STUDY OF RISK FACTORS, CLINICAL PROFILES AND ANGIOGRAPHIC PATTERNS IN PATIENTS OF CORONARY ARTERY DISEASE IN A TERTIARY CARE CENTRE IN CHHATTISGARH

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ABSTRACT

BACKGROUND

Deaths due to Cardiovascular Disease (CVD) accounted for 30.8% of all deaths, i.e. 18.1 million deaths by 2010 and estimated to be 32.5% of all deaths, i.e. 24.2 million deaths by 2030 globally. In 2000, there were an estimated 29.8 million people with cardiovascular disease in India out of a total estimated population of 1.03 billion or a nearly 3% overall prevalence. It is estimated that there were approximately 46.9 million people with cardiovascular disease in India during 2010, of which 2.33 million people succumbed. Considering the increasing burden of atherosclerotic disease and its mortality and also the usefulness of finding risk factors, studying the clinical profile and angiographic pattern will help us to fight the progression of the disease by intervening at various levels which can decrease the morbidity and mortality due to cardiovascular disease.

MATERIALS AND METHODS

The present study was conducted in the Department of Medicine, Dr. B.R.A.M Hospital during the period of 2014 - 2016. This is a hospital-based observational prospective study with prospective data collection, where all patients of coronary artery disease (CAD) who had undergone coronary angiography has been taken into consideration to find out the risk factors, clinical profiles and angiographic patterns in coronary artery disease patients in Chhattisgarh.

RESULTS

Maximum patients were present in the age group of 41 - 50 yrs., mean age being 55 years $\pm$ 12.11 sd. Male patients were 79.4% and 20.58% were female patients. The most common symptom was chest pain, 82.35% patients had it at the time of presentation. The next frequent symptom was breathlessness, 53.92% patients had it; 42.15% patients had sweating and 24.5% patients had palpitations. Among the risk factors, 41.1% had hypertension and 33.3% had sedentary lifestyle. On examination 61.7% patients had obesity defined by BMI > 25 and a total of 41.1% patients had hypertension; 24 patients had ABI < 0.9 indicating PAD i.e. 23.52% in the study had PAD as visualised by CAG, 39.2% patients had SVD, 20.58% patients had DVD and 14.7% had TVD; 8.8% patients had non-significant coronary artery disease; 16.66% patients had recanalised epicardial coronaries. Among 40 patients of SVD, 2 (5%) had ABI < 0.9. Among 21 patients of DVD, 11 (47.6%) had ABI < 0.9. Among 15 patients of TVD, 12 (80%) had ABI < 0.9. None of the patients with non-significant coronary artery disease and normal coronaries had ABI < 0.9. LAD was involved in 49 patients (48.2%), RCA was involved in 30 (29.2%) patients and LCX was involved in 20 (19.6%) patients. The frequency of LAD involvement was maximum followed by RCA and then LCX; 24 (100%) patients who had ABI < 0.9 also had angiographic proven coronary artery disease. Of 78 patients who had ABI > 0.9, 52 (66.7%) patients had significant coronary artery disease. Of 76 patients of significant coronary artery disease, 24 (31.5%) patients had ABI < 0.9.

CONCLUSION

Coronary artery disease, an epidemic in our country has to be tackled by preventing at each step, i.e. at the level of risk factors so that the morbidity and mortality of the disease can be curtailed.

KEYWORDS

Risk Factors, Coronary Artery Disease, Coronary Angiography.

HOW TO CITE THIS ARTICLE: Bansal BL, Akshata PJ. Study of risk factors, clinical profiles and angiographic patterns in patients of coronary artery disease in a Tertiary Care Centre in Chhattisgarh. J. Evolution Med. Dent. Sci. 2016;5(104):7638-7648, DOI: 10.14260/Jemds/2016/1724

BACKGROUND

In developed countries, atherosclerotic disease is a major health problem and is a leading cause of morbidity and mortality. The incidence of coronary artery disease, an

epidemic in India has doubled during past three to four decades and soon will emerge as the single largest disease accounting for nearly one-third of all deaths in India.

CVD deaths accounted for 30.8% of all deaths i.e. 18.1 million deaths by 2010 and estimated to be 32.5% of all deaths i.e. 24.2 million deaths by 2030 globally. In 2000, there were an estimated 29.8 million people with CVD in India out of a total estimated population of 1.03 billion or a nearly 3% overall prevalence. It is estimated that there were approximately 46.9 million people with CVD in India during 2010, of which 2.33 million people succumbed.

Atherosclerotic events are the basic pathophysiological process that causes a wide manifestation of clinical syndromes from chronic stable angina to acute myocardial infarctions. It

Financial or Other, Competing Interest: None.

Submission 08-12-2016, Peer Review 20-12-2016,

Acceptance 22-12-2016, Published 29-12-2016.

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DOI: 10.14260/Jemds/2016/1724

is the most common cause of mortality and morbidity worldwide. It is considered a generalised process affecting coronary, cerebral and peripheral arteries of lower extremities.

Amongst the various risk factors known to cause coronary artery disease are diabetes mellitus, hypertension, age, smoking, alcohol, gender, obesity, low ankle brachial index, homocysteinaemia, increased carotid intimal medial thickness, hyperlipoproteinaemia.

Considering the increasing burden of atherosclerotic disease and its mortality and also the usefulness of finding risk factors, studying the clinical profile and angiographic pattern will help us to fight the progression of the disease by intervening at various levels, which can decrease the morbidity and mortality due to cardiovascular disease.

Review of Literature

Global Burden of CVDs

Life expectancy at birth has increased from a global average of 46 years in 1950 to 66 years in 1998⁽¹⁾ and 71.4 yrs. in 2015.⁽²⁾ With industrialisation, the epidemiologic transition has taken place and the major disease now-a-days are CVS disease.⁽³⁾ This occurs not only between different disease categories, but also within a specific disease category.^(4,5) CVDs are a group of disorders of heart and blood vessels including coronary artery disease, peripheral vascular disease, rheumatic heart disease, congenital heart disease, deep venous thrombosis and pulmonary embolism.⁽⁶⁾

They are the most common cause of death globally. An estimated 17.5 million people died from CVDs in 2012, representing 31% of all global deaths. Of these deaths, an estimated 7.4 million were due to coronary artery disease and 6.7 million were due to stroke⁽⁷⁾; 38 million of the 56 million global deaths in 2012 were due to NCDs. Premature NCD mortality of 48% occurred in < 70 yrs.⁽⁸⁾

Growing Burden of CVD's in Developing Countries

The World Health Report 1999 estimates that in 1998, 78% of the burden of NCDs and 85% of the CV burden arose from the low and middle income countries with CV deaths accounting for 34% of all deaths in women and 28% in men.⁽⁹⁾ About half of the deaths attributable to CVD in developing countries in 1990 occurred < 70 years, in contrast to about a quarter in the developed countries.⁽¹⁰⁾

CVD in India

Mortality data from the Registrar General of India shows CVDs are the major cause of death in India now, i.e. 40% of deaths in urban and 30% in rural areas. The adult prevalence has increased in urban areas from about 2% in 1960 to 6.5% in 1970, 7.0% in 1980, 9.7% in 1990 and 10.5% in 2000; while in rural areas it increased from 2% in 1970, to 2.5% in 1980, 4% in 1990 and 4.5% in 2000 i.e. about 30 million coronary artery disease patients in the country. The disease occurs at a much younger age in Indians. Rural-urban differences reveal that risk factors are more in urban areas.⁽¹¹⁾

Coronary Arterial Circulation (Fig. B)

From the right and left aortic sinuses arise the right and left coronary arteries respectively and their ostia, which normally originate about two-thirds the distance from the aortic annulus to the sinotubular junction and about midway

between the aortic commissures.^[12-14] It supplies the cardiac tissue, conduction tissue, etc. The artery that crosses the cardiac crux and gives rise to the posterior descending branch represents the dominant coronary artery. Dominance is right in 70% of human hearts, left in 10% and shared in 20%.^[12-14] Coronary Arteriography (CAG) remains the standard for identifying arterial narrowings related to atherosclerotic coronary artery disease. First performed by Sones in 1959, CAG has subsequently become one of the most widely used invasive procedures in cardiovascular medicine.^[15]

Angiographic Assessment of Coronary Artery Narrowings (Fig. C)

An angiographic lumen narrowing is commonly referred to as a stenosis, which may be caused by atherosclerosis, vasospasm or angiographic artifact. The diameter of stenosis is calculated in the projection where the greatest narrowing is seen.

Angiographically Estimated Coronary Blood Flow (TIMI Flow)

Qualitative myocardial blood flow is assessed using Thrombolysis in Myocardial Infarction (TIMI) score (TIMI 0 - 3) for qualitative grading of coronary flow. In acute MI trials, TIMI Grade 3 flows have been associated with improved clinical outcomes.^[16]

Conventional Risk Factors^[17]

- Smoking.
- Hypertension.
- Hyperlipidaemia and Elevated Low-Density Lipoprotein Cholesterol.
- High-Density Lipoprotein Cholesterol, Apolipoproteins, and Other Lipid Subclasses.
- Triglyceride-Rich Lipoproteins.
- Metabolic Syndrome, Insulin Resistance and Diabetes.
- Exercise, Weight Loss and Obesity.
- Mental Stress, Depression and Cardiovascular Risk.

Novel Atherosclerotic Risk Markers^[17]

- High-Sensitivity C-Reactive Protein.
- Other Markers of Inflammation.
- Homocysteine.
- Lipoprotein (a).
- Low ABI (< 0.9).

Hypertension

Worldwide, approximately 62% of strokes and 49% of cases of coronary artery disease are attributable to suboptimal (> 115 mmHg systolic) blood pressure, accounts for more than 7 million deaths annually. Lawes and Vander et al^[18] estimated that 14% of deaths and 6% of DALYs lost globally were caused by non-optimal levels of blood pressure.

Pulse pressure reflecting vascular wall stiffness predicts first and recurrent MI and also CVEs independently, particularly heart failure.^[19] Bobrie et al,^[20] Ingelsson et al study^[21] also supported the detrimental effect of hypertension on CVS disease.

Blood pressure reductions as small as 4 to 5 mmHg result in large and clinically significant reductions in cardiovascular risk.^[22] In Law and Associates analysis of 354 randomised trials, regimens of multiple drugs given were estimated capable of reducing SBP by 20 mmHg and DBP by 11 mmHg,

effects that could result in reductions of stroke by 63% and CHD by 46%.^[23]

Smoking

Other than advanced age, smoking is the single most important preventable risk factor for coronary artery disease. Ezzati and co-workers^[24] have calculated that in 2000 more than 1.62 million CVD deaths worldwide or 11% of the total were caused by smoking; 1.17 million were men and 670,000 occurred in the developing world. The combined use of different forms of tobacco is associated with a higher risk of MI than using one type.^[25,26]

Barnoya and Glantz^[27] found that second-hand smoke is associated with 1.31-fold increased risk of CHD. Smoking prevalence is more in men and increases with age.^[28] Critchley and Capewell study showed smoking cessation reduced CHD mortality by 36%.^[29]

Lipids

Worldwide, high cholesterol levels cause 56% of IHD and 18% of strokes amounting to 4.4 million deaths annually. The Heart Protection Study showed that statins can reduce stroke and coronary events in those with pre-existing vascular disease.^[30] As a group, placebo-controlled trials of statins lowered LDL cholesterol levels by 20% to 60% and reduced coronary events by one-third over a 5-year period with no evidence of an increase in nonvascular mortality.

Menotti et al^[31] cited that Low HDL-cholesterol (< 42 mg/dL) is the strongest predictor of subsequent CVDs (3.3 - fold higher risk). In general, increase of HDL cholesterol by 1 mg/dL is associated with a 2% to 3% decrease in risk of total CVD.

Pischon et al^[32] in men and Ridker et al^[33] suggested that the measurement of apolipoproteins A-I and B100 would predict cardiovascular risk better than HDL and LDL cholesterol in clinical practice and also total cholesterol-to-HDL-C ratio remained a very strong predictor, superior even to apolipoprotein B100 to A-I.

Hypertriglyceridaemia is associated with several atherogenic factors and substantially increase the risk of CVD (KU-Leuven and Department of Clinical Chemistry, Belgium). Bansal et al^[34] and Nordestgaard et al^[35] have recently reported that non-fasting TAGs predict vascular events, independent of traditional risk factors, but that fasting TAG levels show little independent relationship.^[34,35] On this basis, prediction of vascular risk may need to be based on an oral triglyceride tolerance test, analogous to a glucose tolerance test used to diagnose diabetes.^[36]

Diabetes, Metabolic Syndrome and Insulin Resistance

Booth et al^[37] stated the presence of diabetes conferred an equivalent risk to aging 15 years, an impact higher than that of smoking. Patients with diabetes have two- to eight-fold higher rates of future CVDs and 75% of all deaths in diabetic patients result from CHD.

Diabetes mellitus affects approximately 180 million people worldwide, which may rise to double by 2030.^[38] Interestingly, Asian countries like India and China have the largest numbers of diabetics - 32 million and 21 million, respectively in the world^[39] due to greater visceral obesity despite lean body weight.

Insulin resistance itself promotes atherosclerosis even before it produces frank diabetes, which has prompted recommendations for increased surveillance for the metabolic syndrome.

Obesity

According to the latest WHO data, there are approximately 1.1 billion overweight adults in the world with 115 million of them known to be living with obesity-related problems.^[40] Popkin and Gordon-Larsen^[41] have reported that use of edible oils, caloric sweeteners and animal source foods is increasing. Women are more affected than men with the number of overweight women generally exceeding underweight women based on data from 36 developing countries.^[42] Adolescents are at particular risk with 1 in 10 children currently estimated to be overweight.^[41,43]

Physical Inactivity

Manson et al showed in both men and women, exercise levels achieved with as little as 30 minutes of walking daily provide major cardiovascular benefits.^[44]

Aerobic exercise is associated with a mean reduction of SBP of 5 mmHg in hypertensive participants. Exercise consistently improves HDL-C and reduces TAG levels. Exercise further improves insulin sensitivity and glycaemic control with major benefits for diabetic patients including reductions in glycated haemoglobin and reduced requirements for therapy.

Diet

A key element of dietary change is an increase in intake of saturated animal fats and inexpensive hydrogenated vegetable fats, which contain atherogenic trans fatty acids leading to abdominal obesity, another risk factor for CVD. Another facet of adopting a Western diet is the introduction of soft drinks and other high-sugar beverages, which is associated with weight gain and increased risk of type 2 diabetes.^[45]

Population Aging

Average life expectancy will reach 73 years by 2025, according to the WHO. The time of transition to an older population is markedly shorter in developing countries. The United States and Canada took more than 65 years to double their over-65 population, but China will do so in 26 years, Tunisia in 24 and Brazil in 21.^[46] Such acute changes in the population structure leave less time to expand an already overburdened health infrastructure to address chronic diseases of older adults, prominently cardiovascular conditions.

Mental Stress, Depression and Cardiovascular Risk

The adrenergic stimulation of mental stress can augment myocardial oxygen requirements, aggravate myocardial ischaemia, cause coronary vasoconstriction, particularly in atherosclerotic coronary arteries, platelet and endothelial dysfunction and ventricular arrhythmias. Work related stress has two components - job strain and effort-reward imbalance, both doubling risk for MI and stroke.^[47]

In the Inter-Heart Study evaluating post-infarction patients from 52 countries, psychosocial stress was associated with vascular risk with a magnitude of effect similar to that of the major coronary risk factors.^[48] In patients with stable IHD and exercise-induced myocardial ischaemia, random

allocation to a stress management program reduced emotional distress and improved biomarkers of vascular risk significantly.^[49] In South Asia of all, the low- and middle-income regions have the highest prevalence of diabetes. In 2006, Goyal and Yusuf^[50] estimated that the prevalence was 3.8% in rural areas and 11.8% in urban areas. Similarly, IC Health reported a prevalence of 14% in an Indian urban setting in 2000.^[51] According to the Inter-Heart study, 11.8% of all MIs in the South Asia region result from diabetes.^[52]

According to Goyal and Yusuf,^[50] data from 2004 have shown that hypertension affects 20% to 40% of urban residents and 12% to 17% of rural residents. This is an estimated total of 118 million people in India.^[50] Inter-Heart study found a prevalence for hypertension of 19.3% attributable to MI.^[52] Goyal^[50] has reported that of those between the ages of 12 and 60, 56% used tobacco.

The IC Health report identified overweight and obesity as a growing issue in Indian populations. In Northern India, prevalence measured by waist circumference soared from 33.2% to 45% in 2001 and 2003, respectively. Urban South Asia had high waist-to-hip ratios as well, increasing 16% (63% to 79%) between 2001 and 2003. In 2000, the prevalence as measured by BMI was 31% in those aged 20 to 40 and 38% in those older than 40 years in seven urban cities. The rate from the same study measured by waist circumference was 32%.^[53] According to Inter-Heart, abdominal obesity accounts for 37.7% of MI cases.^[52]

In addition to factors already mentioned, the Inter-Heart study reported low intake of fruits and vegetables accounts for 18.3% of MI, lack of exercise 27.1% and lipids 58.7%. In total, all nine risk factors explain 89.4% of all causes of MI.^[52]

RESULTS AND DISCUSSION

Age and Sex Wise Analysis of Patients Suspected of Coronary Artery Disease

In our study, mean age is 55 years + 12.11 sd. We had 30.39% patients present in the age group of 41 - 50 yrs., 27.45% patients were present in the age group 51 - 60 yrs., 22 patients were present in the age group 61 - 70 yrs., 11.76% patients were present in age group > 70 yrs., 6.86% patients were present in age group 31 - 40 yrs., 1.96% patients were present in age group ≤ 30 yrs.; maximum number were male patients, i.e. 81 (79.4%) out of 102 patients; 21 (20.6%) were female patients. The Table 3 shows in all the age groups, male patients were more than female patients. Mean age in males is 54.39 years + 12.27 sd. Mean age for females is 54.54 years + 12.27 sd.

Hazratullah, Matiullah et al, study at Punjab Institute of Cardiology, Lahore studied pattern of coronary artery disease in young adults < 40 years and those > 40 years with significant coronary artery disease on CAG. Out of total 400 patients, patients of age < 40 years were 48 (12%) and > 40 years were 352 (88%). There were 77% male patients and 22.5% female patients. Mean age of patients was 52.78 + 10.02. Significant coronary artery disease was present in 48 (10.75%) in patients < 40 years and 306 (76.5%) in patients > 40 years. Frequency of SVD, DVD and TVD in patients < 40 years was 24 (50%), 10 (20.8%), 9 (18%) respectively, while frequency of SVD, DVD and TVD in patients > 40 years 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. They concluded young (< 40 years) patients who

have coronary artery disease have less extensive CAD with higher incidence of angiographically normal vessels and relative paucity of left main coronary artery involvement.

Ezhumalai B, Jayaraman B et al, study at Department of Cardiology, Srivenkateshwara Medical College and Hospital and JIPMER, Puducherry, India, analysed 500 women who underwent CAG for suspected coronary artery disease over 3 years and observed there was greater prevalence of obstructive coronary artery disease, especially DVD and TVD in patients > 55 years, while normal coronaries were more prevalent in patients < 55 years.

Manal Khudhur Abdul Razzaq, Jawad Ibrahim Rasheed et al (2013) conducted their cross-sectional study at Baghdad Teaching Hospital, during the period (May 2011 - Jan. 2012). Fifty patients without known diabetes who were admitted to the CCU with ACS were selected; out of 50 patients 37 (74%) were male and 13 (26%) were female with mean age of (60.6 ± 6.3) year and in the range of (45 - 70) years.

Li-Feng Hong, Xiao-Lin Li et al conducted study enrolled 1433 consecutive women (29.7%) and men (70.3%), mean age is 58.3 ± 10.2, 995 (69.43%) patients are non-diabetic and 438 (30.56%) are diabetic, suggesting males are more affected with ACS. Our study also has same findings, i.e. males (81.7%) are more affected with ACS as compared to female (18.3%). In a study conducted by Christina Chrysohoou, Christos Pitsavos et al, 1000 ACS patients who were consecutively enrolled during 2007 - 2008, 583 (58.3%); mean age of (63 ± 13 years, 20% females) non-diabetic patients were studied in this work and 417 (41.7%) were diabetic. So as per all these studies, males are affected more than female; most of the patients are of age in range of (41 - 60) years.

Analysis of Clinical Symptoms in Patients

The Table 4 describes the major clinical symptoms, which brought the patients to hospital. Most common symptom was chest pain, 84 patients had it at the time of presentation. The next frequent symptom was breathlessness, 55 patients had; 43 patients had sweating; 25 patients had palpitations. In our study the most common symptom was chest pain, 82.35% patients had it at the time of presentation. The next frequent symptom was breathlessness, 53.92% patients had; 42.15% patients had sweating; 24.5% patients had palpitations which was similar to many studies.

Analysis of Clinical Signs on General Physical Examination

On general physical examination, Table 6 predicts that 10 patients had pallor, 1 had icterus. Few patients had signs of heart failure, i.e. 6 had pedal oedema and 2 had raised JVP. On general physical examination, in our study 9.8% patients had pallor, 0.98% had icterus, 9.8% patients had signs of heart failure i.e. 5.88% had pedal oedema and 1.96% had raised JVP.

Analysis of Risk Factors in Patients Suspected of Coronary Artery Disease

The above Table 5 shows various risk factors of Coronary Artery Disease in patients. Maximum hypertension and sedentary lifestyle was found equally among patients, 34 each. Next in frequency was diabetes mellitus type II found in 29 patients; 24 patients would consume alcohol and 21 patients would smoke; 16 patients had silent MI and 16 would consume tobacco; 11 patients were on treatment for dyslipidaemia; 4 patients had family h/o MI.

In our study of all the risk factors, hypertension (Table 7) i.e. 41.1% was found among patients (A total of 42 patients of 102 studied had hypertension); 19 patients had blood pressure recordings in the range of hypertension (as defined by JNC criteria 8) at the time of hospitalisation.

Table 8 predicts that 63 patients out of 102 had obesity, defined by BMI > 25. BMI calculated by weight (in kilograms)/height (in cms)²; 16 patients were overweight with BMI between 23.0 and 24.9. Sedentary lifestyle was found in 33.33%, next in majority.

Diabetes mellitus type II was found in 28.43% patients; 23.52% patients would consume alcohol and 20.58% patients would smoke; 15.68% patients had silent MI and 15.68% would consume tobacco; 10.78% patients were on treatment for dyslipidaemia; 3.9% patients had family h/o MI.

The above Table 9 shows 78 patients out of 102 analysed had ABI > 0.9, i.e. normal ABI; 24 patients had ABI < 0.9 indicating Peripheral Artery Disease (PAD) i.e. 23.52% in the study had PAD.

Goldbourt U, Yaari S, Medalie JH et al, studied isolated low HDL as a risk factor for coronary artery disease mortality; 8000 men were studied in a 21-year followup. Men with isolated low HDL represented one-sixth of the cohort. CHD mortality among these men was 36% higher (age adjusted) than in the counterparts with the desired total cholesterol. This was particularly increased in men with diabetes mellitus, whose death rates was 65% higher than in diabetics with HDL > 40 mg/dL.

Joya Ghosh, TK Mishra, YN Rao, SK Aggarwal et al, at Maulana Azad Medical College, New Delhi, studied 60 aged and sex matched normal healthy individuals were taken as controls and 60 patients of coronary artery disease were taken. Serum levels of HDL, LDL, VLDL and total cholesterol were measured. It was observed that LDL, VLDL, total cholesterol, total cholesterol : HDL ratio, LDL : HDL ratio were significantly raised and HDL was significantly low in patients with p value < 0.001. The levels of oxidised LDL showed an increasing trend in patients.

Weverling-Rijnsburger AW, Jonkers IJ, Van Exel E et al at Leiden University Medical Center, the Netherlands, conducted a prospective study with 599 subjects enrolled and were followed up for 4 years. Serum levels of total cholesterol, LDL and HDL were assessed as baseline and also comorbidities. During 4-year follow-up of 152 subjects died, the leading cause being CVD. Low HDL was associated with two-fold higher risk of fatal CVD (95% CI, 1.2 - 3.2). The mortality risk of coronary artery disease was 2.0 (95% CI, 1 - 3.9) and for stroke it was 2.6 (95% CI, 1.0 - 6.6). The risks were unaffected by comorbidities.

Tavia Gordon, William P Castelli, Marthana C Hjortland, William B Kannel, Thomas R Dawber et al, studied HDL as a protective factor against coronary artery disease. Fasting tags, HDL, LDL and total cholesterol were obtained of 2815 men and women aged between 49 and 82 years at Framingham. In approximately 4 years following characterisation of lipids, coronary artery disease developed in 79 of 1025 men and 63 of 1445 women free of coronary artery diseases. At these older ages, major potent lipid risk factor was HDL, which had inverse association with incidence of coronary artery disease, p value < 0.001 in men and women.

Burman A, Jain K, Gulati R, Chopra V et al, at Delhi University studied 20 coronary artery disease patients and 20

healthy controls were recruited for this study. Their fasting plasma lipoprotein (a) and complete lipid profile were analysed. Results indicated plasma lipoprotein (a), total cholesterol, triglycerides, HDL, LDL and LDL : HDL ratio of coronary artery disease patients were significantly higher than the controls.

Analysis of Angiographic Findings in Patients

In our study, 40 (39.2%) patients of 102 studied had SVD as visualised by coronary angiography; 21 (20.6%) patients had DVD and 15 (14.7%) had TVD; 9 (8.8%) patients had non-significant coronary artery disease, i.e. stenosis < 75%; 17 (16.7%) patients had recanalised epicardial coronaries.

Our study shows LAD was involved in 49 patients (48.2%), RCA was involved in 30 (29.2%) patients and LCX was involved in 20 (19.6%) patients. Diagonal 1 (D1) was involved in 5 (4.9%) patients, OM1 in 5 (4.9%) patients and OM2 in 4 (3.9%) patients. Recanalised vessel was seen in 6 (5.88%) patients. LMCA was not involved in our selected study group. This suggests frequency of LAD involvement was maximum followed by RCA and then LCX.

Zhahid Hassan, Summiya Farooq, Naila Nazir et al, study conducted at SKIMS, Srinagar, J and K, India. In their study, 45 (90%) patients were men and 5 (10%) were women; 10% were obese and 78% were overweight. Smoking was present in 78% population, family history in 52% population, diabetes mellitus in 12%, hypertension in 40% and hyperlipidaemia in 48% population. Angiographically, the % of coronaries involved was 84% (n = 42). SVD was the most common angiographic finding in the study group; 67% of patients had SVD, 28% had DVD and 5% had TVD. LAD was the most commonly involved artery followed in frequency by RCA and then LCX. Findings obtained in our study were similar to this study.

Ibrahim Shah, Muhammad Faheem, Shahzeb et al, conducted study at Department of Cardiology, Lady Reading Hospital, Peshawar, Pakistan. Total of 1325 patients were included in study of which 980 (73.8%) were men and mean age as 53 + 10.8 years; 36% patients suffered from hypertension, 17% from diabetes mellitus, 42% had dyslipidaemia, 37% were smokers and 32% had history of premature coronary artery disease. On angiographic analysis, 251 (18.9%) patients had SVD, 344 (26%) had DVD, 596 (45%) had TVD, 42 (3.2%) had LMD and 92 (6.9%) had normal coronaries. The involvement of LAD, LCX and RCA was 42%, 26% and 32% respectively. A total of 2517 lesions were identified in which mild, moderate and severe were 276 (11%), 327 (13%) and 1912 (76%) respectively. PCI was advised for 874 (66%) and CABG for 251 (18.9%). They concluded conventional risk factors were highly prevalent in patients of coronary artery disease. DVD and TVD was most common in these patients and PCI was frequently used treatment modality. Their findings were similar to our study findings.

Ezhumalai B and Jayaraman B et al, study at Department of Cardiology, Srivenkateshwara Medical College and Hospital and JIPMER, Puducherry, India analysed 500 women who underwent CAG for suspected coronary artery disease over 3 years and observed there was greater prevalence of obstructive coronary artery disease, especially DVD and TVD in patients > 55 years, while normal coronaries were more prevalent in patients < 55 years. Prevalence of left main

disease is 3.4%, obstructive coronary artery disease 45.4% and multivessel disease 28%. The prevalence of LMD and multivessel disease is 31.4%. Pattern of involvement was same between the groups.

Sreeranga PC, V Kumar Swamy, Veeranagowda et al, of Bangalore Medical College conducted a study at Jayadeva Hospital and included 263 patients between age 30 - 83 years among women who routinely underwent CAG. Angiographically determined SVD, DVD and TVD were 41%, 10% and 12.5% respectively. LMCA was involved in 5% patients, recanalised vessel in 5% patients. Age > 50 years formed 82% of their study group.

All the above studies have similar angiographic patterns as with our study.

Analysis of ABI values in Subjects with different Patterns of Coronary Artery Disease

In our study (Table 13) among 40 (39.2%) patients of SVD, 38 (48.7%) patients had ABI > 0.9 and 2 (8.3%) had ABI < 0.9. Among 21 (20.6%) patients of DVD 11 (14.1%) patients had ABI > 0.9 and 10 (41.7%) had ABI < 0.9. Among 15 (14.7%) patients of TVD, 3 (3.8%) patients had ABI > 0.9 and 12 (50.0%) had ABI < 0.9. Patients with non-significant coronary artery disease and normal coronaries had ABI > 0.9 in 17 (21.8%) and 9 (11.5%) respectively with 0% ABI < 0.9 in both categories.

In our study, 24 patients who had ABI < 0.9 also had angiographic proven coronary artery disease. Of 78 patients who had ABI > 0.9, 52 patients had significant coronary artery disease. Of 76 patients of significant coronary artery disease, 24 patients had ABI < 0.9. In our study, it was found that sensitivity of ABI for coronary artery disease is 31.6% (21 - 43) and specificity of ABI for coronary artery disease is 100% (84 - 100%). Positive predictive value of ABI is 100% (82 - 100) and negative predictive value of ABI is 33% (23 - 45). Accuracy of ABI for coronary artery disease was found to be 49.01 in our study.

Masoumeh Sadeghi, Ramin Heidari, Baharak Mostanfar, Ali Akbar Tavassoli et al, study conducted in Isfahan University of Medical Sciences, Isfahan, Iran. Their study included 125 patients, 85 (68%) were men and 40 (32%) were women aged between 32 and 80 years, suspected of coronary artery disease. Mean age of studied patients were 58.9 + 10.0 years; 25 patients (20%) of the studied population had ABI < 0.9. Prevalence of ABI < 0.9 was 25.9% and 7.5% in men and women respectively with P value 0.01. Abnormal angiographic findings were seen in 96% (24 patients) of ABI < 0.9 and 74% (74 patients) of ABI > 0.9 with p value 0.01. In their study, they found that the prevalence of atherosclerotic risk factors was significantly higher in patients with ABI < 0.9. Patients with ABI < 0.9 had more significant stenosis than patients with ABI > 0.9 and the mean occlusion was significantly higher in ABI < 0.9 patients with LMCA, RCA < LAD < LCX and D1 involvement. They concluded that ABI could be a useful method in assessing both atherosclerotic risk factors and the degree of coronary involvements in suspected patients. These findings are similar to that obtained in our study, except that specificity is 100% much higher than their study.

Eduardo DE Papa, Izo Helber, Manes R Ehrlichmann, Claudia Maria Rodrigues Alves et al, study conducted at Department of Cardiology, Universidade Federal Do Estado De Sao Paulo, Brazil. They analysed 100 patients over 65 years of

age with coronary artery disease as confirmed by CAG and with over 70% stenosis of at least one sub-epicardial coronary artery. They measured ABI immediately after CAG and a value < 0.9 was used to diagnose PAD. Their results showed average age of patients was 77.4 years. The most prevalent risk factor was hypertension (96%). The ABI < 0.9 was seen in 47% patients and a low index was more prevalent in patients with multivessel coronary artery disease compared to patients with uniarterial disease in the same group. Using a bivariate analysis, they concluded that only an ABI < 0.9 was a strong predictive factor for cardiovascular events, thereby increasing all-cause mortality and fatal and non-fatal MI two- to three-fold. They concluded that in elderly patients with documented coronary artery disease, a low ABI was associated with the severity and extent of coronary artery disease. The study findings are similar to our study.

Zinat Nadia-Hatmi, Soheila Dabiran, Ahmad Sabouri-Kashani, Zeynab Heidarzadeh et al, conducted a study in Tehran Heart Center between 2010 and 2011, recruited 362 angiographically confirmed cases of coronary artery disease and 337 controls. They concluded that a low ABI had specificity of 99.7%, however of its low sensitivity of 64%, one should consider coronary artery disease risk factors associated with a low ABI in order to use it as a first line screening test. The findings observed in the above study are similar to our study with our study having specificity of 100%.

Age Group	Frequency	Percent
< / = 30	2	2.0
31 - 40	7	6.9
41 - 50	31	30.4
51 - 60	28	27.5
61 - 70	22	21.6
> 70	12	11.8
Total	102	100.0

Table 1. Analysis of Age Distribution in Patients

Gender	Frequency	Percent
Female	21	20.6
Male	81	79.4
Total	102	100.0

Table 2. Analysis of Sex Distribution of Patients

Age Group		Gender		Total
		F	M	
< / = 30	N	1	1	2
	%	4.8%	1.2%	2.0%
31 - 40	N	0	7	7
	%	.0%	8.6%	6.9%
41 - 50	N	4	27	31
	%	19.0%	33.3%	30.4%
51 - 60	N	8	20	28
	%	38.1%	24.7%	27.5%
61 - 70	N	6	16	22
	%	28.6%	19.8%	21.6%
> 70	N	2	10	12
	%	9.5%	12.3%	11.8%
Total	N	21	81	102
	%	100.0%	100.0%	100.0%

Table 3. Analysis of Age and Sex Distribution of Patients

Distribution of Risk Factors of CAD

Characteristics	Frequency	Percent
Chest pain	84	82.4
Breathlessness	55	53.9
Orthopnoea	1	1.0
PND	4	3.9
Palpitation	25	24.5
Syncope	14	13.7
Sweating	43	42.2
Angina equivalents	21	20.6

Table 4. Distribution of Major Clinical Symptoms in Patients

Risk Factors	Frequency	Percent
Diabetes	29	28.4
Hypertension	34	33.3
Smoking	21	20.6
Dyslipidaemia	11	10.8
Family H/O CAD	4	3.9
Previous MI	16	15.7
Tobacco	16	15.7
Alcohol	24	23.5
Sedentary Lifestyle	34	33.3

Table 5. Distribution of Risk Factors of Coronary Artery Disease in Patients

Distribution of Major Clinical Symptoms in Patients

Risk Factors	Frequency	Percent
Pallor	10	9.8
Icterus	1	1.0
Cyanosis	0	0.0
Clubbing	0	0.0
Oedema	6	5.9
JVP	2	2.0

Table 6. Analysis of Clinical Signs on General Physical Examination

Analysis of Blood Pressure Readings of Patients

Hypertension	Frequency	Percent
Absent	83	81.4
Present	19	17.82
Total	102	100.0

Table 7. Analysis of Blood Pressure Readings of Patients at the Time of Hospitalisation

Hypertension					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Absent	60	58.8	58.8	58.8
	Present	42	41.2	41.2	100.0
	Total	102	100.0	100.0	

Table 8. Total Hypertensives in Study (Those Diagnosed at Admission and those who are Already on Treatment)

Analysis of BMI in patients.
Analysis of Ankle Brachial Index in patients.

ABI	Frequency	Percent	Percent	Cumulative Percent
≤ 0.7	1	1.0	1.0	1.0
0.71 - 0.90	23	22.5	22.5	23.5
> 0.9	78	76.5	76.5	100.0
Total	102	100.0	100.0	

Table 9. Analysis of Ankle Brachial Index in Patients

Analysis of Angiographic Findings in Patients

Pattern	Frequency	Percent
Normal coronaries	17	16.7
Non-significant CAD	9	8.8
Single vessel disease	40	39.2
Double vessel disease	21	20.6
Triple vessel disease	15	14.7
Total	102	100.0

Table 11. Analysis of Angiographic Findings in Patients

BMI	Category	Frequency	Percent
< 18.5	Underweight	0	0.0
18.5 - 22.9	Normal	23	22.5
23.0 - 24.9	Overweight	16	15.7
≥ 25	Obese	63	61.8
Total		102	100.0

Table 10. Analysis of BMI in Patients

Comparison of ABI Values in Subjects with Different Patterns of Coronary Artery Disease

Angiographic Patterns		ABI		Total	P Value
		≤ 0.9	> 0.9		
Normal coronaries (recanalised)	N	0	17	17	<0.0001
	%	.0%	21.8%	16.7%	
Non-significant CAD	N	0	9	9	
	%	.0%	11.5%	8.8%	
Single vessel	N	2	38	40	

disease	%	8.3%	48.7%	39.2%
Double vessel disease	N	10	11	21
	%	41.7%	14.1%	20.6%
Triple vessel disease	N	12	3	15
	%	50.0%	3.8%	14.7%
N		24	78	102
%		100.0%	100.0%	100.0%

Table 12. Comparison of ABI Values in Subjects with Different Patterns of Coronary Artery Disease

Pattern of Vessels involved in Study Subjects

Vessel Involved	No. of Subjects	Percentage
LMCA	0	0
LAD	49	48.2
LCX	20	19.6
RCA	30	29.2

Table 13. Pattern of Vessels involved in Study Subjects

Analysis of Association of ABI with CAD

		ABI		Total	P Value
		<= 0.9	> 0.9		
CAD Absent Present	N	0	26	26	0.001
	%	.0%	33.3%	25.5%	
	N	24	52	76	
	%	100.0%	66.7%	74.5%	
Total	N	24	78	102	
	%	100.0%	100.0%	100.0%	

Table 14. Analysis of Association of ABI with CAD

SUMMARY AND CONCLUSION

The Following Conclusions were Drawn from the Study

1. Maximum patients were present in the age group of 41 - 50 yrs., mean age being 55 years + 12.11 sd.
2. Male patients were 79.4% and 20.58% were female patients.
3. The most common symptom was chest pain, 82.35% patients had it at the time of presentation. The next frequent symptom was breathlessness, 53.92% patients had it; 42.15% patients had sweating; 24.5% patients had palpitations.
4. Among the risk factors, 41.1% had hypertension and 33.3% had sedentary lifestyle.
5. On examination 61.7% patients had obesity, defined by BMI > 25 and a total of 41.1% patients had hypertension.
6. 24 patients had ABI < 0.9 indicating PAD i.e. 23.52% in the study had PAD.
7. As visualised by CAG, 39.2% patients had SVD, 20.58% patients had DVD and 14.7% had TVD; 8.8% patients had non-significant coronary artery disease; 16.66% patients had normal epicardial coronaries.
8. Among 40 patients of SVD, 2 (5%) had ABI < 0.9. Among 21 patients of DVD, 11 (47.6%) had ABI < 0.9. Among 15 patients of TVD, 12 (80%) had ABI < 0.9. None of the patients with non-significant coronary artery disease and normal coronaries had ABI < 0.9.
9. LAD was involved in 49 patients (48.2%), RCA was involved in 30 (29.2%) patients and LCX was involved in 20 (19.6%) patients. The frequency of LAD involvement was maximum followed by RCA and then LCX.
10. 24 (100%) patients who had ABI < 0.9 also had angiographic proven coronary artery disease. Of 78 patients who had ABI > 0.9, 52 (66.7%) patients had significant coronary artery disease. Of 76 patients of significant coronary artery disease, 24 (31.5%) patients had ABI < 0.9.

ABBREVIATIONS

ABI- Ankle-Brachial Index
 CAD- Coronary artery disease.
 CVD- Cardiovascular disease.
 CVE- Cardiovascular events.
 SVD- Single Vessel Disease.
 DVD- Double Vessel Disease.
 TVD- Triple Vessel Disease.
 PAD- Peripheral Artery Disease.
 HDL- High Density Lipoprotein.
 LDL- Low Density Lipoprotein.
 VLD- Very Low Density Lipoprotein.
 SBP- Systolic Blood Pressure.
 DBP- Diastolic Blood Pressure.
 BMI- Body Mass Index.
 NCD- Non-Communicable Disease.
 LMCA- Left Main Coronary Artery.

LAD- Left Anterior Descending Artery.
 LCX- Left Circumflex Artery.
 RCA- Right Coronary Artery.
 CLI- Critical Limb Ischaemia.
 LEAD- Lower Limb Arterial Disease.
 LMD- Left Main Disease.
 PND- Paroxysmal Nocturnal Dyspnoea.
 MI- Myocardial Infarction.
 JVP- Jugular Venous Pressure.

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