

Records of clinical history at the time of presentation, type of coronary artery disease, Clinical examination at the time of their admission and throughout the hospital stay, risk

factors for CAD, ECG findings , 2D echocardiography findings, blood investigations, cardiac biomarkers like cardiac troponin and finally coronary angiography reports of these patients were noted. Treatment given to these patients was also collected whether thrombolysis, PCI, CABG was done or the patient were kept on medical therapy and finally outcome as discharged healthy or in hospital mortality were noted.

Ethical approval and consent to participate

The institutional ethics committee approval was taken to look for previous data from hospital records. No patient identity was reveal and no changes were made in the records while collecting the data.

Statistical Analysis

The data was entered in the form of systematic master chart in Microsoft excel sheet. The data was analyzed using the latest version of SPSS 13.0 (Chicago, IL), a statistical tool. Predictive, sensitivity, and specificity values were also calculated for each assessment criterion. A p-value of less than 0.05 was statistically significant. For continuous variables, we looked at means and standard deviations; for discrete variables, we looked at frequencies and percentages. The mean values of continuous variables were compared using t-tests for independent samples. The associations between discrete variables were assessed using chi-square tests of independence.

Results

Description of study population

A total of 5001 cases fulfilled the criteria and were included in this study. 489 patients were in young CAD (< 40 years) group accounting for 9.8% of the total cases, and maximum cases were from elderly population (46.9%). Mean age of presentation in overall study was 58.5 years and male outweigh the female population. Tobacco smoking shows the highest number of association with coronary artery disease accounting for 50.6% of the study population followed by hypertension which is seen in 41.4% cases (Table 1).

Coronary angiography profile and outcome

Majority of patients presented with acute coronary syndrome (82.5%), out of which patients presenting with STEMI was maximum contributing event (41.8%). Patients presenting with stable ischemic heart disease was only 17.5%. SVD was found 28%, DVD was found 29.9%, TVD was found 34.5% and LM disease was found 7.7% (Table 2).

Coronary angiographic findings were showed statistically significant results with various risk factors of coronary artery disease. Smoking habit led to all three types of vessel involvement except left main disease, which was more common in hypertension, and the numbers were more than diabetes mellitus (211 vs 195)(Table 3).

Thrombolysis was given in 6% cases and primary PCI was given in 5.6% cases. PTCA with stent placement, followed by coronary artery bypass grafting, was most common treatment offered in all disease spectrums. 73 patients also underwent hybrid procedure too (Table 4).

According to hospital outcome, survival rate was 97.4% and mortality was 2.6%. Further, maximum deaths were seen in TVD ailment (60 out of 5001), followed by left main with TVD involvement (36 out of 5001) (Table 5).

Discussion

In our study, young patients <40 yeras with CAD were found to be 9.8% while patients in elder age group >65 years were 46.9% with mean age group of presentation being 58.5 years. Our study showed male dominancy in young age group (73%) also showed that mean age. A similar study done by Iragavarapu T et al., showed that mean age of presentation was 56.42 years with young population contributing to 10.42% of total cases, with a male predominance in young age group (71.66%).[12]

In the study, STEMI was found 41.8%, NSTEMI was found 17.7%, USAP was found 23.3% and CSAP was found 17.5%. SAD was found 28%, DVD was found 29.9%, TVD was found 34.5% and LM disease was found 7.7%. In another study done by Ezhumalai B et al., found that majority of the patients were suffering from CSAP with 238 patients in number, followed by STEMI with 102 patients in number, then USAP with 85 patients in number and finally, NSTEMI with 28 patients in number respectively.[13] Oomman A et al., in their research found that the atherosclerotic burden was greater in elderly women than young women due to higher prevalence of obstructive CAD especially DVD (31.2%) and TVD (46.6%) in elderly group and normal epicardial coronaries in young group.[14] On the contrary to the observations of Dave et al in their study found that there was not much variation in the proportion of SVD (17.4%), DVD (16%) and TVD (12%).[15]

In the study, on comparison of coronary angiography with various CAD (STEM1, NSTEMI, USAP & CSAP) we stastistically significant difference as the p value was 0.001 respectively. Deora S et al., in their investigation found that, there was a big difference between the STEMI group and the NSTEMI/UA group in the number of patients with normal coronary arteries ($P < 0.001$). The STEMI group also had a lot more patients with SVD ($P < 0.001$). The proportion of patients with DVD was non-significantly higher in the NSTEMI/UA group ($P=0.084$), but the proportion of patients with TVD was significantly higher ($P<0.001$). In the STEMI group of patients, Left anterior descending (LAD) involvement was more prevalent ($P < 0.001$), but in the NSTEMI/UA group, left main coronary artery, (LMCA) and left circumflex (LCX) involvements were more common ($P = 0.004$ and $P < 0.001$, respectively). Haque AF et al., in their study found that, the SVD were the most common upto 53.12%. While the angiogram pattern in female patients was not similar to that in male patients (26.56% had DVD, and TVD was present in 20.31%.[16] Malik FTN et al., found that, on coronary angiography, SVD was seen in the majority of patients (68.27%), followed by DVD (18.69%). Regarding coronaries, 7.39 % were normal, 5.65 percent had MVD, and 1.73& had LM disease. The coronaries of 7.39% of patients were normal, whereas 83.04% showed significant CAD & 9.57% had non-obstructive disorder.[17]

In the study, comparing SVD, DVD, TVD, LM disease with hypertension, DM, obesity, smoking, dyslipidemia and family history we found significant difference between the 2 variables as the p value was 0.001 respectively. Prajapati J et al., conducted a study wherein they found that, the younger patients were more likely to have a family history of premature coronary artery disease (19 patients with $p =0.041$), but older patients were

significantly more likely to have hypertension (32 patients with p=0.008).[4] The two groups showed statistically similar proportions of patients with obesity, dyslipidemia, diabetes, and active smoking or tobacco chewing practices as the p value was 0.121, 1.000, 0.114, 0.112 & 0.453 respectively. Thus, they concluded that, young patients with acute coronary syndrome had a distinct atherosclerotic risk profile and less extensive coronary artery disease compared to their older counterparts. Haque AF et al., in their study found that, smoking was prevalent among 64.06 percent of patients overall, around 77.35% of male patients. Half of the patients had dyslipidemia, 37.55% were hypertensive, 15.62% were diabetic, and 15.62% were obese. Approximately 26.56 % of patients had a personal or family history of MI.[16] Malik FTN et al., in their study found that, the most common risk factor for myocardial infarction in young people was smoking, which accounted for 77.4% of all cases. Hyperlipidemia was the second most common risk factor, accounting for 70.3% of all cases. A family history of ischemic heart disease (IHD) was present in 47.4% of the patients, while obesity was present in 33.5% of those included.[17]

In this study, mortality rate was 2.6% and SVD had the lowest mortality rate, with only 4 out of 1396 cases succumbing (0.28%). Mortality was highest among patients with LMCA involvement, with 10% of cases resulting in death (56 out of 517). These cases contributed to 40.6% of overall mortality, reflecting the critical role of the left main coronary artery in supplying a large portion of myocardial blood flow.

In the limitations of this study, data on intravascular ultrasound, optical coherence tomography or fractional flow reserve was lacking. Hence we were not able to comment anything further on intermediate lesions. Similarly, it was a single centre study with a retrograde study plan.

Conclusion

The study highlights a typical spectrum of angiographic findings in CAD, with STEMI often presenting as SVD and NSTEMI/CSAP cases frequently involving TVD or LMCA. These patterns reflect the underlying patho-physiology and progression of CAD. Our study results also highlight the need for adherence to evidence-based treatment protocols, particularly for high-risk groups such as those with TVD and LMCA disease. Overall clinical practice for treating CAD requires multidisciplinary approach, optimizing resource allocation while adhering to evidence-based guidelines.

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Tables:

Table no 1: Baseline Age wise characteristics of coronary artery disease

Baseline characteristics	<40 years N (% of 489)	40- 65 years N (% of 2166)	>65 years N (% of 2346)	P value

Male	357 (73%)	1607 (74.2%)	1652 (70.4%)	0.53
Female	132 (27%)	559 (25.8%)	1385 (29.6%)	
Risk factor				
Hypertension	181 (37%)	889 (41%)	999 (42.6%)	0.06
Diabetes mellitus	96 (19.6%)	588 (27.1%)	1401 (30.6%)	0.001 (S)
Obesity	58 (11.9%)	275 (12.7%)	607 (11.7%)	0.56
Smoking	280 (57.3%)	1105 (51%)	2531 (48.8%)	0.003 (S)
Dyslipidemia	68 (13.9%)	360 (16.6%)	870 (18.8%)	0.01 (S)
Family history	122 (24.9%)	589 (27.2%)	1431 (30.7%)	0.006 (S)
Coronary artery syndrome				
AWMI	210 (42.9%)	601 (27.7%)	437 (18.6%)	0.001 (S)
AWMI + IWMI	0	1 (0.04%)	4 (0.2%)	0.02 (S)
IWMI	145 (29.7%)	396 (18.3%)	280 (11.9%)	0.001 (S)
PWMI	0	3 (0.1%)	9 (0.4%)	0.01 (S)
RVMI	2 (0.4%)	6 (0.3%)	3 (0.1%)	0.15
NSTEMI	51 (10.4%)	415 (19.2%)	419 (17.9%)	0.001 (S)
USAP	51 (10.4%)	474 (21.9%)	1117 (25.2%)	0.001 (S)
CSAP	26	257	875	0.001 (S)
Coronary angiographic characteristics				
SVD	205 (41.9%)	662 (30.6%)	532 (22.7%)	0.01 (S)
DVD	124 (25.4%)	645 (29.8%)	724 (30.9%)	0.12
TVD	141 (28.8%)	716 (33.1%)	868 (37%)	0.07
LM disease	19 (3.9%)	143 (6.6%)	222 (9.5%)	0.01 (S)
Treatment given				
PTCA with stent placement	417 (85.3%))	1773 (81.9%)	1782 (76%)	0.001 (S)
CABG	43 (8.8%)	261 (12%)	343 (14.6%)	0.001 (S)
Only Medical management	27 (5.5%)	149 (6.9%)	228 (9.7%)	0.001 (S)
Hybrid procedure (PTCA + CABG)	7 (1.4%)	39 (1.8%)	32 (1.4%)	0.001 (S)
Total	489 (of 5001)	2166 (of 5001)	2346 (of 5001)	

AWMI- Anterior wall myocardial infarction, IWMI- Inferior wall myocardial infarction, PWMI- Posterior wall myocardial infarction, RVMI- Right ventricular myocardial infarction, NSTEMI- non-ST elevation myocardial infarction, USAP- unstable angina pectoris, CSAP- chronic stable angina pectoris, SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LM disease- left main coronary artery disease, PTCA- Percutaneous transluminal coronary angioplasty, CABG- Coronary artery bypass grafting

Table 2: Comparison of coronary angiographic findings in various types of coronary syndrome

	STEMI (% of 2069)	NSTEMI (% of 885)	USAP (% of 1117)	CSAP (% of 875)	P value
SVD	812 (39.2%)	155 (17.5%)	286 (25.6%)	140 (12.5%)	0.001 (S)

DVD	573 (27.6%)	269 (30.3%)	386 (34.5%)	260 (23.2%)	0.001 (S)
TVD	653 (31.5%)	364 (41.1%)	357 (31.9%)	335 (29.9%)	0.001 (S)
LM disease	59 (2.8%)	97 (10.9%)	88 (7.87%)	140 (12.5%)	0.001 (S)
Total	2069 (of 5001)	885 (of 5001)	1117 (of 5001)	875 (of 5001)	
SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LM disease- left main coronary artery disease, STEMI- ST elevation myocardial infarction, NSTEMI- non-ST elevation myocardial infarction, USAP- unstable angina pectoris, CSAP- chronic stable angina pectoris					

Table 3: Comparison of coronary angiographic findings seen in various risk factors of coronary artery disease

	Hypertension Total (%)	Diabetes mellitus Total (%)	Obesity Total (%)	Smoking Total (%)	Dyslipidemia Total (%)	Family history Total (%)
SVD	507 (24.5)	265 (18.9)	193 (31.8)	693 (27.4)	190 (21.8)	346 (24.2)
DVD	601 (29)	345 (24.6)	152 (25)	807 (31.9)	196 (22.5)	473 (33.1)
TVD	750 (36.2)	596 (42.5)	193 (31.8)	888 (35.1)	362 (41.6)	539 (37.7)
LM disease	211 (10.2)	195 (13.9)	69 (11.4)	143 (5.6)	122 (14)	73 (5.1)
P value	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)	0.001 (S)
SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LM disease- left main coronary artery disease						

Table 4: Comparison of treatment given in various types of coronary artery syndrome patients

Treatment given in patients of coronary artery disease	STEMI TOTAL (%)	NSTEMI TOTAL (%)	USAP TOTAL (%)	CSAP TOTAL (%)	P value
PTCA with stent placement	1877 (37.5)	725 (14.5)	762 (15.2)	576 (11.5)	0.001 (S)
CABG	147 (2.9)	112 (2.2)	167 (3.3)	216 (4.3)	0.001 (S)
Only medical management	77 (1.5)	51 (1)	190 (3.8)	86 (1.7)	0.001 (S)
Hybrid procedure (CABG + PTCA)	55 (1.1)	0	12 (0.2)	6 (0.1)	0.001 (S)

PTCA- Percutaneous transluminal coronary angioplasty, CABG- Coronary artery bypass grafting, STEMI- ST elevation myocardial infarction, NSTEMI- non-ST elevation myocardial infarction, USAP- unstable angina pectoris, CSAP- chronic stable angina pectoris

Table 5: In hospital outcome in patients with different coronary angiographic profile

Coronary angiographic findings	Survivors n	Non survivors n	P value
SVD	1395	4	0.001 (S)
DVD	1481	12	0.001 (S)
TVD	1665	60	0.001 (S)
LM + SVD	28	3	0.001 (S)
LM + DVD	67	13	0.001 (S)
LM + TVD	235	36	0.001 (S)
TOTAL	4873 (97.4%)	128 (2.6%)	0.001 (S)
SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LM disease- left main coronary artery disease			