

**CLINICAL AND ANGIOGRAPHIC PROFILE OF  
PATIENTS WITH LEFT MAIN CORONARY  
ARTERY STENOSIS**

*Dissertation submitted to*  
**THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY**

*In partial fulfillment of the requirements for the award of the degree of*

**D.M BRANCH - II  
CARDIOLOGY**

**MADRAS MEDICAL COLLEGE  
RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL,  
CHENNAI 600 003**



**THE TAMIL NADU  
DR. M.G.R. MEDICAL UNIVERSITY  
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## **CERTIFICATE**

This is to certify that the dissertation titled “**CLINICAL AND ANGIOGRAPHIC PROFILE OF PATIENTS WITH LEFT MAIN CORONARY ARTERY STENOSIS**” is the bonafide original work of **Dr. GANESH.V**, in partial fulfillment of the requirements for D.M. Branch– II (CARDIOLOGY) Examination of the Tamilnadu Dr. M.G.R Medical University to be held in AUGUST 2013. The Period of study was from November 2012 to February 2013.

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## **DECLARATION**

I hereby solemnly declare that the dissertation titled “**CLINICAL AND ANGIOGRAPHIC PROFILE OF PATIENTS WITH LEFT MAIN CORONARY ARTERY STENOSIS**” was done by me at Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-3 during OCTOBER 2012 to FEBRAUARY 2013 under the guidance and supervision of my HOD and Chief **Prof.V.E.DHANDAPANI. D.M**; The dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University towards the partial fulfillment of requirement for the award of D.M degree (Branch-II) in **CARDIOLOGY**.

Place:  
Date:

Dr. V. Ganesh  
**SIGNATURE OF THE CANDIDATE**

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## **CONTENTS**

<b>Sl.No.</b>	<b>Title</b>	<b>Page No.</b>
<b>1.</b>	<b>INTRODUCTION</b>	<b>1</b>
<b>2.</b>	<b>REVIEW OF LITERATURE</b>	<b>7</b>
<b>3.</b>	<b>AIMS AND OBJECTIVES</b>	<b>12</b>
<b>4.</b>	<b>MATERIALS AND METHODS</b>	<b>13</b>
<b>5.</b>	<b>RESULTS</b>	<b>20</b>
<b>6.</b>	<b>DISCUSSION</b>	<b>41</b>
<b>7.</b>	<b>CONCLUSION</b>	<b>49</b>
<b>8.</b>	<b>REFERENCES</b>	
	<b>APPENDIX</b>	
	<b>MASTER CHART</b>	
	<b>PROFORMA</b>	
	<b>ETHICAL COMMITTEE APPROVAL ORDER</b>	
	<b>PLAGARISM RECEIPT</b>	



**Dyspnoea :** duration progressive/ static/improve  
NYHA class PND: orthopnoea:

**Fatigue** duration

**Palpitation** duration rest / exertion.

**Syncope** duration no of episodes

Exertion/ rest.

### **Angina equivalents:**

Pedal edema/ oliguria/ abdominal distension/

Other symptoms

### **Clinical presentation**

**Chronic stable angina ;** duration

Class: on treatment/without treatment

Drugs; static/improve/progressive

### **Acute coronary syndrome;**

**Unstable angina/ NSTEMI** duration

severity class

TIMI SCORE ECG changes

Hypotension shock

Inotropic support biomarkers

**STEMI**                      onset of pain                      ecg changes

Type of MI

### **Clinical features**

Pulse rate;                      BP:                      JVP:

Pedal edema:                      cyanosis:

Features of shock:

### **CVS examination**

Heart sounds;

Murmurs

Additional sounds:

Respiratory system:

### **ELECTROCARDIOGRAM:**

HR                      rhythm                      axis                      p wave, QRS complex

ST,T changes

Arrhythmias-                      Tachy/Brady;

### **ECHOCARDIOGRAM**

Wall motion areas:                      score:

Ejection fraction:                      LV function

Chamber dimensions:

PA pressure

RV function                      TAPSE

Valvular stenosis/ regurgitation

LVclot:

Chest x ray





Post procedural complication

Chestpain                      ecg changes

LV failure/pulmonary edema

Unstable angina/nstemi                      STEMI

Treatment given

Medical management

percutaneous intervention

CABG                                      elective/emergency

Death -                                      hrs after procedure:                      cause:

Other complications :

CIN:

Local vascular complications

### **Hospital outcome**

No of days in hospital

CABG -                      emergency/ elective                      if elective after-                      hrs

Post CABG complications

Survived/ dead.

Conservative treatment -

Reason for not taken for CABG

Outcome -                      improved/ worsened/ died

If died – cause                                      cardiovascular / non cardiac

Other complications during hospital stay:

Stroke

Acute coronary syndrome ;                      UA/NSTEMI/STEMI

ஆராய்ச்சி தலைப்பு :

இடது பிராதான கரோனி தமனி அடைப்பு - மருத்துவ மற்றும்  
ஆஞ்சியோகிராப்பி ஆய்வு

பெயர் : தேதி :  
வயது : புற நோயாளி எண் :  
பால் : ஆராய்ச்சி சேர்க்கை எண் :

ராஜிவ் காந்தி சென்னை அரசு பொது மருத்துவமனையில்  
ஆஞ்சியோகிராம் செய்து கொள்ளும் நோயாளிகளின் இடது பிராதான  
கரோனி தமனி அடைப்பின் மருத்துவ மற்றும் ஆஞ்சியோகிராப்பி ஆய்வு  
மேற்கொள்ளப்படும் ஆராய்ச்சி இங்கு நடைபெற்று வருகின்றது.

நீங்களும் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்பு  
கிறோம். இதனால் தங்களது நோயின் ஆய்வறிக்கையோ அல்லது  
சிகிச்சையோ பாதிப்புக்கு ஏற்படாது என்பதையும் தெரிவித்துக்கொள்கிறோம்.

முடிவுகளை அல்லது கருத்துக்களை வெளியிடும் போதோ  
அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது  
அடையாளங்களையோ வெளியிடமாட்டோம் என்பதையும் தெரிவித்துக்  
கொள்கிறோம்

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய  
விருப்பத்தின் பேரில் தான் இருக்கிறது. நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சி  
யிலிருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

இந்த சிறப்பு பரிசோதனைகளின் முடிவுகளை ஆராய்ச்சி  
யின் போது அல்லது ஆராய்ச்சியின் முடிவின் போது தங்களுக்கு அறிவிப்  
போம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

ஆராய்ச்சியாளர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

தேதி :



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1 INTRODUCTION Left main coronary artery disease is a important risk factor for increased morbidity and mortality in the diagnosis and management of coronary artery disease .Left main coronary artery disease is a highly emergency and lethal condition characterised by high mortality if not intervened early. Left main disease is can be silent with unpredictable presentation,which poses diagnostic and management challenges.Left main coronary artery disease is seen in 7 to 15% of patients who are having coronary artery disease by coronary angiography.Overall incidence of significant obstructive left main disease is about 4% of all subjects undergoing coronary angiography. Multivessel disease of...

## INTRODUCTION

Left main coronary artery disease is a important risk factor for increased morbidity and mortality in the diagnosis and management of coronary artery disease. Left main coronary artery disease is a highly emergency and lethal condition characterised by high mortality if not intervened early. Left main disease is can be <sup>1</sup> silent with unpredictable presentation, which poses diagnostic and management challenges. <sup>18</sup> Left main coronary artery disease is seen in 7 to 15% of patients who are having coronary artery disease by coronary angiography. Overall <sup>9</sup> incidence of significant obstructive left main disease is about 4% of all subjects undergoing coronary angiography. Multivessel disease of other coronary arteries are seen in 80% of <sup>5</sup> patients with left main disease.

### Match Overview

1	Chikwe, J.. "Current di... Publication	4%
2	Levine, G.N.. "2011 A... Publication	1%
3	"Sunday, 29 August 20... Publication	1%
4	"Abstracts", European ... Publication	1%
5	Ki Bae Seung. "Stents ... Publication	1%
6	Jonsson, A.. "Classific... Publication	1%
7	"Day 3 - Monday 30 A... Publication	1%
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# INTRODUCTION

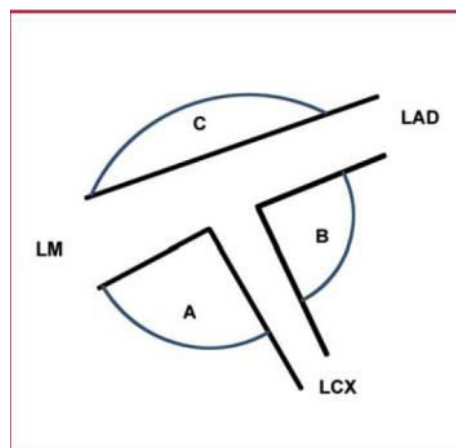
Left main coronary artery disease is an important risk factor for increased morbidity and mortality in the diagnosis and management of coronary artery disease<sup>1</sup>. Left main coronary artery disease is a highly emergency and lethal condition characterised by high mortality if not intervened early. Left main disease is can be silent with unpredictable presentation, which poses diagnostic and management challenges. Left main coronary artery disease is seen in 7 to 15% of patients who are having coronary artery disease by coronary angiography<sup>2</sup>. Overall incidence of significant obstructive left main disease is about 4% of all subjects undergoing coronary angiography<sup>2</sup>. Multivessel disease of other coronary arteries are seen in 80% of patients with left main disease. With drug eluting stents and advances in percutaneous coronary intervention management of this disease is not purely surgical. In CASS registry patients with significant left main stenosis (stenosis of  $\geq 50\%$ ) found to have mean survival of about 13.3 years in surgical group compared to 6.6 years in medical treatment group<sup>4</sup>. The survival benefit in CABG group was also seen patients who are asymptomatic.

Most of patients with significant left main disease were symptomatic and are at high risk of cardiovascular events. This is

because significant left main stenosis is associated with reduction of blood flow to at least 75% of left ventricular myocardium unless it is protected either by collateral flow or by coronary artery bypass grafting to either left anterior descending or left circumflex coronary artery.

## ANATOMY

Left main coronary artery arises from left coronary sinus of aorta just above the left coronary cusp, it enters the transverse sinus and goes between left atrial appendage and pulmonary trunk<sup>6</sup>. Its length is between 1 to 25 mm and it divides into left anterior descending and left circumflex arteries. The normal average diameter of nondiseased vessel is about  $4.5 \pm 0.5$  mm in men and  $3.9 \pm 0.4$  in women measured by angiography<sup>7</sup>. In about 25% of population it gives rise to ramus intermedius. The course may be angulated or straight. It bifurcates at an angle which is important during intervention.<sup>7</sup>



Length of left main coronary artery is highly variable, in autopsy studies it range from 2 to 40 mm<sup>9</sup>. Left main coronary artery is considered short if length is less than 8 mm and long if it is more than 15 mm. and diameter 3.5 mm is cut off. Short LMCA is associated with bicuspid aortic valve. The left main coronary is divided into three parts <sup>7</sup>

1. Ostium – orgin of artery from just above the sinus of valsalva.
2. Mid portion – Body.
3. Distal portion – Bifurcation.

Left main coronary is a muscular artery, there is absence of tunica adventitia at the ostium (orgin from aorta).The tunica media contain predominant smooth muscle cells and rich in elastic tissue<sup>10</sup> .Elastic tissue decreases as we go distally. The normal course of LMCA is leftward , posterior, superior, and running about 90°from ostium and running about 2 to 4 mm in aortic wall. It then emerges posterior to pulmonary trunk and running for a short distance in left interventricular groove before dividing into left anterior desending and left circumflex coronary arteries at the base of left atrial appendage<sup>11</sup>. Variants : There are anatomic variants in orgin, course and termination of LMCA.In about two thirds it divide into LAD and LCX arteries.In one third of cases it trifurcates the third branch is known as Ramus



intermedius. More than three branches are seen in 2.4% of cases. In about 1% of cases there may be no LMCA, the LAD and LCX arise from separate ostium or common ostium. This is a common congenital anomaly and is associated with high incidence aortic valve disease. The right sinus origin of LMCA is dangerous where it can be associated with sudden death particularly when it runs between aorta and pulmonary artery.

Non coronary sinus origin is benign. High take of LMCA seen in 0.013% of cases where it arises distal to origin of left sinus of valsalva.

Classification : LMCA disease is classified according to etiology<sup>14</sup>

## **OBSTRUCTIVE**

Atherosclerotic plaque, Thrombus on unstable plaque.

Coronary dissection: Spontaneous, iatrogenic.

Aortic dissection Type A.

Arteritis : Syphilitic, Takayasu arteritis.

Vasospasm .

Radiation .

Iatrogenic ; Percutaneous, Direct injury during surgery.

External compression : Tumour ,Aortic aneurysm.

## **NONOBSTRUCTIVE**

Congenital anomalies

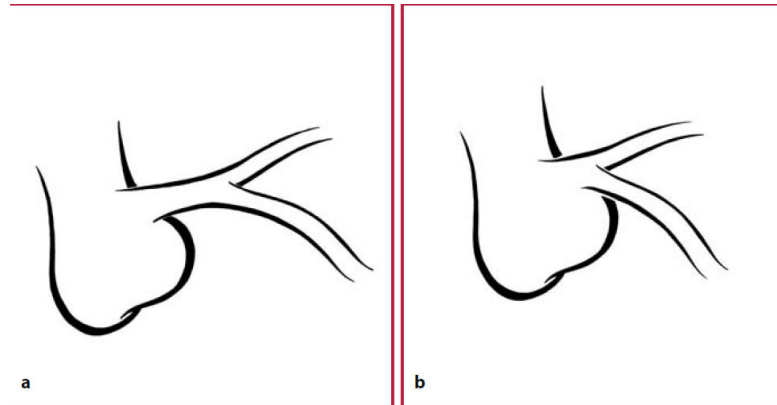
Aneurysmal dilatation: atherosclerosis, Kawasaki disease.

Left main stenosis is significant when the diameter stenosis of about  $\geq 50\%$ . Left main equivalent disease defined as significant ( $\geq 70\%$ ) diameter stenosis of proximal left anterior descending and proximal left circumflex arteries<sup>7</sup>.

### **Morphological characteristics**

Compensatory enlargement occurs before the atherosclerosis encroach the arterial lumen (glagov phenomenon). luminal flow is not reduced unless 40% of total cross sectional area is encroached. Isolated involvement of left main artery is highly unlikely. Distal left main is involved in about 65% of cases, out of which 40% are bifurcation lesions. Isolated ostial lesions are seen in less than 1% of population and most were females. Proximal left main is involved in 25% of cases and 10% of cases occurs in midportion. Besides atherosclerosis, aneurysms can involve left main. Kawasaki disease can affect left main in paediatric population, other causes for left main aneurysms are trauma, polyarteritis nodosa, SLE, Marfan's syndrome etc. Left main coronary artery can be involved during ascending aorta dissection<sup>8</sup>.

Clinical presentation may be a sporadic event or as a acute coronary syndrome. The occurrence of spasm in left main disease is unlikely. However it can occur with irritation due to catheter<sup>5</sup>



a. long left main.

B. short left main

## REVIEW OF LITERATURE

First clinical description of left main stenosis was given by JAMES HERRICK of Chicago in 1912, His patient was a 55 year old male who had acute anterior wall myocardial infarction with cardiogenic shock ,he died after 52 hours.At autopsy he found there is a extensive necrosis of left ventricle with total occlusion of left main coronary artery with a thrombus which occurred over a area of atherosclerotic narrowing<sup>4</sup>.Over the years left main stenosis became important lethal condition affecting the coronary arteries. The prognosis for patient with significant left main stenosis is grave, for individual patients it may vary widely.

In a study by slunga et al showed that involvement of left main is seen in about 5 to 8 % of patients who are under going coronary angiography. Most of them had unstable angina (75%) and 5 to 10% has ST elevation myocardial infarction. Most of the patients have obstructive disease of other coronary arteries. Collaterals from right coronary artery was seen in all of the patients<sup>6</sup> .

Another study by dacosta et al showed patients with left main stenosis had same risk factors as that of other coronary artery disease. There are other causes such as spasm, dissection etc. Symptoms are predominantly of angina especially unstable angina. Surgery is the

treatment of choice with 30 months survival rate of about 80% in surgical group compared to that of 64% in medical therapy group. Long term survival is good<sup>15</sup>. Chronic total occlusion of left main coronary artery is rare occurs in about 0.01 to 0.7% in angiographic studies .Clinical features, ECG and stress test are like severe coronary artery disease. Acute total occlusion of left main coronary artery is generally fatal and it is rare. It is due to acute thrombosis causing extensive myocardial infarction with cardiogenic shock<sup>13</sup>.

In a study of left main disease taken up for coronary artery bypass surgery by jonson et al showed that in 384 patients who underwent CABG for left main stem disease, total occlusion as seen in 2% , proximal ostial stenosis was seen in 9% and mid shaft stenosis was seen in 24% of patients, circular stenosis 25% and distal bifurcation was seen in 40% of patients Patients who had ostial lesions were found to women, and were younger and had less severe disease ,less calcification. Early mortality after surgery is higher in patients with obstruction(4.7%) than in those without obstruction (1.7%)<sup>9</sup>.

### **Clinical features**

The prevalence of LMCA disease in patients presenting with angina NYHA class II was 11% ,NYHA class III was 13%,NYHA class

IV was 9%. Spontaneous dissection of LMCA was rare ,seen during postpartum period in young women. There are many causes iatrogenic trauma causing LMCA ostial stenosis. This can occur during antegrade cardioplegia (1%), percutaneous intubation(0.2 to 1.7%). If the strut of the aortic prosthesis is not properly positioned can lead to ostial LMCA lesions.

### **Clinical associations**

Pryor et al in an analysis of 6435 patients identified 11 clinical variables that predicted LMCA or triple vessel disease including angina, previous myocardial infarction, duration of angina symptoms, gender, age, chest pain frequency, risk factors, carotid bruit, using logical regression analysis he constructed a predictive model and validated independently it 2342 patients<sup>8</sup>.Of 37% of patients who have categorised as low risk only less than 1% had LMCA disease compared to 70% of patients had LMCA disease who were categorised as high risk by the model. Carotid artery disease and LMCA disease has strong association. Carotid artery disease is present in 40% of patients with significant left main stem disease who undergoing coronary angiography for evaluation of angina compared to 5% in patients with single vessel disease. The ACC/AHA guidelines strongly recommend screening for carotid artery

disease in patients with left main disease who are going for coronary artery bypass grafting<sup>6</sup>.

Shaik et al in their study of 180 patients with LMCA disease out of 1111 consecutive patients who undergone coronary angiography found to have a overall incidence of 16.2%..Significant LMCA( $\geq 50\%$ ) was present in 4.5% of patients. Mean age was 58 .9 yrs.88% were over the age of 50 yrs ,while 11% were below the age of 50 yrs<sup>10</sup>. Males were 73,3% while females were 26.7% .among male patients obstructive left main disease was present 28% while 72% had non obstructive disease.and among female 25% had obstructive disease while 75% had nonobstructive disease, 41.6% of them were smokers, 50% were hypertensives. diabetes in 67.2%. obstructive left main disease is seen in 34.7% of smokers against 21.6% of non smokers. Diabetes is more common than hypertension and diabetic patients tend to have more of non obstructive than obstructive left main disease. Obstructive disease was more common in distal left main vessel. Smoking is common in younger patients while diabetes and hypertension were common among older patients<sup>7</sup>.

In a study by mahajan et al that atherosclerosis is commonest cause of isolated left main stem disease. Isolated LMCA disease is more common in women, Diabetes is more commonly associated with distal

LMCA disease. Ostial isolated LMCA is more common in women and smokers.<sup>11</sup>

The mean survival of patients with LMCA disease who were managed medically were 6.6 yrs in CASS study .In veterans administrative cooperative study patients were stratified into high and low risk based on the presence of LMCA stenosis of  $\geq 75\%$  and presence of LV dysfunction at the end of 42 months 92% of low risk group were survived , while 50% of high risk group survived on medical management<sup>8</sup>.



## **AIMS AND OBJECTIVES**

- To study the risk factors associated with the development LMCA disease.
- To study type of presentation to hospital in patients with LMCA disease.
- To study clinical features of patients with left main stem disease.
- To study angiographic characteristics of patients with LMCA disease.
- To study the pattern of involvement in patients with various risk factors who present with LMCA disease.
- To study the in hospital outcome of patients with left main disease diagnosed during coronary angiography.

## **MATERIALS AND METHODS**

We conducted the study in department of cardiology at Rajiv Gandhi Government General hospital in Chennai. Patients underwent coronary angiogram for usual indications which include emergency and elective. Emergency indications include patients admitted for acute coronary syndrome in coronary care unit and were taken for coronary angiogram for various indications. Elective indications include patients with chronic stable angina who were enrolled for coronary angiogram either directly or following a positive stress test.

Patients who were excluded from this study were those with valvular heart disease, congenital heart disease, cardiomyopathy, who were taken up for coronary angiogram.

All patients were routine evaluated with standard blood tests before coronary angiogram include complete blood count, blood urea, serum creatinine, serum electrolytes, coagulation profile, electrocardiogram, chest X-Ray, Echocardiogram by PHILIPS HD 7 machine before the procedure.

Coronary angiogram was performed by consultant cardiologists of our department in our cath lab by TOSHIBA infinix machine with standard views. Number of views were minimised if the patient found to

have left main stem disease during the procedure. Quantitative coronary angiography was used to measure the diameter stenosis of coronary arteries. All patients with left main coronary artery disease either isolated or with other coronary artery involvement are included in this study.

Patients with left main coronary disease with diameter stenosis of  $\geq 50\%$  are classified as having significant obstructive left main disease, those with diameter stenosis of  $\leq 50\%$  are classified as having nonobstructive left main disease. Both obstructive and non obstructive patients were included in this study.

Patients who are found to left main coronary artery disease (both obstructive and nonobstructive) in coronary angiogram were retrospectively analysed for the following parameters which include

- Mode of presentation,
- Symptoms,
- Risk factors,
- Clinical features,
- Blood investigations,
- Electrocardiogram ,
- Chest xray,
- Echocardiogram – transthoracic,

- Coronary angiographic characteristics,
- In hospital outcome.

Patients history was recorded and hospital case sheets were analysed for the type of presentation of patients to hospital. There are three modes of presentation which include

1. chronic stable angina
2. unstable angina/ non ST elevation myocardial infarction.
3. ST elevation myocardial infarction.
4. Others

Chronic stable angina was analysed for type, character, frequency, NYHA class, CCS class, etc. Patients with unstable angina were stratified by TIMI risk scoring ,and patients with STElevation myocardial infarction were analysed for the duration of chest pain, area of involvement by ECG. biomarker elevation. Complications including heart failure, arrhythmias, sudden cardiac death, mechanical complications , cardiogenic shock.

Other symptoms also analysed include dyspnoea – duration, NYHA class, paroxysmal nocturnal dyspnoea, orthopnoea. Palpitations – rest, exertion. Syncope, Fatigue, pedal edema, anginal equivalents etc.

Patients also enquired about their risk factors such as Diabetes – type1/ 2, duration, HBAIC levels, oral drugs, insulin, other complications etc.

Hypertension – duration ,drugs and complications etc.

Hyperlipidemia – duration , drugs, level of lipids.

Smoking – duration, no of packets/ day, quit/ continuing smoking.

Alcohol intake, and family history of coronary artery disease / sudden cardiac death. Other risk factors if present also recorded.

Routine personal data including sex, occupation etc were also recorded.

Through clinical examination was conducted including general examination, recording pulse, blood pressure, etc, followed by systemic examination of all other organ systems including detailed cardiovascular examination.

All patients undergone routine blood tests in either coronary care unit or in wards which include complete blood count , serum electrolytes, blood urea, serum creatinine, coagulation profile. Cardiac biomarkers and additional investigations if they are in CCU.

Electrocardiogram was recorded and analysed.

Chest x ray PA view was taken in all patients.

Echocardiogram was done for all patients using PHILIPS HD 7 echo machine, and analysed for regional wall motion abnormalities, left ventricular systolic function parameters include ejection fraction etc, left ventricular diastolic dysfunction parameters, chamber dimensions, valvular pathology, pulmonary artery pressure, right ventricular function, presence of clot , imaging of proximal coronary arteries if possible etc.

Coronary angiogram was analysed which include route of procedure either radial or femoral route was used. Pressures in femoral and aorta were recorded.

Total number of views taken. Normal or anomalous origin of left main coronary artery and course of the artery before dividing into LAD, and LCX.

Length and diameter of left main coronary artery. Branching pattern of the LMCA such as bifurcation, trifurcation etc, presence of ramus intermedius branch. Angle between LMCA and left anterior descending and left circumflex arteries.

Number of lesions in left main coronary artery ,percentage of diameter stenosis of each lesions, location of each lesion such ostial

lesion, mid shaft , distal circumflex, distal bifurcation lesion etc.character of each lesion including type A,B,C. Presence of calcification. Etc

If it is going to be a bifurcation lesion then Medina classification of the lesion.

Distal flow - TIMI grading.

Presence of collaterals, type of collaterals, number of collaterals, collaterals from where to where etc.presence of bridging collaterals etc.

Lesion in other coronary arteries such as Left anterior descending ,left circumflex, right coronary arteries, and classification into single, double, triple vessel disease.

Also noted is whether left or right dominant system.

Development of any intraprocedural complications such as hypotension during the procedure, development of chest pain, left ventricular dysfunction/ pulmonary edema during the procedure.and if there is any ECG changes during the procedure

Patients were also observed post coronary angiogram for the development of complication in the form of anginal episodes, hypotension, cardiac failure, development of arrhythmias , and sudden death.

All patients included in this study were followed up during the hospital in our cardiology department during hospital stay and observed for the development of complications such acute coronary syndrome, left ventricular dysfunction, hypotension and cardiogenic shock. arrhythmias , and death.

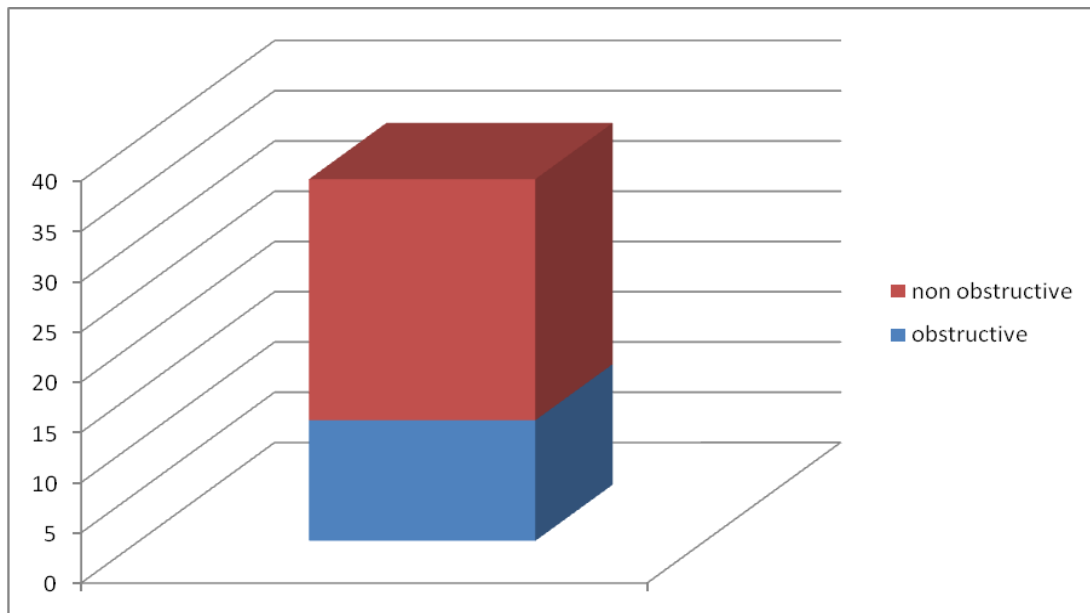
Patients were given options include medical and surgical management based on current existing guidelines and their comorbidities, and was referred to cardiothoracic surgery department for those patients whose option is surgical treatment.



## OBSERVATION AND RESULTS

In our study we analysed about 400 coronary angiograms during the study period and found 36 cases with left main coronary artery disease which constitutes about 9% overall incidence in the population that undergone coronary angiogram.

**TABLE 1 – DISTRIBUTION OF LMCA DISEASE**



In these 36 cases with left main coronary artery disease, obstructive (significant) left main coronary artery disease was present in 12 cases which constitutes about 3 % of the overall cases taken for coronary angiogram and about 33.5% of total cases with left main disease in this study.

In these 36 cases with left main coronary artery disease , non obstructive left main coronary artery disease was present in 24 cases which constitutes about 66.5% of total cases.

Mean age of patients presented with left main coronary artery disease was 56.5 years.

Out of 36 cases, 21 number of patients were between 50 to 60 years of age which constitute of 58% .

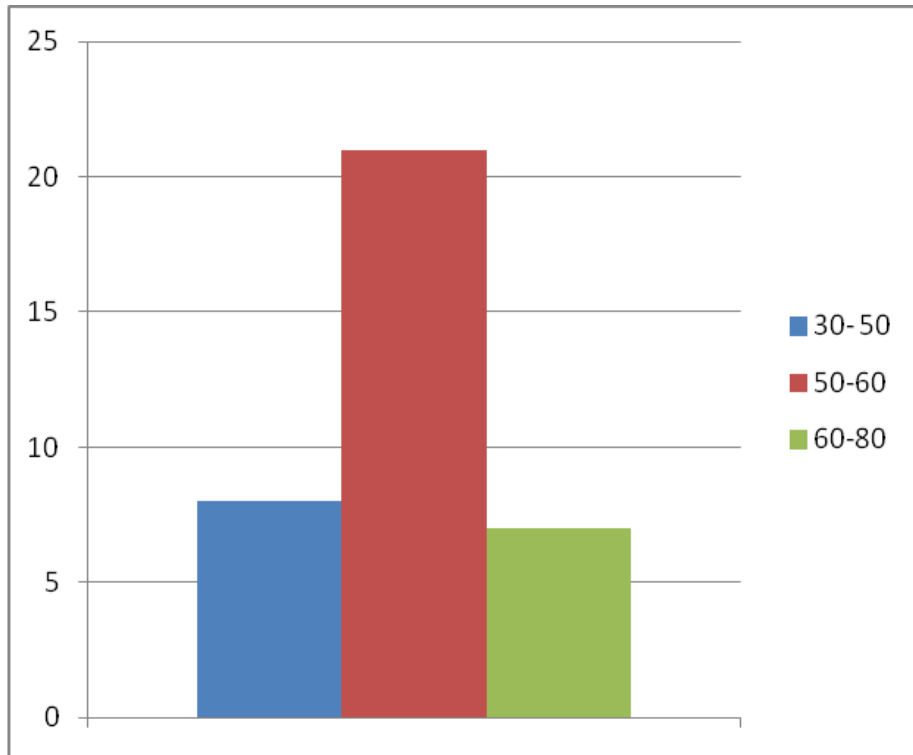
Of the total number of cases 8number of patients were less than 50 years of age. and 7 cases were above the age of 60 years.

Out of the total number of patients, males constitute 25 cases (70%) while females constitute 11 cases(30%).

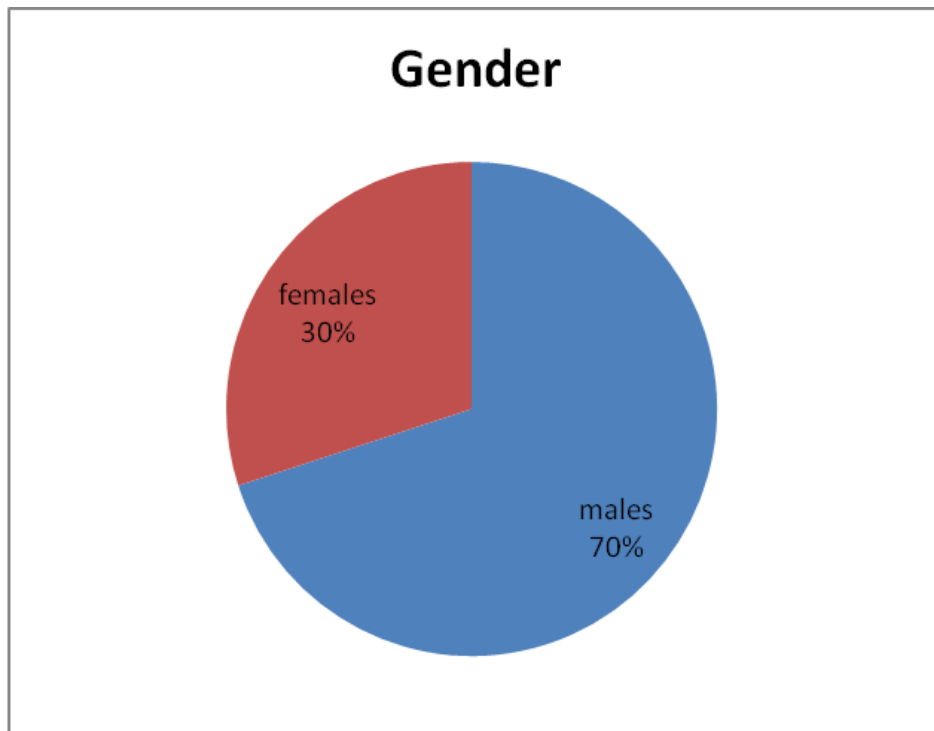
**TABLE 1**

<b>Age</b>	<b>Number</b>	<b>Percentage</b>
>50 yrs	28 cases	77%
<50 yrs	8 cases	23%

**FIGURE 2. DISTRIBUTION ACCORDING TO AGE GROUPS**



**FIGURE - 3**



Out of the 25 male patients with LMCA disease , 6 patients had obstructive coronary artery disease which constitute about 24%. Remaining 19 patients had nonobstructive LMCA disease which is about 76% of total.

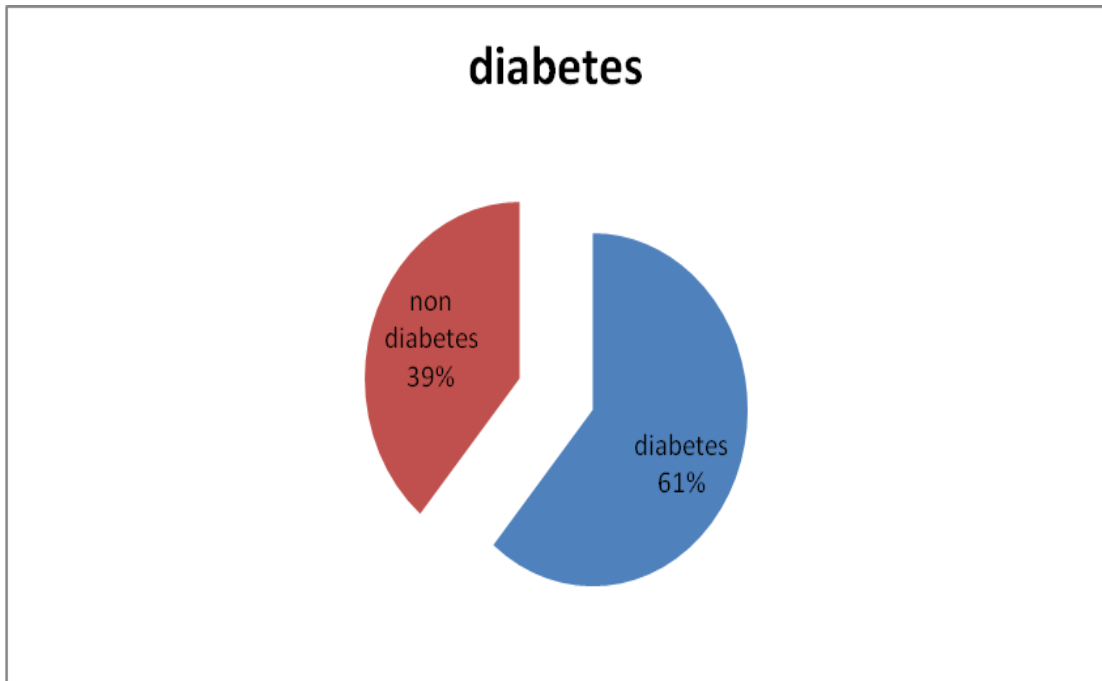
Out of 11 female patients with left main coronary artery disease , 3 patients had obstructive LMCA disease which is about 27% of total. 8 patients had nonobstructive LMCA disease which is about 73% of the total number of patients.

**TABLE - 2**

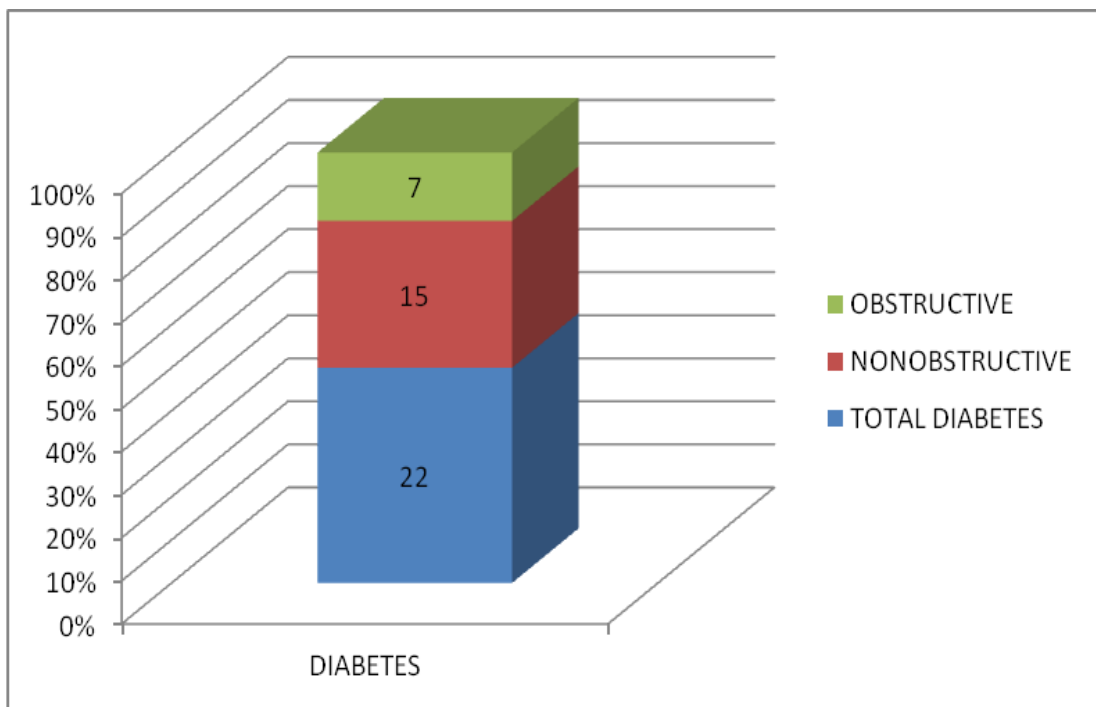
<b>AGE</b>	<b>OBSTRUCTIVE</b>	<b>NONOBSTRUCTIVE</b>	<b>TOTAL</b>
<b>MALE</b>	6	19	25
	24%	76%	100%
<b>FEMALE</b>	3	8	11
	27%	73%	100%
<b>TOTAL</b>	9	27	36
	25%	75%	100%

Out of the total number of cases left main coronary artery stenosis, Patients who had Diabetes mellitus constitute nearly 61% i.e of the 36 cases with LMCA stenosis 22 cases had diabetes .

**FIGURE - 4**



**FIGURE - 5**



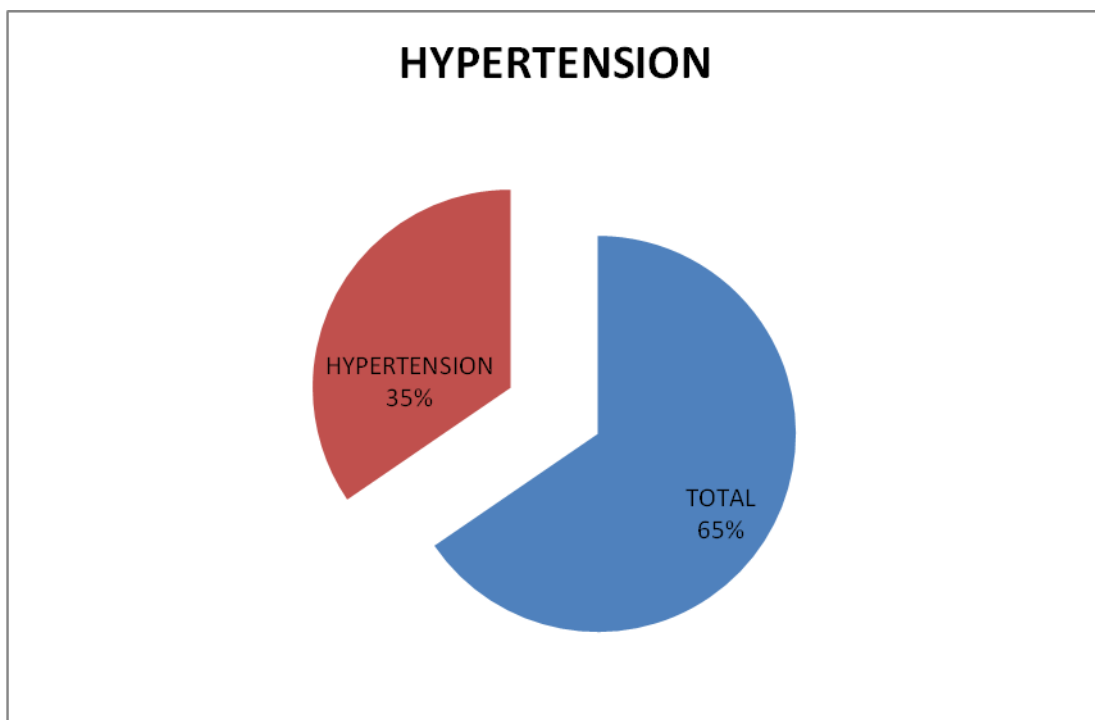
Among the 22 patients who diabetes mellitus in the LMCA group , 15 patients had Nonobstructive coronary artery disease which constitute about 68.1% of total patients with diabetes mellitus.

Obstructive left main coronary artery disease was present in the remaining 7 patients which is about 31.9% of the total number of patients with diabetes mellitus.

### **HYPERTENSION**

Out of the total number of patients with left main coronary artery disease Hypertension was present in 19 patients which constitute about 52.7% of the total number of cases.

**FIGURE - 6**

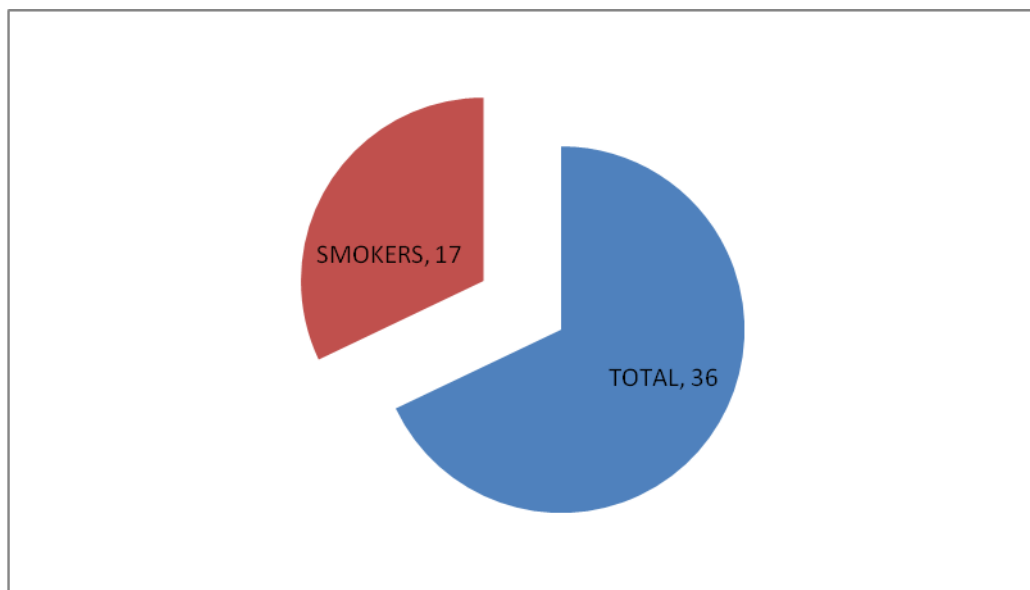


Among the patients with hypertension obstructive left main coronary artery disease was present in 5 patients out of the total of 19 patients with hypertension .which constitute nearly 26.3% of the hypertension patients. The remainder of 14 patients had non obstructive left main coronary artery disease which is about 73.7% of hypertension patients.

### **SMOKING**

Of the total number of patients with left main coronary artery disease, smokers constitute 17 patients of the total 36 patients which is about 47.2%.All patient who were smokers were male and none of them were female. Of the 17 patients who were smokers 4 patients quit their smoking before the illness.

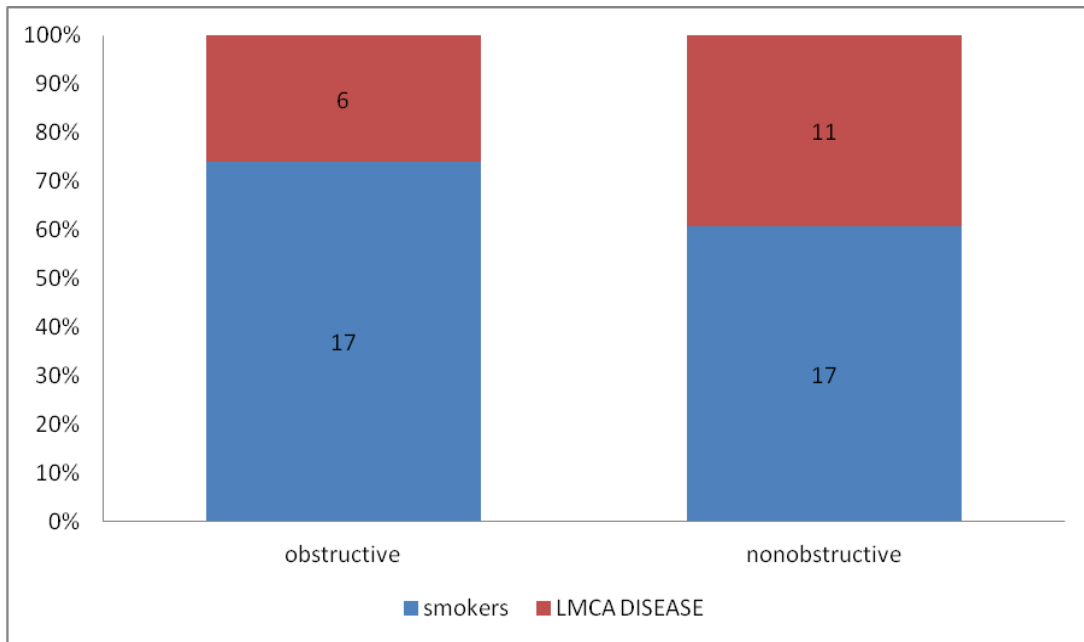
**FIGURE - 7**



Among the smokers who are having left main coronary artery disease. Cases who had obstructive LMCA disease were 6 patients. Which is about 35.2% of the total smokers.

Among the smokers who are having left main coronary artery disease, cases who had nonobstructive LMCA disease were 11 patients which is about 64.8% of total smokers.

**FIGURE - 8**



Of the total number of patients with left main disease in coronary angiogram only 8 patients gave history of treatment for hyperlipidemia. In all the patients were treated with statin for elevated LDL levels.

No patient in our study gave history of sudden cardiac death in their family members



No patient in our study group have history of premature coronary artery disease in their family members.

No other risk factors were noted in the study group.

### **Mode of presentation**

The mode of presentation of patients with left main disease were analysed in all the 36 patients .

Unstable angina was the mode of presentation in 26 patients out of the total number of 36 patients who had left main disease in their coronary angiography.

Unstable angina was the common mode of presentation in 72.2% of the patients with left main disease.

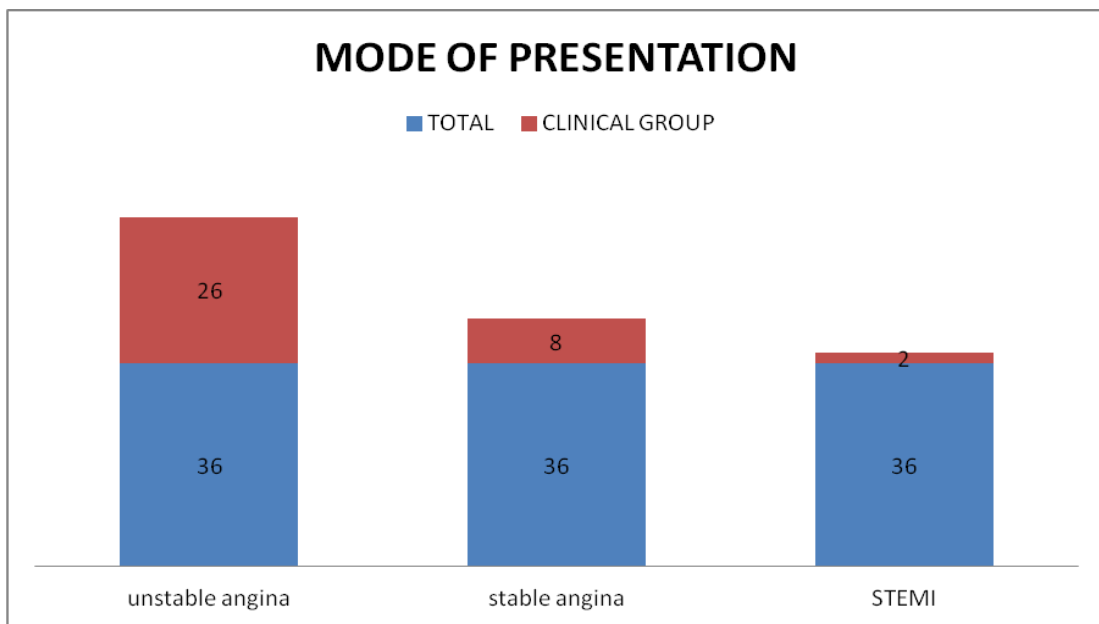
Stable angina was the mode of presentation in 8 patients out of the total number of 36 patients who had left main disease in coronary angiogram.

Stable angina constitute about 22.2% of the patients with left main stem disease.

ST elevation myocardial infarction was the mode of presentation in 2 patients out of total 36 patients with left main disease.

ST elevation myocardial infarction constitute about 5.5% of the patients with left main disease.

**FIGURE - 9**



Of the 26 patients presented with unstable angina , 8 patients presented with significant obstructive left main disease which is about 30% of the cases

All Patients with unstable angina who had obstructive LMCA disease in coronary angiogram were belong high TIMI risk score , positive cardiac biomarkers – high risk unstable angina.

Rest of the 18 patients (70%) presented with unstable angina had nonobstructive left main disease.

Of the Patients with stable angina 2 patients had significant obstructive disease of left main coronary artery in coronary angiogram which is about 25% of the cases with stable angina.

All the patients with stable angina with obstructive left main coronary artery disease had NYHA class III angina, and CCS class III angina.

One of the patient underwent exercise stress test in other hospital which showed strongly positive test at low exercise workload.

All the 2 patients who presented with anterior wall ST elevation myocardial infarction had significant obstructive left main coronary artery disease in coronary angiogram.

Both the patients with ST elevation myocardial infarction presented with cardiogenic shock.

Regarding clinical features, 5 out of 12 patients with obstructive left main coronary disease presented with cardiogenic shock which is about 41% of the total patients with significant left main disease

Out of 5 patients with cardiogenic shock 3 patients presented with unstable angina and 2 patients presented with ST elevation myocardial infarction.

Signs of heart failure was present in 5 patients with significant obstructive left main disease. which is about 41% of the total patients with obstructive left main disease.

Out of 5 patients with heart failure , 3 patients had unstable angina and 2 patients had ST elevation myocardial infarction.

Regarding clinical features in patients with non obstructive left main disease , none of the patient had cardiogenic shock, heart failure.

In Patients who left main coronary artery disease without obstruction,

18 patients presented with unstable angina of low risk score. and 6 patients presented with stable angina with angina of NYHA/CCS class II severity

### **Electrocardiogram :**

Regarding ECG changes in patients with left main coronary disease ST segment elevation in lead avR is seen in all the 12 patients with significant left main disease with obstruction.

In the subset of patients who presented with ST segment elevation , these 2 patients had ST segment elevation in anterior chest leads V1 to

V6, lead I and avL along with avR. Suggesting predominant anterior wall myocardial infarction.

Of the 18 patients who presented with unstable angina with left main coronary artery disease without obstruction showed diffuse ST segment changes in the form ST segment depression of >1 mm. and T wave inversion.

In patients who presented with stable angina, patients who had obstructive left main coronary artery disease, ie 2 patients showed diffuse ST depression in anterior precordial leads and T wave inversion.

The remaining 4 patients with LMCA without obstruction and stable angina showed no ECG changes at rest but developed ST changes with exercise stress test at low workloads and involved multiple leads, persisted into recovery.

And 2 patients who presented with stable angina with left main disease without obstruction had normal ECG.

### **Chest x ray :**

X ray chest PA view was taken only in stable patients who are taken up for coronary angiogram.

Chest x ray was taken in total of 30 patients out of 36 patients.

Of the 30 patients evidence of cardiomegaly seen in 3 patients with unstable angina who had heart failure.

Features of left ventricular enlargement seen in 4 patients who had hypertension.

### **Echocardiogram :**

Wall motion abnormalities confined to left anterior descending territory was seen in all the 2 patients with ST segment elevation myocardial infarction.

Hypokinesia in area corresponding to LAD and LCX territories were also seen in 6 patients with unstable angina.

Other patients did not demonstrate any wall motion defects.

Ejection fraction was reduced in 9 patients in left main coronary artery disease with obstruction ,out of which 2 patients were in STEMI group and 7 patients were in unstable angina group

When stratified according to level of ejection fraction

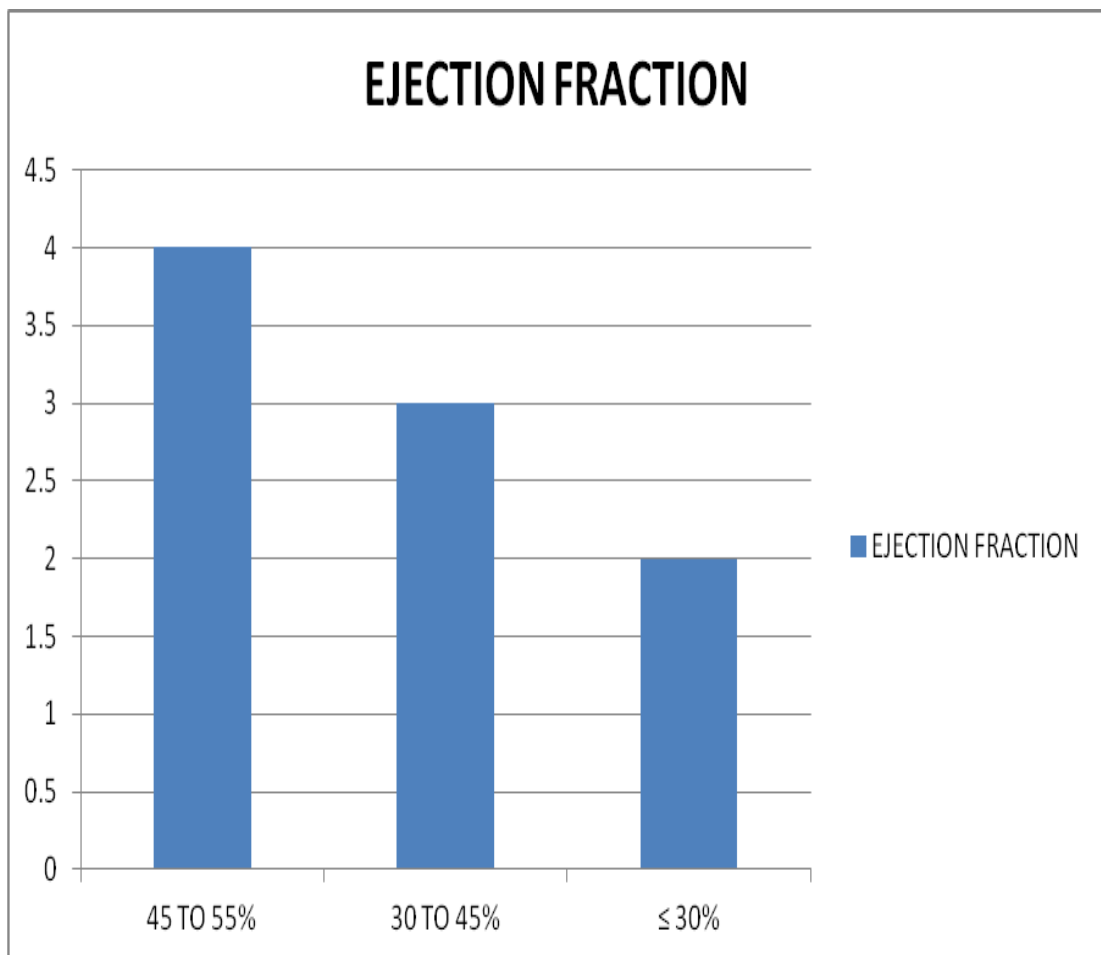
Ejection fraction- 45% to 55 % - 4 patients.

Ejection fraction – 30% to 45% - 3 patients.

Ejection fraction – less than 30% - 2 patients.

Ejection fraction was not reduced in any of the patients in non obstructive LMCA group and 3 patients in obstructive LMCA group.

**FIGURE - 10**



**Coronary angiogram:**

Coronary angiogram by femoral route was carried out in 16 patients while the remaining 20 patients it was done by radial route.

In patients who were found to have obstructive LMCA disease minimal number of views (3 views or less) were taken.

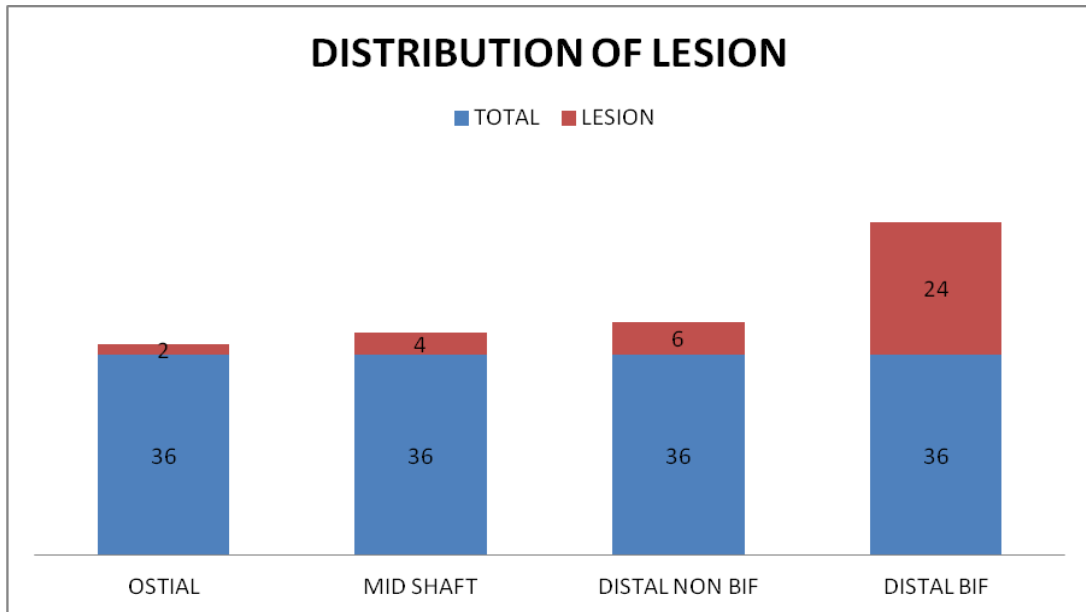
Regarding distribution of lesions, ostial lesions were seen 2 patients, which is about 5.5 % of the total patients with left main coronary artery disease. Mid shaft lesions were seen in 4 patients, which is about 11.1% of the total patients. Distal left main lesions were seen in 30 patients which is about 83.3% of the total patients. Of the distal left main lesions, Bifurcation lesions were seen in 24 patients which is about 66.6% of the total lesions while non bifurcation lesion of left main seen in 6 patients which is about 16.6% of the total cases.

**TABLE – 3 : DISTRIBUTION OF LESIONS.**

<b>Site of lesion</b>	<b>No of cases</b>	<b>Percentage of total.</b>
Ostial	2	5.5%
Mid shaft	4	11.3%
Distal non bifurcation	6	16.6%
Distal bifurcation	24	66.6%
Total	36	100%



**FIGURE - 11**



**CORONARY ANGIOGRAM SHOWING DISTAL LEFT MAIN  
DISEASE WITH TRIPLE VESSEL DISEASE**



In patients with distal bifurcation lesions ,left anterior coronary artery involvement is seen in 66.6% of cases while left circumflex artery involvement is seen 33.3% of cases.

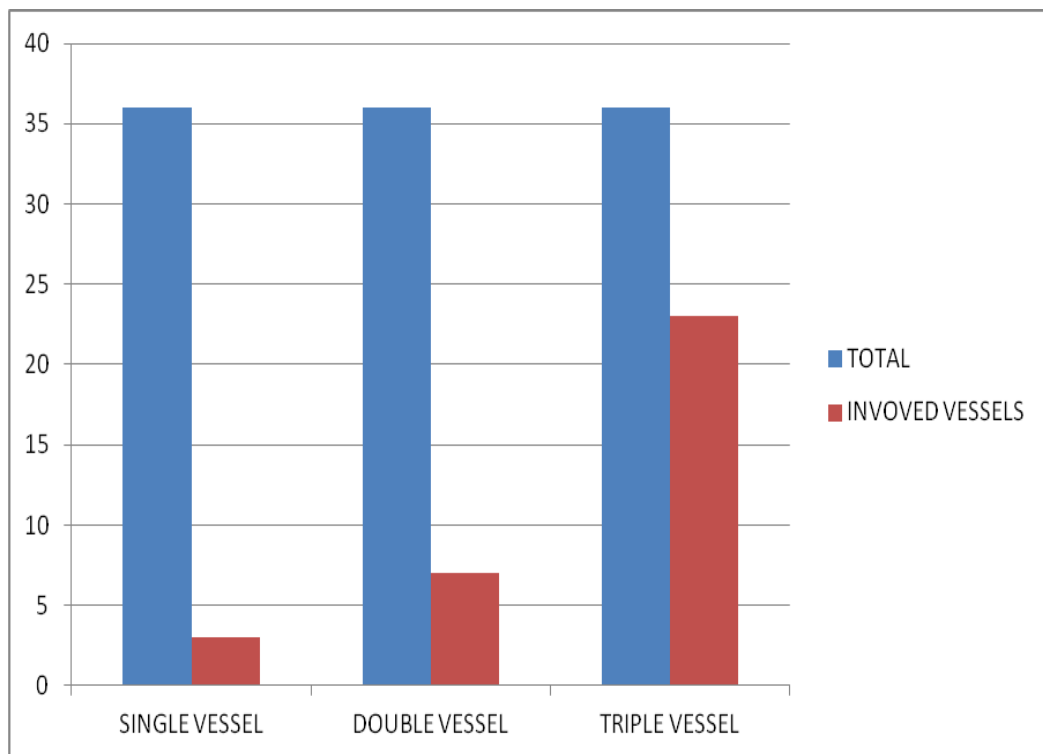
In this study patients 33 patients out of the 36 patients which is about 91.1% had involvement of other coronary arteries.

Coexistent single vessel disease was present in 3 patients that is 8.3% of total cases .

Coexistent double vessel disease was present in 7 patients that is 19.44% of the total cases.

Coexistent triple vessel disease was present 23 patients that is 72.22% of the total cases.

**FIGURE - 12**



Presence of obstructive left main disease in respect to distribution of lesions include in distal bifurcation lesions had 8 patients, in distal nonbifurcation lesions had 2 patients and mid shaft lesions had 2 patients.

Presence of nonobstructive left main disease in respect to distribution of lesions include in distal bifurcation lesions had 16 patients, in distal nonbifurcation lesions had 4 patients, in mid shaft lesions had 2 patients, in ostial lesions had 2 patients.

### **CORONARY ANGIOGRAM SHOWING SIGNIFICANT DISTAL LEFT MAIN DISEASE**



As for obstructive disease of left main disease with respect to distribution of lesions, distal left main has highest amount cases. 10 cases out of 12 cases occurred in distal left main which is about 83.3% .

As far as risk factors in patients with obstructive LMCA disease, smokers had more number of obstructive LMCA disease (35.2%) when compared to non-smokers (29%).

Regarding hypertension obstructive LMCA disease is seen in 5 of the total of 19 patients with hypertension which is about 26.3% , when compared non hypertensive group obstructive LMCA disease is present in 7 out of the 17 patients which is about 41.1% of the total.

Regarding diabetes obstructive LMCA disease was seen in 7 patients out of 22 patients which is about 31.9% of the total, when compared to non diabetic population which is about 32.5%.

Diabetic population has more of non obstructive left main coronary artery disease compared to that obstructive LMCA disease.

Regarding distribution of lesions female had more ostial involvement ,2 patients with ostial LMCA disease were females.

In other obstructive LMCA disease group most of cases presented with distal LMCA involvement.

## **Complications :**

During coronary angiogram 5 of 12 patients developed chest pain along with ECG changes during the procedure. These changes were transient and disappeared after the procedure. No other complication was noted in these patients.

Post procedure complication: no post procedure complication was seen in any of the 36 patients with left main disease .

No in hospital death was noted in any of our patients.

All the patients with significant left main disease was sent coronary artery bypass surgery.

Patients with non obstructive left main stenosis were treated according to other vessel involvement.

## DISCUSSION

In our study analysis of 400 coronary angiograms were undertaken and 36 patients were found to have left main coronary artery disease, which is about 9% of the total. This result is consistent with various studies undertaken in different population with different ethnic groups which showed a incidence of around 8 to 16% with high incidence reported in some asian countries.

When total cases were divided into obstructive and non obstructive based on the standard cut of  $\geq 50\%$  . Obstructive coronary artery disease was present 12 out of the 36 cases which is about 33.5% .of the cases with LMCA disease and 3% of the total coronary angiograms.This is consistent with data obtained from multiple studies which showed a incidence between 3 to 6% as presence of significant obstructive LMCA disease in the total coronary angiograms.

When gender was taken into consideration males have overall high incidence of left main coronary artery disease compared to females .

Males form 69.4% and females form 31.4%. which is a expected as high incidence of various risk factors in male population.

But in patients with obstructive left main coronary disease females had higher incidence compared to male population. Females incidence is 27% of the total cases with LMCA stenosis. While in males the incidence is 24% of the total. This in contrast to other study carried by shaik et al which showed a high incidence of obstructive left main disease in male population.

The overall mean age of patients with left main coronary artery disease is 56.5 years.

High incidence of this disease is seen in the age group between 50 to 60 years.

58% of the total cases occurred in this age group.

This is consistent with other data where maximum cases occurred in age group more than 50 years.

Among the risk factors present diabetes is the commonest risk factor present

Which account of nearly 61% of total cases.

Patients with diabetes had high incidence of non obstructive left main coronary artery disease (68.1% ) compared to obstructive disease (31.9%).

Diabetic patients also predominant distal left main disease compared to proximal left main disease.

Predominant presentation in patients with diabetes with left main coronary artery disease is unstable angina.

Hypertension as risk factor is present in half of the patients (52.7%) with left main coronary artery disease. It is the second common risk factor in this study. Majority of the patients with hypertension present with non obstructive left main disease (73.7%) compared to obstructive left main disease (26.3%).

Mode of presentation in patient with hypertension is unstable angina. and predominant involvement is distal left main in most of the patients

Smoking as a risk factor is present in 47.2 % of total cases. All patient who smoked were males. Obstructive left main coronary disease is present in 35.2% of the patients and non obstructive disease in 64.8%. Though the commonest mode of presentation in smokers were unstable angina , all the 2 patients present with ST elevation myocardial infarction were smokers.

Regarding mode of presentation in patients with obstructive left main disease. Unstable angina is commonest presentation which accounts



for 72.2% of the total cases, Stable angina is the second common presentation occurred in 22.2% of cases and ST elevation myocardial infarction occurs in 5.5% in 2 cases. This data is consistent with other studies which showed similar results in the mode of presentation.

The obstructive left main disease was commonest in patients with ST elevation myocardial infarction, since both the patients in this group had obstructive left main disease.

Patients who presented with unstable angina and who had obstructive disease of the left main, the severity of unstable angina is high reflected by a high TIMI risk score. and 3 patients with unstable angina and obstructive left main disease presented with cardiogenic shock.

Patients who had stable angina as mode of presentation and had obstructive disease of left main had severe angina in the form of NYHA and CCS class III angina.

Regarding clinical features 5 patients with obstructive left main disease presented with cardiogenic shock, out of which 3 patients had unstable angina and all the 2 patients with myocardial infarction group had cardiogenic shock.

Heart failure is present in 5 patients with obstructive LMCA group.

Both the patients in ST elevation myocardial infarction group had evidence of both heart failure and cardiogenic shock reflecting the large area of myocardium is in jeopardy when there is a critical occlusion of left main coronary artery.

Regarding ECG changes in patients with left main disease , ST segment elevation in lead avR is highly specific for critical left main obstruction, In all the 12 patients with obstructive left main disease there ST segment elevation in lead avR.

In 2 patients who presented with ST elevation myocardial infarction also had ST elevation in lead avR along with ST elevation in anterior leads.

In patients with unstable angina had diffuse ST depression in multiple leads along with T wave inversion .some of the patients with non obstructive disease also had ST and T changes.

Patients with stable angina who had non obstructive disease 4 patients had positive exercise stress test at low workloads , ST changes occurred over multiple leads and persisted into recovery.

2 patients with stable angina with non obstructive disease had normal ECG

Chest X ray showed cardiomegaly only in patients with heart failure.

Regarding echocardiogram which showed hypokinesia in both the patients who presented with ST segment elevation myocardial infarction which was as expected.

While 6 patients with unstable angina also had hypokinesia of the anterior wall, as well as there is reduction in ejection fraction in 7 patients with unstable angina which may be due to hibernating myocardium produced by severe ischemia.

Patients with STEMI as well as unstable angina who presented with heart failure and cardiogenic shock showed hypokinesia and severe reduction in ejection fraction.

Coronary angiogram showed predominant showed distal left main disease in 30 patients out of 36 patients which is about 83.3% of the total .In distal left main lesions the predominant is distal bifurcation lesions accounting to 66.6% of the total.while non bifurcating lesions were only 16.6% .In study by jonsson et al who showed that distal left main involvement is seen in 65% of the 384 patients who underwent coronary artery bypass surgery .Our study showed the incidence was higher .Also

the distal bifurcation was 40 % in the study by jonsonn ,In our study the incidence was higher about 65% .

With respect to risk factors ,smokers had higher incidence obstructive distal left main disease compared to patients with other risk factors.

Regarding ostial involvement in our study it was 5.5% (only 2 cases out of the 36) which is slightly higher than jonsonn study of 2%.

Mid shaft lesions were 11.1% in our study which were similar to the study by jonsonn which showed 9%.

Both of the two patients with ostial lesions were female, which is consistent with other data which showed ostial lesions were more common in female and younger patients.

Involvement of other coronary arteries are seen in 91% of the cases which is similar to other studies which showed a incidence of more than 80%.

Associated Triple vessel disease is more common which occurred in 72.22% of the cases which is slightly higher than in the study by shah et al which showed a incidence of 58%.this difference in our study is because of high propotion of people with diabetes .

We don't see any significant intra procedural or post procedural complications in study group except for the transient chest pain and ischemic ECG changes which subsided spontaneously after the procedure.

## CONCLUSION

The overall incidence of left main coronary artery disease in patients undergoing coronary angiogram is about 9%. If only significant obstructive lesions are considered it is about 3%.

Only one third of patients with left main disease is obstructive and rest are non obstructive.

The majority of cases occurs between 50 to 60 years. Males outnumber the females when overall incidence is considered however if percentage of obstructive disease compared to nonobstructive disease female incidence is higher.

All the risk factors are associated with left main disease with about two third cases were nonobstructive except in smokers where obstructive disease incidence is slightly high.

Mode of presentation is commonly unstable angina, with stable angina is second common.

Patients with obstructive left main disease has florid presentation in the form of high risk unstable angina, severe class stable angina ,ST elevation myocardial infarction .

Some patients with severe obstructive left main disease also present with heart failure and cardiogenic shock.

ST elevation in avR is the common ECG change seen in patients with obstructive left main disease.

Some patients with unstable angina and obstructive left main disease also had wall motion abnormalities ,and reduced ejection fraction in echocardiogram.

Distal left main disease especially bifurcation lesions are the commonest lesions in coronary angiogram in patients with left main disease.

Two third of patients with distal left main disease had associated triple vessel disease.

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