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ASSESSMENT OF ETIOLOGICAL FACTORS THAT LEADS TO CABG OR PTCA

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ABSTRACT

Background: The leading cause of coronary heart disease (CHD) is atherosclerosis, and risk factors like high blood cholesterol levels, high blood pressure, the presence of diabetes mellitus, heavy alcohol consumption, and stress. Corrections of various risk factors are essential for preventing CHD recurrence. **Materials and methods**: This study was a prospective study conducted in 120 patients over a period of 6 months in a tertiary care teaching hospital. Patients various etiological factors that leads to Coronary Atrery Bypass Graphting or Percutaneous Transluminal Coronary Angioplasty were assessed. **Results**: The study population constitutes 120 patients of which 80% were male and 20% are female. The majority of population who undergone cardiac intervention procedures were on the age group 60-69. The modifiable risk factors assessed among study populations were Diabetes, Hypertension, Dyslipidimia, Smoking, alcohol, obese/ overweight and tobacco chewing. **Conclusion:** The various etiological factors that the patients are presented with, especially hyperglycemia should be effectively managed for the better prognosis of the patient after a coronary re-vascularizing procedure. If they are not effectively managed re-occlusion may occur. So the health care professionals are needed to effectively evaluate and manage them.

KEYWORDS: CABG, CAD, PTCA, RISK FACTOR.

INTRODUCTION

Cardiac disease is the most common cause of death in many countries and the incidence of disease is steadily increasing each year because of lifestyles which include an unhealthy diet, insufficient physical activity, tobacco use, and being overweight by individuals. The leading cause of coronary heart disease (CHD) is atherosclerosis, and risk factors like high blood cholesterol levels, high blood pressure, the presence of diabetes mellitus, heavy alcohol consumption, and stress.[1] Corrections of various risk factors are essential for preventing CHD recurrence.

Coronary artery bypass graft (CABG) and Percutaneous Trans-luminal coronary angioplasty (PTCA) are revascularising methods used in Ischemic Heart Disease (IHD) patients.[2] The patients who underwent these procedures usually have co-morbid conditions such as type 2 DM, CKD, COPD, anxiety or depression, PVD etc. From the various studies it was found that approximately 20.3% were obese of which 6% were severely obese.[3] The 2006 update of Heart and Stroke statistics reported that 37% of all deaths in 2003 and 58% of all deaths in 2002 were caused by cardiovascular disease. From the databases of WHO, in 2012, cardiovascular diseases were the leading cause of Non-Communicable Disease (NCD) deaths which is 17.5 million.[4] The emergence of IHD are associated with a high-fat, energy-rich diet, smoking, and a sedentary life-style.

The major etiologic factor leading to the development of CHD is atherosclerosis. Risk factors of atherosclerosis are divided into several types i.e., conventional, modifiable, non-traditional, various medical conditions and miscellaneous. Conventional include age, race etc. The various factors that can be modified either by treatment or life style changes include High blood cholesterol levels, high blood pressure, cigarette smoking, DM, obesity, lack of physical activity, metabolic syndrome and mental stress and depression. Non-traditional risk factors are C-reactive protein (CRP), Lipoprotein, Homocysteine, Dense LDL-C particles and Fibrinogen. End stage renal disease, Coronary inflammatory disease, Human immunodeficiency virus

and Xanthelasmata are various medical conditions that may lead to CAD[5]

Atherosclerosis is the main risk factor that leads to CAD. The major risk factors for atherosclerosis is low plasma high density lipoprotein (HDL), high plasma low-density lipoprotein (LDL), smoking, hypertension, and DM disturb the normal functions of the vascular endothelium which include, maintenance of an anticoagulant surface, local control of vascular tone and defense against inflammatory cells.[6]

All coronary patients should be professionally encouraged, to lose weight and reduce central obesity. Lifestyle modifications in relation to tobacco smoking, diet and physical activity can reduce the risk of recurrent cardiovascular events and improve survival.[7] There is a strong scientific evidence showing that favorable risk factor modification, lifestyle modifications, and selective use of prophylactic drugs can reduce non-fatal and fatal events risk and improve survival in coronary heart disease (CHD) patients.[8] The 2003 Joint European Societies' guidelines defined the lifestyle and risk factor goals for patients with CHD as follows: stop smoking, be physically active; a body mass index (BMI) less than 25 kg/m2; blood pressure less than 140/90mmHg (<130/80mmHg in patients with diabetes); total cholesterol less than 4.5 mmol/l; low-density lipoprotein (LDL) cholesterol less than 2.5mmol/l, make healthy food choices and appropriate use of cardio protective drug therapies, in addition to medication for the treatment of elevated blood pressure, glucose and lipids and drugs such as aspirin or other platelet-active drugs, b-blockers, angiotensin-converting enzyme (ACE) inhibitors/angiotensin II receptor blockers and anticoagulants[9]

METHODOLOGY

A prospective study for a period of six months (December 2014-June 2015) was conducted in cardiology department of 500 bedded tertiary care teaching hospital, after getting approval from IEC.

The patients who were admitted in the hospital for elective CABG or PTCA were selected for the study.

Inclusion criteria

(i) Patients above 18 years of age who undergoing CABG/ PTCA,
(ii) Patient must have any other co-morbid condition other than cardiac disorders,
(iii) Those who are willing to give informed consent.

Exclusion criteria

(i) Patients without any other co-morbid condition.
(ii) Mentally retarded.
(iii) Pregnancy
(iv) Physically handicapped

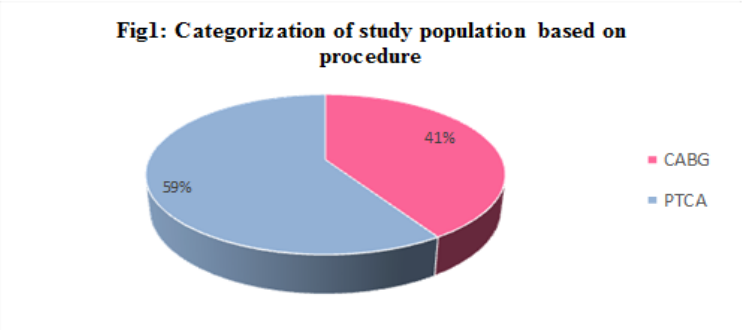
For the study 120 patients were enrolled. The patient's demographical details, past medical and medication history, social habits, family history, laboratory investigations, medication order review were collected.

RESULTS

A total of 307 PTCA and 103 CABG procedures were conducted in the department of cardiology, from which 71(59%) PTCA patients and 49(41%) CABG patients were selected randomly who were satisfied the inclusion and exclusion criteria. Overall 120 patients were selected for the study of which 96 were males and 24 were females .Out of 71 patients undergoing PTCA 60 were male patients and 11 female patients with a prevalence rate of 84.5% and 15.5% respectively. Whereas 36 male and 13 female undergone CABG with a prevalence rate of 73.5% and 26.5% respectively.

Categorization of study population based on procedure

Among 120 patients, 59% underwent PTCA and 41% underwent CABG.



The major portion of the study population constituted of PTCA i.e. 59% than CABG, i.e. 41%.

RISK FACTORS ASSESSMENT OF CAD

The various risk factors that caused CAD and which lead to coronary revascularising procedure among the study population were assessed. The modifiable risk factors assessed among study populations were DM, HTN, DLP, Smoking, alcohol, obese/ overweight and tobacco chewing. The factors were assessed and Tabulated in Table No: 1.

Table No: 1. Modifiable risk factors assessed.

RISK FACTORS	MALE (%)	FEMALE (%)
Diabetes Mellitus	85.4%	83.3%
Hypertension	71.81%	83.3%
Dyslipidemia	30.20%	70.83%
Smoking	64.5%	16.6%
Alcohol	18.75%	0
Obese/Overweight	33.3%	29.1%
Tobacco Chewing	11.45%	8.33%

Table no: 1 shows that, diabetes mellitus is the common risk factor that were assessed by the study, followed by HTN, smoking, obese/overt, DLP, alcohol, and tobacco in males. In females, DM and HTN were the leading causes, followed by DLP, obese/over wt, smoking, tobacco chewing. Most of the patients were assessed with multiple risk factors. The multiple causes that lead to cardiac intervening is tabulated in table no: 2.

Table no: 2 multiple risk factors assessed.

Risk factor combination	male	female	total	%
DM+HTN+DLP	**1**	**5**	**6**	**5%**
DM+HTN+overweight	**4**	**1**	**5**	**4.16%**
DM + HTN + Alco + over wt.	**4**		**4**	**3.33%**
`DM+HTN+Smoking	**5**		**5**	**4.16%**
DM+ smoking+ family history	**4**		**4**	**3.33%**
DM+ HTN+ Alcohol+ smoking	**5**		**5**	**4.16%**
DM+ DLP+ Over wt. + Tobacco chewing	**3**	**1**	**4**	**3.33%**
HTN+ smoking	**8**	**1**	**9**	**7.5%**
DM+ HTN+ DLP+ over weight+ smoking	**4**		**4**	**3.33%**
DM+ HTN+ DLP+smoking	**8**	**1**	**9**	**7.5%**

From table no: 2, DM+ HTN+ DLP+smoking and HTN+smoking are most common risk factor that seen on patients.

SOCIAL HABITS AND FOOD HABITS.

Table 3 shows; smoking is highly prevalent among patients undertaking coronary revascularising procedure, followed by alcoholism. Smoking is highly prevalent in males than in females. Non- vegetarians are prominent than vegetarians. Among vegetarians, females are predominant than males (30% are males and 70% are females). Most of the patients presented with normal BMI. Male to female proportion is higher in underweight population.

Table No: 3 Social habits and food habits.

Social habit					
	Male	**%**	**Female**	**%**	**Total**
Smoking	54	94.73%	3	5.27%	57
Alcohol	7	100%	0	0%	7
Smoking + alcohol	7	100%	0	0%	7
Others	8	88.89%	1	11.11%	9
None	15	42.86%	20	57.14%	35
Food habits					
Vegetarian	3	30%	7	70%	10
Non-vegetarian	93	84.54%	17	15.45%	110
BMI					
Underweight	4	66.67%	2	33.33%	6
Normal weight	60	78.95%	16	21.05%	76
Over weight	27	87.10%	4	12.90%	31
Obese	5	71.43%	2	28.57%	7

NON MODIFIABLE RISK FACTOR

Tab: 4, classification of study subjects according to age.

Age group	No: of males	%	No: of females	%	total
30-39	3	100%	0	0%	3
40-49	14	93.33%	1	6.67%	15
50-59	26	78.79%	7	21.21%	33
60-69	41	77.36%	12	22.64%	53
70-79	9	69.23%	4	30.77%	13
80-89	3	100%	0	0%	3

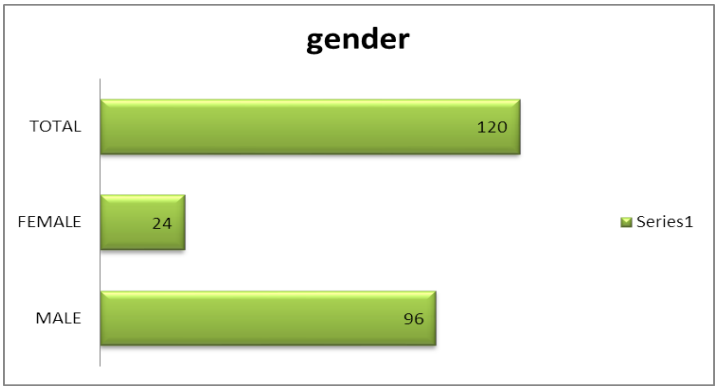


Fig: 2, classification of study subjects according to gender.

The current study had shown that the majority of patients undergone PTCA or CABG was males.

The majority of population who undergone cardiac intervention procedures were on the age group 60-69. Only women aged above 50 is seem to have undertaken the procedure.

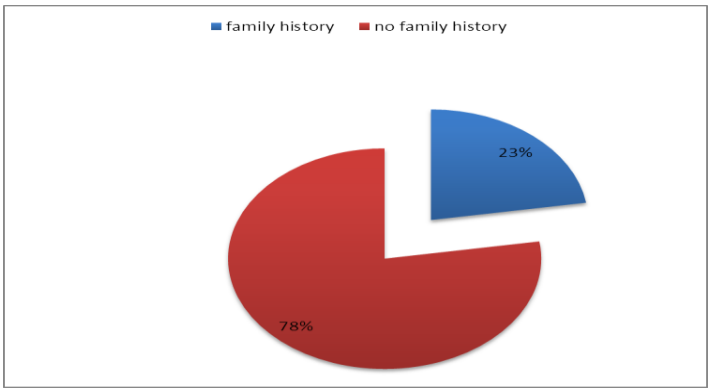


Fig: 3, classification of study subjects according to family history.

From the fig: 3, about 22.5% of population have family history of CAD.

DISCUSSION

The study population constitutes 120 patients of which 80% were male and 20% are female. The number of females was comparatively less in the study population which indicates an overall less prevalence of CAD in females than males which is congruent with the already established clinical data. Women have less prevalence for CAD as they have a natural protective mechanism against vascular disease.[10] No woman of less than 40 age is seemed to have undertaken the procedure in the study group. The women until their menopause have estrogen hormones which maintain a patent cardiovascular system.[6] After the menopause this shield is seem to be lost which shows a rapid shoot up of the prevalence of CAD in females in the age 50-59 and seems to be steadily increasing till the age group of 70-79. The number of male patients who underwent the procedure was also increasing with age. After the age of 70, the no: of population is decreasing owing to the fact that the average life expectancy is up to 70 years. The number of PTCA patients is more in the study population owing to the easiness of the procedure and less number of hospitalized day.

Etiological Factors

The major etiological factors for the patients undertaking CABG and PTCA were identified as hyperglycemia, HTN, DLP, Smoking, Alcohol, Tobacco chewing, Family history, Obesity, Food habits.

The patients were presented with either a single factor or a combination of more than one factor as depicted in Table No: 1& 2. The major risk factor combination was found to be DM + HTN + DLP + smoking which constitute 7.5 % of the population and HTN + smoking which also constitutes 7.5 % of the population. The major risk factor for women was found to be DM+ HTN+ DLP for which 5 out of 24 women in the study population has presented with which shows a prevalence of 20% of the risk factor in total female populations.

The risk factors associated with CAD are well established and can be classified as background, behavioral and physiological factors. Background factors include epigenetics, reduced height, low birth weight, gender, social class, race and geographical location. Behavioral factors include reduced physical activity, a poor diet high in saturated fats, smoking and stress. The

physiological factors associated with CAD include hypertension, increased plasma insulin and increased plasma cholesterol. The causes of CAD are multi-factorial and arise from an interaction of these risk factors. Changes to diet, stopping smoking and increasing physical activity levels can significantly reduce the risk of developing CAD and further complications. The important point is that these behavioral risk factors are modifiable. [11] In our study the study individuals were selected from the northern part of Kerala. The food habit in Northern-Kerala is well-known as Malabari food which is rich in oil and sweet more than other parts of Kerala. From a study of food habits in Kerala, it is pointed that Keralites are more inclining towards non-vegetarian food especially meat. The consumption of alcohol is also the highest in Kerala than any other parts of the nation.[12]

It is important for the healthcare professional to assess an individual's cardiovascular risk factors. One landmark study (the INTERHEART study) demonstrated that in the majority of heart attacks, over 90% of the risks were associated with nine main risk factors. These risk factors identified were cigarette smoking, abnormal blood lipid levels, hypertension, diabetes, abdominal obesity, a lack of physical activity, low daily fruit and vegetable consumption, alcohol over-consumption and psychosocial index. In this 52 country case-control study, the investigators noted that the results were independent of gender, ethnicity and geographical location. This strongly supports the results applicability to any population group.

HTN is the most discussed etiological factor behind the development of CAD. Our study constituted 74.16% of hypertensive patients. As age increases essential hypertension emerges which increases total peripheral resistance. Elasticity of arteries loses leading to platelet adhesion and lipid attraction which causes the atherosclerosis. Hypertension is an independent risk factor of CAD. If it combines with DM or DLP the chances are much more. HTN along with smoking also has equal chances.[11]

The correlation between CAD and risk factors is evident in other studies, particularly high cholesterol, HTN and diabetes. These three risk factors significantly increase the risk of fatal CAD. The risk of MI is significantly reduced in those with none of these risk factors. The NHANES II Study reports that the risk for fatal CAD is 51% lower for men and 71% lower for women, when no risk factors were present. Clinical pharmacist play a role in helping reduce incidents associated with CAD.

Obesity is an established risk factor for CAD. 32.5% of the study population was presented with either obesity or overweight. Obesity is associated with increased levels of a number of adipokines (cytokines released from adipose tissue), including tumor necrosis factor-α, interleukin 1β, interleukin 6, and plasminogen activator inhibitor 1 (PAI-1), all linked to the inflammatory response. The levels of these pro-inflammatory cytokines typically increase as fat mass increases; however, one exception is the adipokine-adiponectin, which has anti-inflammatory properties and is decreased in obese subjects, exacerbating the chronic inflammatory nature of obesity. In addition to their endocrine properties, these locally produced cytokines have been found to possess autocrine and paracrine properties that can influence neighboring tissues as well as the entire organism. Pro-inflammatory cytokines can enhance the production of reactive oxidative species (ROS) which are a subset of molecules called “free radicals” which are high reactive and bonds with other compounds, altering the structure and function of the tissue. Because of the reactive propensity of these molecules, ROS can directly damage a number of cell components, such as plasma membranes and organelles. Oxidative stress occurs when the cellular production of ROS exceeds the capacity of anti-oxidant defenses within cells. Numerous studies have demonstrated chronic oxidative stress in diabetic humans and animals, purportedly related to the metabolism of excess substrates (glucose and fatty acids) present in the hyperglycemic state, as well as to the mitochondrial dysfunction associated with insulin resistance. For example, plasma levels of oxidative free radicals are higher in subjects with type 2 diabetes compared to non-diabetic subjects, and these levels are inversely correlated with the degree of metabolic control.[11]

Smoking and alcoholism are found to be independent risk factors for the development of CAD. The study constituted 47.5% of smokers, 5.833% of alcoholics and 5.833% individuals who were both alcoholics as well as smokers. Smoking increases the chance of atherosclerosis in patients. The smoke contains various carcinogens and radicals that increase the inflammatory process in the body through free radical formation and oxidative stress. From a recent study it has found that smoking inhibits adiponectin, which has significant anti-inflammatory properties, thus enhancing inflammatory response leading to atherosclerosis.[13] It also contaminates the hemoglobin by producing carboxyhemoglobin which is toxic. Alcohol reduces the intake of proper food in the body and lead to malnutrition. This causes the fat in the adipose tissues to mobilize into the blood stream and patients become hyperlipidemic and atherosclerosis occurs. 18.33% of the study population presented with a familial history of CAD. Familial risk factors can never be modified by can be extended to a certain degree by having proper diet and exercise.[7]

CONCLUSION

The present study was performed to get a comprehensive overview of etiologic factors that lead to CABG or PTCA. The various etiological factors that the patients are presented with, especially hyperglycemia should be effectively managed for the better prognosis of the patient after a coronary re-vascularizing procedure. They

also act as risk factors for the development of CAD as well as causes re-occlusion after CABG and PTCA. So the health care professionals are needed to effectively evaluate and manage them.

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