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"A PROSPECTIVE CARDIOVASCULAR STUDY UNDER THE PREVALENCE OF HYPERLIPIDEMIA, HYPERTENSION, DIABETES MELLITUS AND OBESITY IN CORONARY ARTERY DISEASE IN A TERTIARY CARE TEACHING HOSPITAL"

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ABSTRACT

Background: The burden of coronary artery disease can be explained by the alarming rise in the prevalence of CAD risk factors like hypertension, diabetes mellitus, hyperlipidemia and obesity. So it is crucial to evaluate the role of such risk factors in developing CAD. **Objective:** The objective of the study was to evaluate the prevalence of risk factors such as HTN, DM, hyperlipidemia and obesity in CAD in a tertiary care teaching hospital. **Methodology:** A prospective observational study was carried out for a period of 6 months in the inpatient medicine department and cardiac care unit of Chigateri district hospital, Davangere. A total of 170 CAD patients were enrolled in the study. The collected data were analyzed with MS Excel and descriptive statistics. **Result:** Among the 170 CAD patients, the most prevalent risk factor was hypertension (59.41%) followed by DM (43.52%) and hyperlipidemia (34.11%). Obesity was the least prevalent risk factor to develop CAD (17.05%). The most frequently prescribed class of drugs among the 170 study subjects were anti- platelets (30.08%). **Conclusion:** The research steadily shows that modifiable risk factors such as hypertension, diabetes mellitus and hyperlipidemia are strongly linked to the development of coronary artery disease and the most frequently used drugs in CAD patients were antiplatelets. These findings highlights the importance of a comprehensive

approach to CAD prevention and management.

KEYWORDS: *Coronary Artery Disease, Hypertension, Diabetes Mellitus, Hyperlipidemia, Prevalence, Risk Factor, Antiplatelets.*

INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of morbidity and mortality in the world. Highest burden of acute coronary syndrome (both prevalence and incidence) in the world is found to be in India. Compared with other populations around the world, CAD occurs in Indians 5-10years earlier and this peculiar phenomenon majorly affects the productive work force of the country aged from 35-65 years. CAD can lead to Acute Coronary Syndrome (ACS) such as unstable angina, STEMI and NSTEMI. A series of modifiable risk factors and non-modifiable risk factors leads to the development of atherosclerosis and the risk of presenting with ACS. Some of the known risks for ACS include smoking, high blood cholesterol, physical inactivity, diabetes, high blood pressure, being overweight or obese.[1]

Arterial chronic hypertension is one of the established cardiovascular risk factor for development of atherosclerosis and increased incidence of peripheral vascular disease, cerebrovascular disease and CAD. Arterial hypertension is one of the main factors leading to atherogenesis and the development of vulnerable plaques whose instability or rupture (which in turns results in thrombosis and vessel occlusions) are responsible for the development of ACS. In the general population, the prevalence of hypertension rises progressively with age in both men and women.[2] The risk of CAD among hypertensive patients, for example increase with the number of additional risk factors, and > 50% of all coronary events among patients with HTN (40% in men & 68% in women) are attributable to the presence of ≥ 2 additional risk factors. The identification and appropriate management of multiple risk factors is thus an important aspect of hypertension treatment.[3]

Diabetes mellitus continues to rise and has quickly become one of the most prevalent and chronic disease worldwide. A close link exist between diabetes mellitus (DM) and CVD which is most prevalent cause of morbidity and mortality in diabetic patients.[4] The main mechanism of diabetes mellitus pathophysiology is a condition of long term insulin resistance, which is strictly associated with hyperglycemia followed by a compensatory

hyperinsulinemia. Hyperglycemia, insulin resistance and fatty acid excessive production lead to an increasing systemic oxidative stress, inflammatory response and advanced glycation product (AGE) production. All these mechanism contribute to both coronary atherosclerosis.[5]

Hyperlipidemia has a significant correlation with the incidence of CHD, meaning that people with history of hyperlipidemia have higher risks of suffering from CHD than those with normal lipid levels. Although they are primary sources of energy and are required for many biological functions, foods with high cholesterol can cause detrimental effects on cardiovascular health. Oxidation of low density lipoprotein will attract leukocytes into the intima tunica of the coronary arteries, which will then be taken up by macrophages and there is the formation of foamy cells. The foamy cells will replicate and form lesions; this lesions will be called atherosclerosis in the early stages. This repeated process if lipids will cause a buildup or lesions in the coronary arteries and eventually block blood circulation in the coronary arteries and results in CAD.[6]

Obesity is a metabolic disorder associated with CVD and increased morbidity and mortality.[7] The world health organization (WHO) has defined normal weight as a body mass index (BMI) between 18.5 and 24.9 kg/m^2 and obesity as body mass index (BMI) $\geq$ 30 kg/m^2. Over recent decades, obesity has become a global epidemic, representing a major cause of disabilities and mortality. Both obesity and overweight are associated with an increase in overall mortality. Obesity has been estimated to annually account for 280,000 to 325,000 deaths in the United States, with CVD contributing significantly to obesity. Although obesity is associated with other downstream cardiovascular risk factor such as diabetes mellitus and hypertension, it is also an independent risk factor for CVD.[8]

MATERIAL AND METHODS

Study site: The study was conducted at the General medicine Inpatient department and Cardiac care unit of Chigateri district hospital, Davangere over a duration of six months.

Study design: It is a prospective observational study.

Sample size: The study was conducted over 170 inpatients of general medicine department and cardiac care unit.

Study criteria Inclusion criteria

- All inpatients with newly detected and known case of CAD admitted in general medicine department and cardiac care unit during the period of study
- CAD patients who have hypertension, diabetes mellitus, hyperlipidemia orobesity

Exclusion criteria

- Patients who are admitted in pediatrics and pregnant women.
- Patients have missing and insufficient data.
- Patients below 20 years of age

Study procedure

A prospective observational study was conducted among 170 CAD patients admitted to general medicine department and cardiac care unit of Chigateri district hospital, Davangere over a period of six months. The study received approval from the Institutional Ethical Committee of SCS College of Pharmacy and written consent was obtained from all residents. For the study patients case reports were reviewed and details such as demographics, medical conditions, risk factors, social habits, treatment are recorded in specifically designed data collection form. The collected data were analyzed with MS Excel and descriptive statistics.

RESULTS

1. GENDER-WISE DISTRIBUTION OF CORONARY ARTERY DISEASE (CAD) PATIENTS

A total of 170 patients were included in the study, in which 105 (61.76%) were malesand 65 (38.23%) were females.

Table 1: Gender -wise distribution of CAD patients.

Sl. No	Gender	No: of patients (n)	Percentage (%)
1	Male	105	61.76%
2	Female	65	38.23%

2. AGE-WISE DISTRIBUTION OF CORONARY ARTERY DISEASE (CAD) PATIENTS

Age-wise classification revealed that the highest number of patients belongs to the group 70-79 years (n=52 / 30.58%) and the lowest number of patients belongs to group of 20-29years (n=4 / 2.35%) and 90-99years (n=4 / 2.35%).

Table 2: Age-wise distribution of CAD patients.

SL. No	Age Group	No: of Patients(n)	Percentage (%)
1	20-29	4	2.35%
2	30-39	5	2.94%
3	40-49	20	11.76%
4	50-59	33	19.41%
5	60-69	40	23.52%
6	70-79	52	30.58%
7	80-89	12	7.05%
8	90-99	4	2.35%

3. DISTRIBUTION OF CORONARY ARTERY DISEASE (CAD) PATIENTS BASED ON SOCIAL HABITS

Out of 170 CAD patients 32 are not having any habits, majority of the patients were smokers (n=52 / 37.68%) followed by tobacco users (n=46 /33.33%) and alcoholics (n=40 / 28.98%)

Table 3: Distribution of CAD patients based on social habits.

Sl.no	Social habits	No: of patients(n)	Percentage (%)
1	Smokers	52	37.68%
2	Alcoholics	40	28.98%
3	Tobacco users	46	33.33%

4. DISTRIBUTION OF CORONARY ARTERY DISEASE (CAD) PATIENT BASED ON BMI (BODY MASS INDEX) CLASSIFICATION

Among the 170 patients the majority of the patients were found to have normal weight (101/ 59.41%), followed by overweight (n=38 / 22.35%), obese (n=29 / 17.05%) and underweight (n=2 / 1.17%)

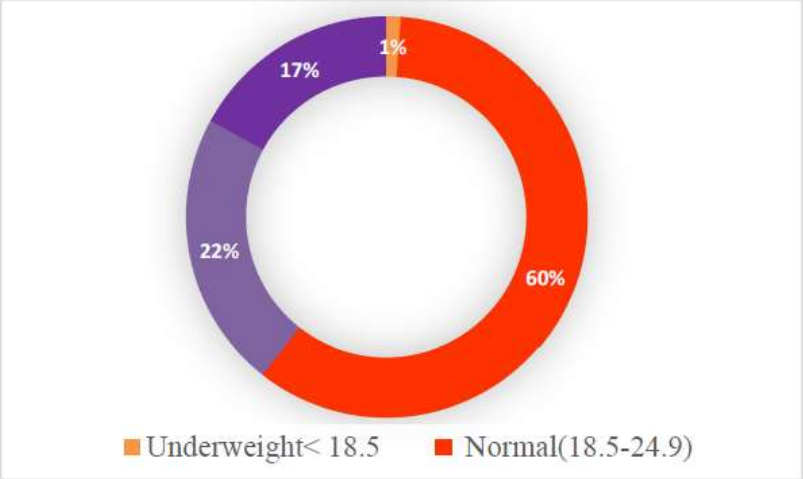

Figure 1: Distribution of CAD patient based on BMI.

5. DISTRIBUTION OF CARDIOVASCULAR DISEASES AMONG CORONARY ARTERY DISEASE (CAD) PATIENTS

The most commonly seen cardiovascular disease among the 170 study subjects were identified as IHD (n=170 / 58.62%), NSTEMI (n=39 / 13.44%), STEMI(n=28 / 9.65%), CCF(21 / 7.24%), Dilated cardiomyopathy(7 / 2.41%), LBBB(7 / 2.41%), TVD(6 / 2.06%), Unstable angina(5 / 1.72%), Arrhythmia(5 / 1.72%), Cardiac arrest(1 / 0.34%), LVH(1 / 0.34%)

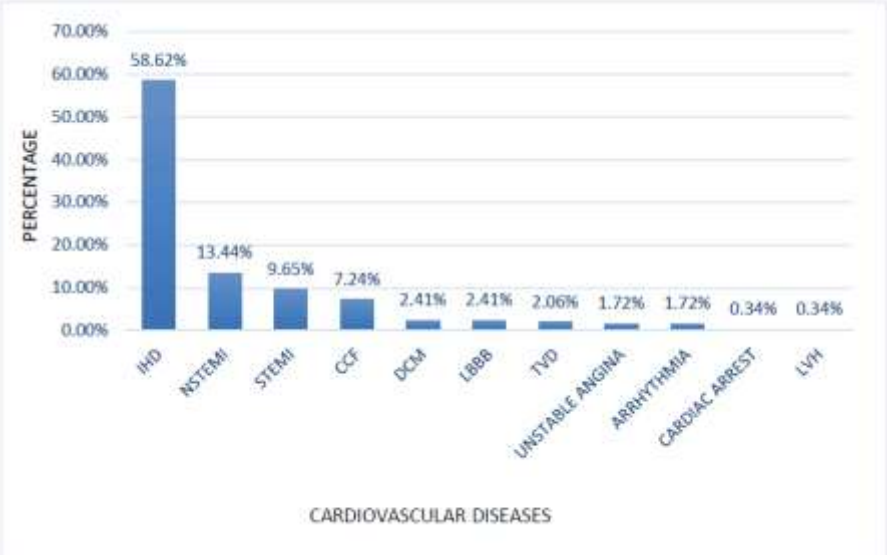

Figure 2: Distribution of CVD's among CAD patients.

6. DISTRIBUTION OF RISK FACTORS AMONG CORONARY ARTERY DISEASE (CAD) PATIENTS

Out of 170 patients, the risk of developing coronary artery disease is more in patients having Hypertension (n=101 / 33.66%) followed by patients who having Diabetes mellitus (n=74 / 24.66%), Hyperlipidemia (n=58 / 19.33%), Overweight (n=38 / 12.66%) and Obesity (n=29 / 9.66%)

Table 4: Distribution of risk factors among CAD patients.

SL.No	Risk factors	No: of patients	Percentage
1	Hypertension	101	33.66%
2	Diabetes mellitus	74	24.66%
3	Hyperlipidemia	58	19.33%
4	Overweight	38	12.66%
5	Obesity	29	9.66%

7. PREVALENCE OF RISK FACTORS AMONG CORONARY ARTERY DISEASE (CAD) PATIENTS

Out of 170 patients, the most prevalent risk factor among CAD patients was Hypertension (n=101 / 59.41%), followed by Diabetes mellitus (n=74 / 43.52%) and the least prevalent risk factor was Obesity (n=29 / 17.05%)

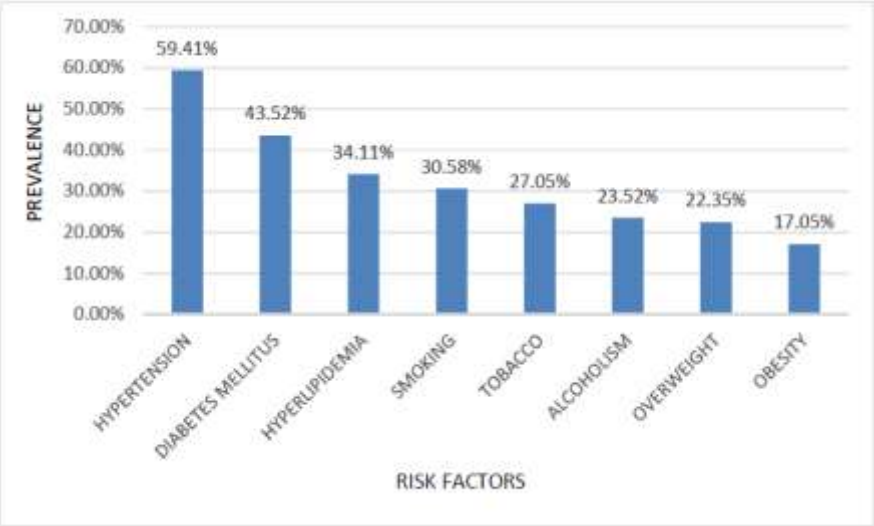

Figure 3: Prevalance of Risk Factors among CAD Patients.

8. AGE WISE PREVALENCE OF HYPERTENSION (HTN) IN CORONARY ARTERY DISEASE (CAD) PATIENTS

The prevalence of hypertension among CAD patients is more in the age group of 60-99(n=65 / 60.18%) followed by age group of 20-59(n=36 / 58.06%)

Table 5: Age wise prevalence of hypertension in CAD patients.

SL. No	Age group	No: of patients having HTN	Prevalence (%)
1	20-59	36	58.06%
2	60-99	65	60.18%

9. AGE WISE PREVALENCE OF DIABETES MELLITUS (DM) IN CORONARY ARTERY DISEASE (CAD) PATIENT

The prevalence of diabetes mellitus among CAD patients is slightly more in age group 20-59(n=27 / 43.54%) as compared to the age group of 60-99(n=47 / 43.51%)

Table 6: Age wise prevalence of DM in CAD patients.

SL. No	Age group	No: of patients having DM	Prevalence (%)
1	20-59	27	43.54%
2	60-99	47	43.51%

10. AGE WISE PREVALENCE OF HYPERLIPIDEMIA IN CORONARY ARTERY DISEASE (CAD) PATIENTS

The prevalence of hyperlipidemia among CAD patients is more in age groups of 60-99 (n= 38 / 35.18%) followed by age group of 20-59 (n=20 / 32.25%).

Table 7: Age wise prevalence of hyperlipidemia in CAD patients.

SL. No:	Age groups	No: of patients havinghyperlipidemia	Prevalence (%)
1	20-59	20	32.25%
2	60-99	38	35.18%

11. AGE WISE PREVALENCE OF OBESITY AND OVERWEIGHT IN CORONARY ARTERY DISEASE (CAD) PATIENTS

The prevalence of risk factors such as obesity and overweight in CAD patients is higher in age group of 20-59 ie, the prevalence of obesity is 24.19% and overweight is 27.41%. Comparing the prevalence of obesity and overweight in age group of 20-59, overweight is more prevalent.

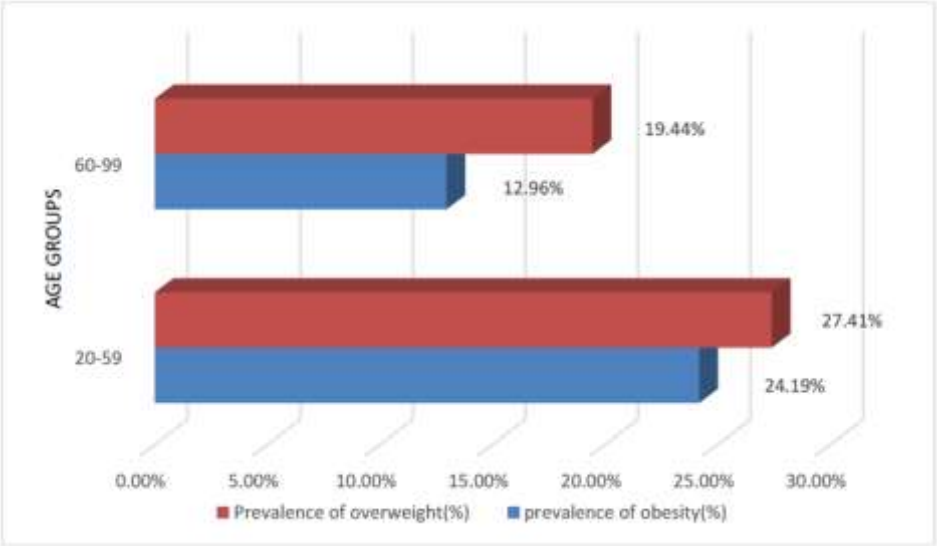

Figure 4: Assessment of age wise prevalence of obesity and overweight.

12. GENDER WISE PREVALENCE OF RISK FACTORS IN CORONARY ARTERY DISEASE (CAD) PATIENTS

The prevalence of hypertension is higher in both male and female CAD patients followed by DM. It is found that the prevalence of hypertension is more in females (n=44 / 67.69%) than males (n=57 / 54.28%), the prevalence of DM is more in females (n=34 / 52.30%) than males (n=40 / 38.09%), the prevalence of hyperlipidemia is more in

females (n=23 / 35.38%) than males (n=35 / 33.33%), the prevalence of obesity is more in males (n=19 / 18.09%) than females (n=10 / 15.38%), prevalence of overweight is more in females (n=15 / 23.07%) than males (n=23 / 21.90%), prevalence of smoking is more in males (n=49 / 46.66%), prevalence of alcoholism is more in males (n=38 / 36.19%) and prevalence of tobaccois more on males (n=30 / 28.57%) than females.

Table 8: Gender wise prevalence of risk factor in CAD patients.

Sl.no	Risk factor	No: ofmales	No: of females	Prevalence ofrisk factors in males	Prevalence of risk factors infemales
1	Hypertension	57	44	54.28%	67.69%
2	Diabetes Mellitus	40	34	38.09%	52.30%
3	Hyperlipidemia	35	23	33.33%	35.38%
4	Obesity	19	10	18.09%	15.38%
5	Overweight	23	15	21.90%	23.07%
6	Smoking	49	3	46.66%	4.61%
7	Alcohol	38	2	36.19%	3.07%
8	Tobacco	30	16	28.57%	24.61%

13. DISTRIBUTION OF DIFFERENT CLASSES OF CARDIOVASCULAR DRUGS PRESCRIBED IN STUDY POPULATION

The most frequently prescribed class of drugs among the 170 study subjects were anti-platelets (n=272/30.08%) followed by statins (n=142/15.70%), loop diuretics (n=85/9.40%), anti –coagulants (n=72/7.96%). The least prescribed class of drugs were opioid analgesics (n=19/2.10%) and thrombolytics (n=8/0.88%).

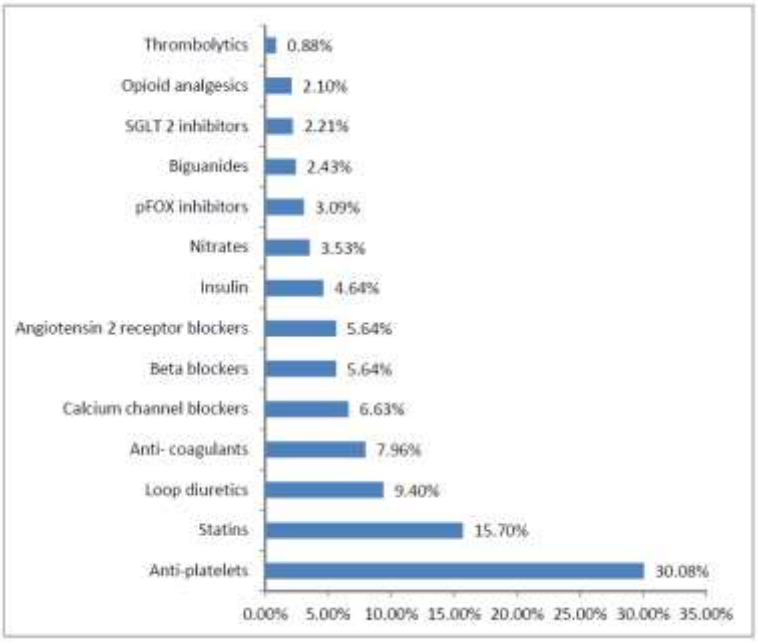

Figure 5: frequency of different classes of drugs.

DISCUSSION

Acknowledgement of the crucial role of risk factors in the development of CAD is one of the most significant advance in the understanding of disease.[9] The present study has described several unique characteristics that influence the cardiovascular health of the patients, including a low degree of control of high blood pressure and elevated sugar level, a fairly high rate of hyperlipidemia and overweight, and an extremely high percentage of men who smoke and increased rate of alcohol consumption and tobacco use. The participants in this study were predominantly in the age group of 50 years and above and there was a predominance of males, possibly because of the adoption of the adverse lifestyle trends and an increased rate of smoking, tobacco use and alcohol consumption. However, this study also found that even in the younger age (20-49 years old), cardiovascular risk factors were already present.[1]

In this study, 170 CAD patients were taken as study participants. Out of this, the proportion of male patients with CAD was significantly higher (n=105 / 61.76%), compared to female patients (n=65 / 38.23%), which is in agreement with the study conducted in Kerala by Dilip *et al*.[1] Another study in Finland by Pekka Jousilahti *et al*.,[10] revealed that the CHD incidence among men was 3-fold and mortality 5-fold greater than in women.

The present study, shows that the incidence of CAD is more in the age group above 50 and less in young adults, which is in concordance with result of study conducted at Peshawar by Riaz Gul *et al*.,[11] In present analysis the maximum frequency is found to be in age group 70-79 (n=52 / 30.58%)

HTN is an independent risk factor for CVD and can increase the risk by 2-3 fold. In the present study, HTN was more common in patients, out of 170 patients 101 patients (33.66%) were having HTN, which is in consistent with the study conducted by Shahadat *et al*.[12] In our study the prevalence of hypertension is more in female patients than in male. Out of 101 patients the prevalence of hypertension in females is 67.69% followed by 54.28% in males. This is consistent with the study conducted by Pranay Wal *et al*.[13] in which they reported a higher incidence of HTN in female (92.3%) than in male (49.38%). The increase in the development of HTN was observed as age increased, especially after age 60. This result is similar to study conducted by Bhalli *et al*.,[14] which reveals that HTN was significantly higher among elder groups.

DM was present in 74 (43.52%) patients. The prevalence of diabetes was more in females (52.30%) than in males (38.09%). This result is in concordance with the study carried out by Umesh *et al*.,[9] and another study carried out by Warren.L.Lee *et al*.,[15]in which they reported that impact of diabetes on the risk of CHD is significantly greater for women than men.

In the present analysis study, hyperlipidemia was present in 34.11% (n=58) of patients and it increase with increase in age. The prevalence of hyperlipidemia is slightly morein females (35.38%) than in males (33.33%), which is in agreement with the result of study conducted by Joseph.L.Goldstein *et al*.,[16]

It was observed that overweight and obesity is prevalent in the study site population. In this study overweight is highly prevalent ie, 38 (22.35%) patients were overweighed, in that 21.90% were male and 23.07% were female. But obesity was found to be with much lower prevalence (17.05%). The result is quite similar to the study result conducted by Bhalli *et, al*.,[14] The reason for this high prevalence of dyslipidemia and overweight may be due to sedentary lifestyle, physical inactivity and excess saturated fat in the diet.[1]

Another finding of this study is that people with social habits such as alcoholism, smoking and tobacco use have a higher risk of coronary artery disease. In the present study the percentage of prevalence of smoking (46.66%), alcoholism (36.19%) and tobacco use (28.57%) in males is higher than in females respectively (4.61%, 3.07%,and 24.61%). Out of these social habits smoking among men (46.66%) is a highly prevalent risk factor. This is consistent with the result of study carried out by Dilip *etal.*,[1] and also quite similar to the study results conducted by Umesh *et al*.,.[9] The study states that cigarette smoking played a critical role in the development of premature coronary heart disease. Thus elimination of cigarette smoking is of dramatic public health importance because it could delay the onset of CAD by a decade.

Our study revealed that only 6% patients lacking any of the risk factors meanwhile, 94% of the patient have atleast one risk factor for developing CAD. Out of 170 patients more than 30% have both hypertension and Diabetes. More than 50% of patients with hypertension have Diabetes as an additional risk factor which is in concordance with the study carried out by Weycker *et al*.,[3] The majority of the patients received standard care therapies including widespread utilization of antiplatelet agents(Aspirin, clopidogrel),

these findings align with the research conducted by Pranay wal *et al*.,[13] Among the total study population 11% of patients have performed Percutaneous transluminal angioplasty (PTCA) and coronary artery bypass graft (CABG).These findings highlights the importance of comprehensive approach to CAD and its Risk factors prevention and management.

CONCLUSION

It was a prospective study that depicted the risk factors among CAD patients. This study found a higher prevalence of CAD among males which suggests that males are more susceptible to CAD. In 170 study patients CAD is more common among older individuals in the age range of 60-99, which aligns with the well-established understanding that age is a significant risk factor for CAD. When social habits were taken into account smoking was more prevalent. So, it may be a notable social factor contributing to CAD. In this research, most of the modifiable cardiovascular risk factor such as hypertension (HTN), diabetes mellitus (DM), and hyperlipidemia are highly prevalent in CAD patients especially, in an age group of 60-99. Among this, HTN is the most prevalent risk factor when compared to DM and hyperlipidemia. This reaffirms that critical role of managing HTN in CAD prevention and treatment. DM is the second most common risk factor. The finding highlights the strong association between diabetes and CAD, emphasizing the need for diabetes control and prevention in CAD management. Hyperlipidemia is another significant risk factor which demands the importance of managing lipid levels, while obesity is less prevalent. Our study revealed that only 6% of patients lacking any of the risk factors meanwhile, 94% of the patients have atleast one risk factor for developing CAD. Our study suggests that many patients with HTN have comorbid DM, these additional risk factors substantially increase the risk of CAD. When evaluating the gender-wise prevalence of risk factors, HTN, DM and hyperlipidemia are predominated in females which suggests that gender is more susceptible to the development of risk factors. Antiplatelet therapy remains a corner stone in the treatment and prevention of CAD, as evidenced by our study.

These findings highlights the importance of a comprehensive approach to CAD prevention and management, including targeted interventions for high risk groups and efforts to address modifiable risk factors such as HTN, DM, hyperlipidemia, obesity and smoking.

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AUTHORS CONTRIBUTION

All authors have made an equal contribution to this research.

CONFLICT OF INTEREST

All authors affirm that there are no conflicts of interest.

ETHICS DECLARATION

The institutional ethics committee at SCS College of Pharmacy approved the protocol, informed consent has obtained from all residents in the hospital.

CONSENT FOR PUBLICATION

All authors have provided the consent for the publication of their work.

COMPETING INTERESTS

The authors have confirmed that they have no competing interests.

AUTHORS FUNDING

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