**Sudan University of Science and Technology**

**College of Graduate Studies**

# A Study of Coronary Arteries Diseases by Cardiac Catheterization

## دراسة امراض الشرايين التاجية عن طريق قسطرة القلب

A Research submitted for partial fulfillment for the Requirements of M.Sc. degree in Diagnostic Radiologic Technology

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# الاية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

(قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ)

صدق الله العظيم

سورة البقرة: الآية (32)

## Dedication

I dedicate this work to:

My big family

My friends and colleagues.

## Acknowledgement

First and foremost, praises and thanks to the Allah, the Almighty, for his shows of blessing though out my research work to complete the research successfully.

I am grateful for all who help me though this research, beginning from my supervisor **Dr. Mona Ahmed Mohamed** who supervised this research and guide me.

I am extending my heartfelt thanks to the family of Ahmed Gasim Hospital for their moral support.

## Abstract

This was descriptive analytic prospective study, aimed to study coronary arteries diseases by cardiac catheterization, problem of the study was coronary artery diseases become common and incidence all age especially elder people and causes completely block lead to death, carried out in cardiac catheterization department of Ahmed Gasim Hospital during the period from November 2021 to June 2022. A total of 50 patients with coronary artery disease (50%) males and (50%) females.

The results found that most areas of abnormalities 15(30%) in [LAD, LCX, RCA (3VD)], 13(26%) in LAD, most patients had PCI in LAD were 19(38%), there was statistically significant correlation between areas of abnormalities and type of catheterization (p-value = 0.005), between areas of abnormalities and area of PCI (p-value = 0.005) and there was statistically insignificant correlation between areas of abnormalities, gender, age group and risk factors (p-value > 0.05)

The study concluded that most patients had abnormalities in LAD, and [LAD, LCX, RCA (3VD)], with diagnostic catheterization, had PCI in LAD, there was statistically significant correlation between areas of abnormalities and type of cauterization, between area of abnormalities and areas of PCI.

The study recommended that training and education for radiologic specialist on CCTA should continue to increase the number of radiologic centres that performing the CCTA to avoid radiation hazards and complications that involved in cardiac catheterization due to invasive procedure during exams.

## المستخلص

دراسة وصفية تحليلية مستقبلية ، هدفت إلى دراسة امراض الشرايين التاجية عن طريق قسطرة القلب، كانت مشكلة الدراسة ان امراض الشرايين التاجية منتشرة بين جميع الاعمار وخاصة كبار السن وتسبب انسداد تام يؤدي الى الوفاة، أجريت في قسم مختبر القسطرة بمستشفى أحمد قاسم خلال الفترة من نوفمبر 2021 إلى يونيو 2022. تم اختيار 50 مريضا يعانون من مرض الشريان التاجي (50٪) ) ذكور و (50٪) إناث.

كانت نتائج الدراسة معظم المناطق الغير طبيعية 13 (26٪) في الشريان النازل الأمامي الأيسر، و 15 (30٪) في [الشريان الأمامي الأيسر النازل، الشريان المحيط الأيسر، الشريان التاجي الأيمن (مرض الأوعية الدموية الثلاثية)] ، كان لدى معظم المرضى تدخلي للشريان التاجي عن طريق الجلد في الشريان النازل الأمامي الأيسر 19 (38٪)، كان هناك ارتباط ذو دلالة إحصائية بين المناطق الغير طبيعية ونوع القسطرة (القيمة الاحتمالية = 0.005) ، بين المناطق الغير طبيعية ومناطق التداخل التاجية عن طريق الجلد (القيمة الاحتمالية = 0.005) وكان هناك ارتباط غير ذي دلالة إحصائية بين المناطق الغير طبيعية والفئة العمرية، الجنس وعامل الخطر (القيمة الاحتمالية> 0.05).

خلصت الدراسة إلى أن معظم المرضى لديهم تشوهات في الشريان الأمامي الأيسر النازل، و [الشريان الأمامي الأيسر، الشريان التاجي الأيسر، الشريان التاجي الأيمن (مرض الأوعية الدموية الثلاثية])، مع القسطرة التشخيصية، كان الشريان التاجي عن طريق الجلد تدخليا في الشريان الأمامي الأيسر النازل، هناك كان ارتباطًا ذا دلالة إحصائية بين مناطق التشوهات ونوع القسطرة، بين منطقة التشوهات ومناطق التداخل التاجية عن طريق الجلد.

أوصت الدراسة بضرورة استمرار تدريب وتعليم أخصائي الأشعة على تصوير الأوعية التاجية المقطعي المحوسب وزيادة عدد المراكز الإشعاعية التي تقوم بإجراء تصوير الأوعية التاجية المقطعي المحوسب لتجنب مخاطر الإشعاع والمضاعفات التي تنطوي عليها القسطرة القلبية بسبب إجراء جراحي أثناء الفحص.

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# List of abbreviations

AP: Antero-Posterior

CAD: Coronary artery disease.

CT: Computed Tomography

CCTA: Coronary Computed Tomography angiography.

CHF: Congestive Heart Failure.

CVD: Cardiovascular disease.

DM: Diabetes mellitus.

HTN: Hypertension

LAD: Left anterior descending artery.

LAO: Left anterior oblique.

LCO: Left coronary ostium.

LCX: Left circumflex artery.

MR: Magnetic Resonance.

PCI: Percutaneous coronary interventional

RCA: Right coronary artery.

RCO: Right coronary ostium.

3VD: 3-vessel disease.

# Chapter one

# Introduction

# Chapter one

# Introduction

## 1.1 Introduction:

Coronary artery disease is caused by plaque buildup in the wall of arteries that supply blood to the heart (called coronary arteries), plaque is made up of cholesterol deposits. (Coronary artery Disease / c dc. gov, 2022)

Plaque buildup causes the inside of the arteries to narrow, this process is called atherosclerosis.(Coronary artery Disease/cdc.gov, 2022)

Cardiac catheterization is procedure in which a thin, flexible tube (catheter) is guided through a blood vessel to the heart to diagnose or treat certain heart condition. (Cardiac catheterization –Mayo Clinic, 2022)

During cardiac catheterization, doctor can do different heart test, deliver treatment, or remove a piece of tissue for examination, some heart disease treatments – such as coronary angioplasty and coronary stenting – are done using cardiac catheterization. (Cardiac catheterization –Mayo Clinic, 2022)

Cardiac catheterization is a more general term that is used to describe placing a catheter in the heart; it includes studies in addition to radiologic imaging, such as obtaining blood samples to measure oxygen saturation (oximetry) and measuring hemodynamic pressures and gradients. Specialized physiologic monitoring equipment is required or these sensitive measurements.

## 1.2 Problem of the study:

Coronary artery diseases become common and incidence all age especially elder people and causes completely block lead to death.

## 1.3 Important the study:

Nowadays, most of reports from health authorities in Sudan signify the wide spreading of coronary artery disease which might threaten people's life. Due to lack of knowledge of the symptoms of the disease, most cases come to the hospitals as hopeless cases. Hence, here arises the importance of the research which aims to detect and treat the disease early.

## 1.4 Objectives:

### 1.4.1 General objective:

To evaluate of coronary artery disease by cardiac catheterization.

### 1.4.2 Specific objectives:

- To evaluate the importance of cardiac catheterization in diagnose and treatment of coronary artery disease.
- To determine which part of the heart is most affected by the coronary artery disease.
- To determine the most age and gender affected by the coronary artery disease.
- To correlate between risk factor, age, gender and diagnosis.

## 1.5 Overview of study:

This study was consisting five chapters, chapter one was introduction. Chapter two was theoretical background and previous studies. Chapter three was describing the materials and methods. Chapter four was result. Chapter five included discussion, conclusion and recommendations

# Chapter two

# Theoretical Background and Previous Studies

# Chapter two

# Theoretical Background and Previous Studies

## 2.1 Anatomy:

### 2.1.1 Arterial supply:

The heart is supplied with arterial blood by the right and left coronary arteries, which branch from the aorta immediately distal to the aortic valve. (WAUGH, 2014)

The coronary arteries receive about 5% of the blood pumped from the heart, although the heart comprises a small proportion of body weight this large blood supply, of which a large proportion goes to the left ventricle, highlights the importance of the heart to body function. The coronary arteries traverse the heart, eventually forming a vast network of capillaries. (WAUGH, 2014)

**2.1.1.1 The right coronary artery**:

Arises from the anterior aortic sinus of the ascending aorta and runs forward between the pulmonary trunk and the right auricle. It descends almost vertically in the right atrioventricular groove, and at the inferior border of the heart it continues posteriorly along the atrioventricular groove to anastomose with the left coronary artery in the posterior interventricular groove. The following branches from the right coronary artery supply the right atrium and right ventricle and parts of the left atrium and left ventricle and the atrioventricular septum. (Snell, 2012)

Branches: The right conus artery supplies the anterior surface of the pulmonary conus (infundibulum of the right ventricle) and the upper part of the anterior wall of the right ventricle. The anterior ventricular branches are two or three in number and supply the anterior surface of the right ventricle. The marginal branch is the largest and runs along the lower margin of the costal surface to reach the apex. The posterior ventricular branches are usually two in number and supply the diaphragmatic surface of the right ventricle. (Snell, 2012)

The posterior interventricular (descending) artery runs toward the apex in the posterior interventricular groove. It gives off branches to the right and left ventricles, including its inferior wall. It supplies branches to the posterior part of the ventricular septum but not to the apical part, which receives its supply from the anterior interventricular branch of the left coronary artery. A large septal branch supplies the atrioventricular node. In 10% of individuals, the posterior interventricular artery is replaced by a branch from the left coronary artery. The atrial branches supply the anterior and lateral surfaces of the right atrium. One branch supplies the posterior surface of both the right and left atria. The artery of the sinuatrial node supplies the node and the right and left atria; in 35% of individuals it arises from the left coronary artery (Snell, 2012).

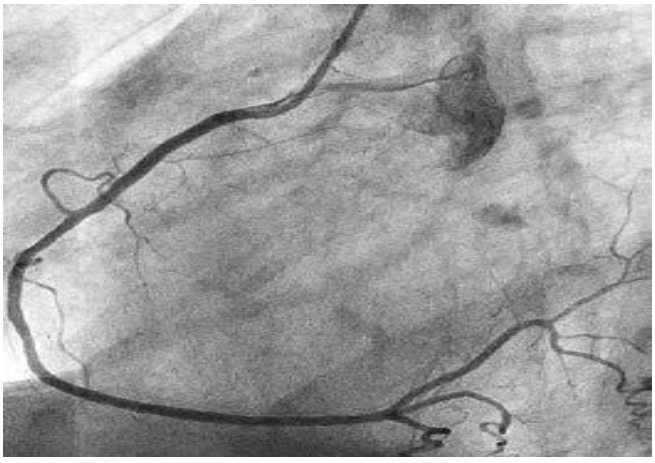


Figure (2.1): Right coronary artery.(Courtesy Philips Medical Systems, 2022)

**2.1.1.2 The left coronary artery**:

Which is usually larger than the right coronary artery, supplies the major part of the heart, including the greater part of the left atrium, left ventricle, and ventricular septum. It arises from the left posterior aortic sinus of the ascending aorta and passes forward between the pulmonary trunk and the left auricle. It then enters the atrioventricular groove and divides into an anterior interventricular branch and a circumflex branch. (Snell, 2012)

Branches: The anterior interventricular (descending) branch runs downward in the anterior interventricular groove to the apex of the heart. In most individuals, it then passes around the apex of the heart to enter the posterior interventricular

groove and anastomoses with the terminal branches of the right coronary artery. In one third of individuals, it ends at the apex of the heart. The anterior interventricular branch supplies the right and left ventricles with numerous branches that also supply the anterior part of the ventricular septum. One of these ventricular branches (left diagonal artery) may arise directly from the trunk of the left coronary artery. A small left conus artery supplies the pulmonary conus. (Snell, 2012)

The circumflex artery is the same size as the anterior interventricular Artery. It winds around the left margin of the heart in the atrioventricular groove. A left marginal artery is a large branch that supplies the left margin of the left ventricle down to the apex. Anterior ventricular and posterior ventricular branches supply the left ventricle. Atrial branches supply the left atrium. Variations in the Coronary Arteries Variations in the blood supply to the heart do occur, and the most common variations affect the blood supply to the diaphragmatic surface of both ventricles. Here the origin, size, and distribution of the posterior interventricular artery are variable. In right dominance, the posterior interventricular artery is a large branch of the right coronary artery. Right dominance is present in most individuals (90%). In left dominance, the posterior interventricular artery is a branch of the circumflex branch of the left coronary artery (10%). (Snell, 2012)

Figure (2.2): Left coronary artery. (Courtesy Philips Medical Systems, 2022.)

### 2.1.2 Coronary Artery Anastomoses:

Anastomoses between the terminal branches of the right and left coronary arteries (collateral circulation) exist, but they are usually not large enough to provide an adequate blood supply to the cardiac muscle should one of the large branches become blocked by disease. A sudden block of one of the larger branches of either coronary artery usually leads to myocardial death (myocardial infarction), although sometimes the collateral circulation is enough to sustain the muscle. (Snell, 2012)

## 2.2 Physiology:

The heart is highly metabolically active and boasts the highest oxygen consumption by mass of any organ. this demand for oxygen is met by the coronary circulation, which is responsible for delivery blood to the myocardium and represents approximately 5% of cardiac output.( Rehman, et al., 2021)

Coronary circulation: part of the systemic circulatory system that supplies blood to and provides drainage from the tissues of the heart. in the human heart, two coronary arteries arise from the aorta just beyond the semilunar valves ; during diastole, the increased aortic pressure above the valves forces blood into the coronary arteries and hence into the musculature of the heart. (Coronary circulation / physiology, 2022)

Deoxygenated blood is returned to the chambers of the heart via coronary veins; most of these converge to form the coronary venous sinus, which drain into the right atrium. (coronary circulation / physiology, 2022)

The heart normally extracts 70 to 75 percent of the available oxygen from the blood in coronary circulation, which is more than the amount extracted by other organs from their circulation. obstruction of coronary artery, depriving the heart tissue of oxygen –rich blood, leads to death of part of the heart muscle (myocardial infarction ) in severe cases, and total heart failure and death may ensue.(coronary circulation / physiology, 2022)

## 2.3 Coronary Artery Disease

Narrowing of the coronary arteries causes oxygen deprivation of the myocardium and ischemic heart disease. In most patients, narrowing of the lumen of one or more of the coronary arteries is attributable to the deposition of fatty material on the inner arterial wall (atherosclerosis). Factors predisposing to the development of coronary artery disease include hypertension, obesity, smoking, a high-cholesterol diet, and lack of exercise. (Ronald and Nancy, 2012)

The speed and degree of luminal narrowing determine whether an atherosclerotic lesion causes significant and clinically evident ischemia. Temporary oxygen insufficiency causes angina pectoris, a feeling of severe chest pain that may radiate to the neck, jaw, and left arm (sometimes both arms) and that is often associated with the sensation of chest tightness or suffocation. Attacks of angina pectoris are often related to a sudden increase in the demand of the myocardium for oxygen, such as after strenuous exercise or a heavy meal or with emotional stress or exposure to severe cold. The placing of a nitroglycerin tablet under the tongue causes venous dilatation, thus decreasing preload and myocardial oxygen demand. (Ronald and Nancy, 2012)

Occlusion of a coronary artery deprives an area of myocardium of its blood supply and leads to the death of muscle cells (myocardial infarction) in the area of vascular distribution. The size of the coronary artery that is occluded and the myocardium that it supplies determines the extent of heart muscle damage. The greater the area affected, the poorer the prognosis because of the increased loss of pumping function that may result in congestive heart failure (CHF). A favorable prognostic factor is the development of collateral circulation, through which blood from surrounding vessels is channeled into the damaged tissue. (Ronald and Nancy, 2012)

If the patient survives, the infarcted region heals with fibrosis. Long-term complications include the development of thrombi on the surface of the

damaged area and the production of a local bulge (ventricular aneurysm) at the site of the weakness of the myocardial wall. (Ronald and Nancy, 2012)

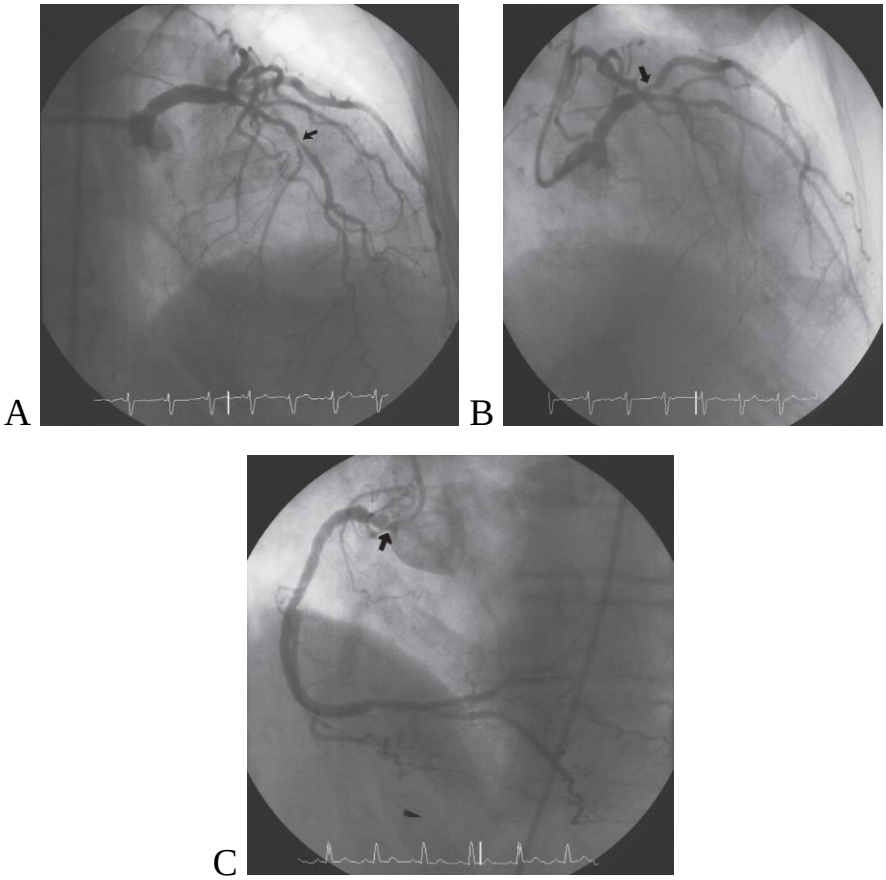



Figure (2.3): Coronary angiography. A, Posteroanterior cranial projection of the left main coronary artery shows a lesion involving the left anterior descending artery. B, Right anterior oblique cranial projection of the left main coronary artery shows a lesion in the diagonal artery. C, Left anterior oblique projection of the right coronary artery demonstrates an ostial lesion at the origin. (Ronald and Nancy, 2012)

**2.4 Physics and equipment:**

An angiography unit generally requires the following; An island-type table that provides access to the patient from all sides; it should have four-way floating capability, adjustable height, and a tilting mechanism. An analog-to-digital conversion fluoroscopy imaging system with intensifier or the newer flat detector digital fluoroscopy acquisition type; both of these systems are available in C-arm configurations single or biplane. Programmable digital image

acquisition system that allows selection and acquisition of the imaging rate as well as sequence and processing of the images. Specialized x-ray tube with high heat load capacity and rapid cooling to meet the need or high mA, high frame rates, and multiple acquisition series. Electromechanical injector or delivery of contrast media. Physiologic monitoring equipment that allows monitoring of the patient's venous and arterial pressures, oxygen levels, and electrocardiogram (especially important or angioplasty and cardiac catheterization). Image archiving method linked to a PACS (picture archiving and communications system) or laser printer. (John and Leslie, 2018)

Figure (2.4 ): Flat detector digital angiographic system, single plane. (Courtesy Philips Medical Systems, 2022)

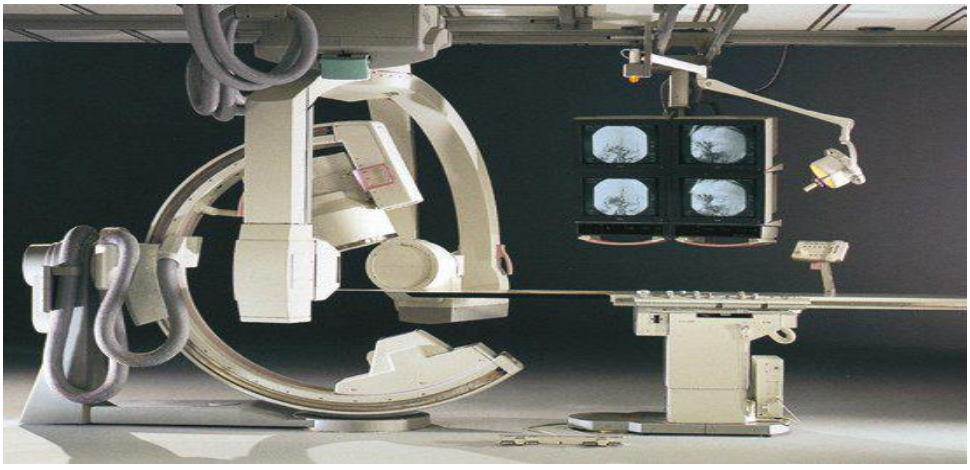


Figure (2.5): Biplane digital angiographic system. (Courtesy Philips Medical Systems, 2022.)

## 2.5 Other Radiological Investigation for CAD:

### 2.5.1 Radionuclide thallium perfusion scanning:

Is the major noninvasive study for assessment of regional blood flow to the myocardium. Focal decreases in thallium uptake that are observed immediately after exercise but are no longer identified on delayed scans usually indicate transient ischemia associated with significant coronary artery stenosis or spasm. (Ronald and Nancy, 2012)

### 2.5.2 Radionuclide CT scanning:

Single-photon emission computed tomography, or (SPECT), using technetium pyrophosphate or other compounds that are taken up by acutely infarcted myocardium, is a new noninvasive technique for detecting, localizing, and classifying myocardial necrosis. (Ronald and Nancy, 2012)

### 2.5.3 Coronary arteriography:

Is generally considered the definitive test for determining the presence and assessing the severity of coronary artery disease. (Ronald and Nancy, 2012)

### 2.5.4 Intravascular ultrasound (IVUS):

Provides the most precise anatomic information to guide interventional procedures. The severity of arterial stenosis, measurement of lesion length, lumen dimension, and any unusual morphology can be determined. This modality is especially helpful in demonstrating the origin of the left main coronary artery, which may be obscured by the catheter in angiography. However, this equipment is not readily available in most institutions because of its expense. (Ronald and Nancy, 2012)

### 2.5.5 Cardiac CT:

The rapid evolution of multi-detector CT scanner technology over the last 5 years has resulted in cardiac CT and coronary CT angiography becoming well-established techniques in the investigation and management of cardiovascular disease. Greater temporal resolution, sophisticated ECG-gating software and post processing algorithms and, very importantly, radiation dose reducing

strategies allow cardiac CT to be used widely. CT has a high accuracy in detecting coronary vessel stenosis and a very high negative predictive value in excluding significant disease. (Waston, 2017)

### 2.5.6 Cardiac MR:

Cardiac MR imaging has a major role in the assessment of cardiac disease. MR is well established in the evaluation of cardiac and major vessel anatomy, ventricular volumes and mass; functional imaging to assess ventricular and valve motion; and flow quantification allowing measurement of blood velocity and volume to assess intracardiac shunts and stenotic and regurgitate, valvar disease. More recently contrast-enhanced MR has evolved as a powerful tool in assessing myocardial viability and perfusion both in the evaluation of acute myocardial ischemia and also in assessment of myocardial viability and potential reversibility prior to revascularization. Coronary artery MR imaging has yet to be developed to be of routine use and, for the present, has been comprehensively overtaken by recent advances in CT coronary imaging. (Waston, 2017)

## 2.6 Previous studies:

Several authors have developed in cardiac catheterization diagnose and treatment of coronary artery disease in Sudan and reach to following result:

**- Study done by Alaa Abd Alazem et al in Sudan, (2017) under the title of Assessment of cardiac catheterization role in diagnosis and treatment of coronary artery disease.** The aim of study to assess the role of cardiac catheterization in diagnose and treatment of coronary artery disease. The main result was out of 60 patients. The study found that most of cardiac catheterization patients were male 78.3%, (61-75) years most common age group affected, 56% hypertensive, 51.6% diabetic, 45% of patients had three vessels disease and the main affected coronary artery is left anterior descending left circumflex and right coronary artery percentage (38.3%), 23.3% of patients was treated by using interventional radiology. The study catheterization is the

conclude that cardiac best modalities in diagnosed and treatment of cardiac disease by using interventional radiology.

**- Study done by Kabashi Mohammed Alnour Mohammed (2015) under the title of Role of cardiac catheterization in diagnose and treatment of coronary artery disease.** The aim of study to explain the importance of cardiac catheterization in diagnose and treatment of coronary artery disease. The main result was out of 69 patient there were 66 male (95,7%) and 3 patient female (4.3%).The study found that the main factor lead to cardiac abnormalities was hypertension percentage (94.3%). The main affected coronary artery is left anterior descending artery percentage (65.0%). This study found that most of patients were treated by using interventional radiology percentage (84.0%). The study conclude that cardiac catheterization is the best modalities in diagnosed and treatment of cardiac disease by using interventional radiology

**- Study done by Mohammed Yousif in Sudan (2013) under title of Role of cardiac catheterization in diagnose and treatment of coronary artery disease.** The aim of study was to assess the role of cardiac catheterization in diagnose and treatment of coronary artery disease. The main result was out of the 50 patient. The most common diagnostic catheterization were delineation of coronary artery disease 86% include left coronary artery 36.5%, Right coronary artery 11.6%, circumflex 36.5%. Male to female ratio was 1:1. Diagnostic catheterization was done to all patients.

**- Study done by Parsa et al. in Iran (2019) under title of Assessment of the risk of Coronary Heart Disease in Diabetes Patients Type-II.** aimed to determine the risk of coronary heart disease in patients with type 2 diabetes. The coronary heart disease was associated with variables of age, gender, systolic and diastolic blood pressure ($p < 0.05$). Conclusion: The risk of coronary heart disease in diabetic patients was high. So, to minimize the risk of coronary heart disease in the society, it is suggested to prioritize the preventive interventions to decrease the modifiable risks of CHD.

# Chapter Three

# Material and Methods

# Chapter Three

# Material and Methods

## 3.1 Material:

### 3.1.1 Study type:

Descriptive analytic prospective study.

### 3.1.2 Study area:

The study was carried out in catheter lab department of Sudan Khartoum state Ahmed Gasim Hospital.

### 3.1.3 Study duration:

This study was carried out during the period from November 2021 to June 2022.

### 3.1.4 Sample size:

A total of 50 patients with coronary artery disease had been examined.

### 3.1.5 Inclusion criteria:

This study was including adult and oldest patients with coronary artery disease and DM, HTN attend to the catheter lab department.

### 3.1.6 Exclusion criteria:

Any child patients with coronary artery disease and patients have not DM and HTN.

### 3.1.7 Study variables:

The variable was include the patients age, gender, risk factor, type of catheterization and area of PCI.

### 3.1.8 Equipment used in study:

Toshiba fluoroscopy machine with 24v, Max input power 48w, Max tube voltage 125kv, Min. inherent filtration 1.8mm Al eq. AT 70kv/HVL, 2.5mm Al, 1.8mm Al eq. AT 75kv/HVL, 2.7mm AL.

## 3.2. Methods:

### 3.2.1 Technique:

The patient was given a mild sedative to relax. The doctor was used a local anesthetic to numb the catheter insertion site. During a cardiac catheterization, a

long, narrow tube called a catheter is inserted through a plastic introducer sheath (a short, hollow tube that is inserted into a blood vessel in leg or arm).The catheter guided through the blood vessel to the coronary arteries with the aid of a fluoroscopy machine. Contrast material is injected through the catheter and x-ray movies are created as the contrast material moves through the heart's chamber, valves and major vessels.

**3.2.2 Data collection:**

The data was collected by using data collection sheet design especially for this study.

**3.2.3 Data analysis:**

Statistical analysis was performed using SPSS for windows version 20. Percentage and frequency was used to describe all categorical data, p- value of less than 0.05 was used to regarded as significant.

**3.2.4 Data presentation:**

The data was present in tables and graphs.

**3.2.5 Data storage:**

The data in cardiac catheterization store in computer system and the image store in CD and DVD.

**3.2.6 Ethical clearance:**

The procedure of the scanning were explained to the patients and the purpose of incorporating their data in case of agreement, patient personal details data was not be revealed in the study and permission from the hospital and catheter lab department was granted.

# Chapter four

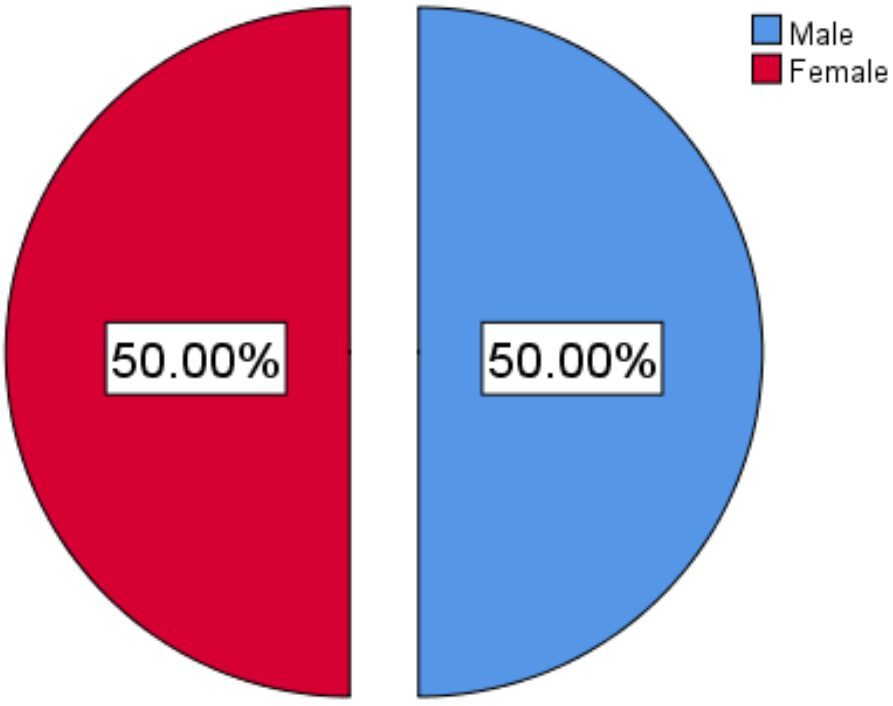
# Results

## Chapter four

## Results

**Table (4.1) Shows frequency distribution of gender**:

| Gender | Frequency | Percent |
|---|---|---|
| Male | 25 | 50% |
| Female | 25 | 50% |
| Total | 50 | 100% |




Figure(4.1) Shows frequency distribution of gender

**Table (4.2) Shows frequency distribution of age group**:

| Age group | Frequency | Percent |
|---|---|---|
| (45-54) | 15 | 30% |
| (55-65) | 22 | 44% |
| (>65) | 13 | 26% |
| Total | 50 | 100% |

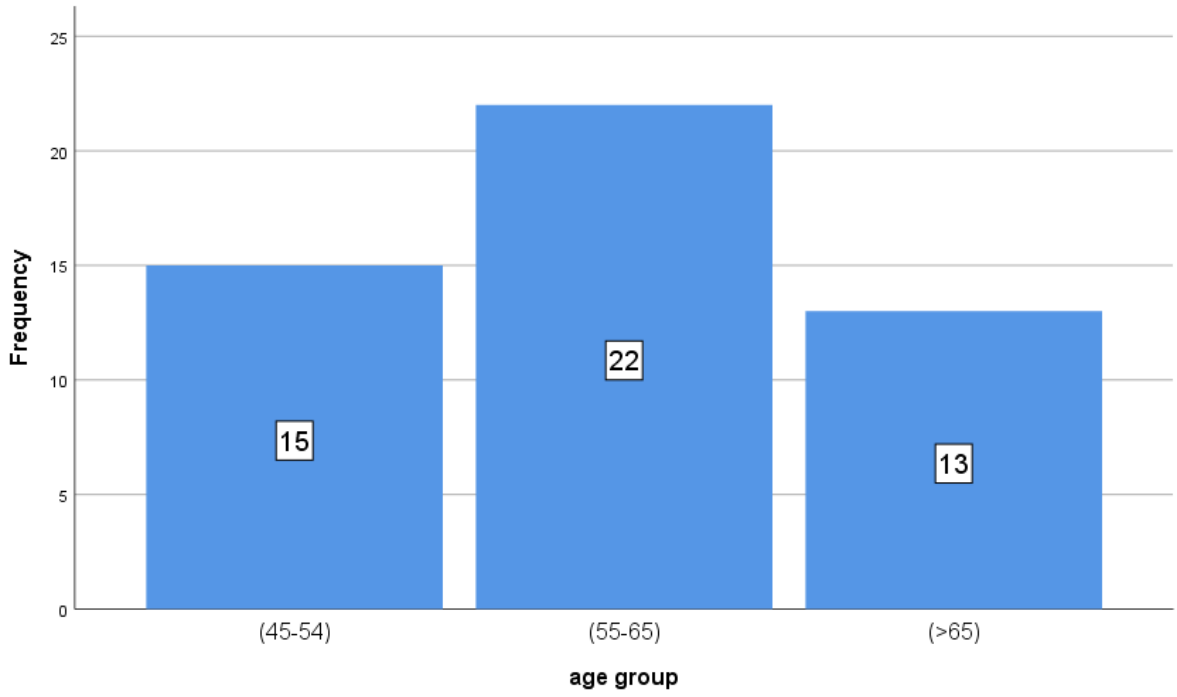



Figure (4.2) Shows frequency distribution of age group

**Table (4.3) Shows frequency distribution of risk factor**:

| Risk factor | Frequency | Percent |
|---|---|---|
| HTN | 13 | 26% |
| DM | 18 | 36% |
| HTN & DM | 19 | 38% |
| Total | 50 | 100% |

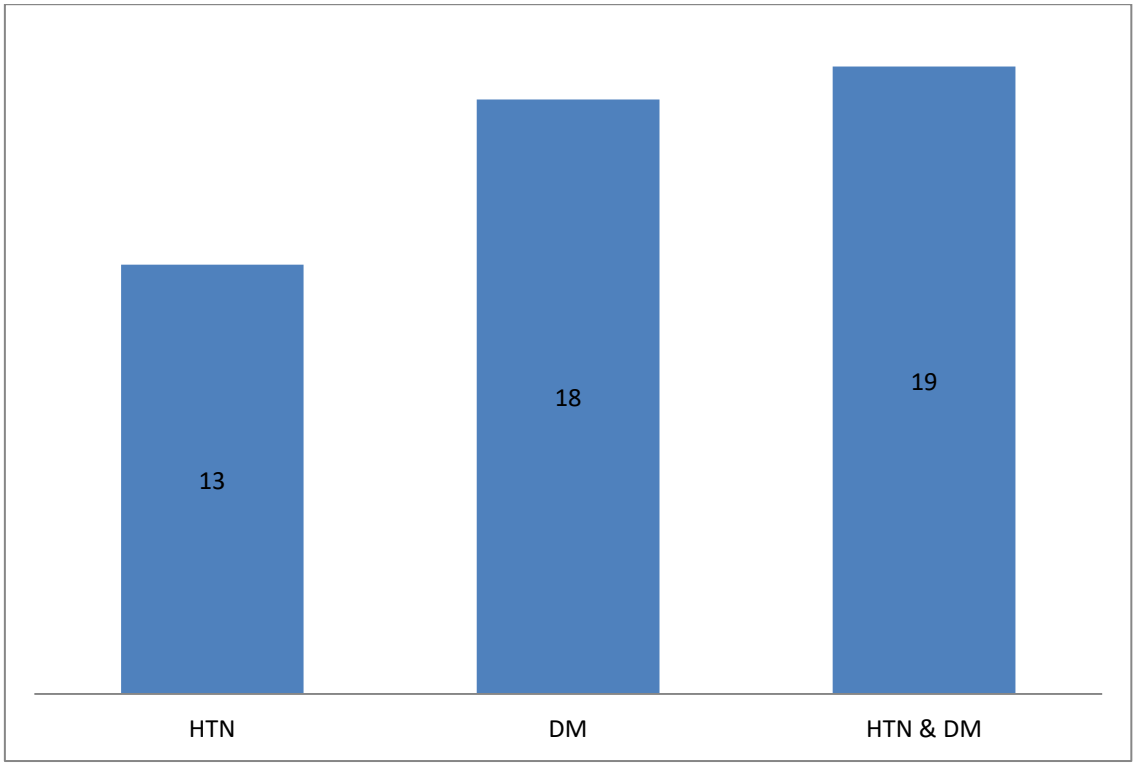



Figure (4.3) Shows frequency distribution of risk factor

**Table (4.4) Shows frequency distribution of area of abnormalities**:

| Area of abnormalities | Frequency | Percent |
|---|---|---|
| LAD | 13 | 26% |
| LAD, LCX | 7 | 14% |
| LAD, LCX, RCA | 15 | 30% |
| LAD, RCA | 10 | 20% |
| LCX | 1 | 2% |
| LCX, RCA | 1 | 2% |
| RCA | 3 | 6% |
| Total | 50 | 100% |

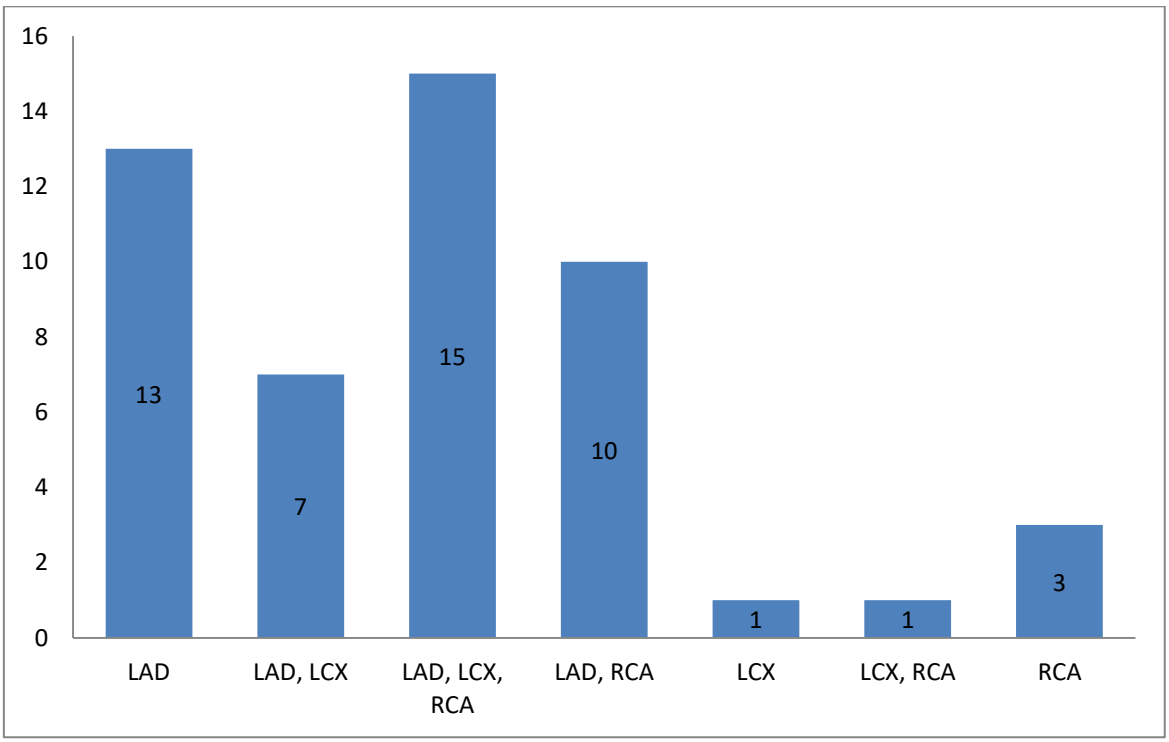



Figure (4.4) Shows frequency distribution of area of abnormalities

**Table (4.5) Shows frequency distribution of type of catheterization**:

| Type of catheterization | Frequency | Percent |
|---|---|---|
| Diagnostic | 36 | 72% |
| Therapeutic | 5 | 10% |
| Diagnostic & Therapeutic | 9 | 18% |
| Total | 50 | 100% |

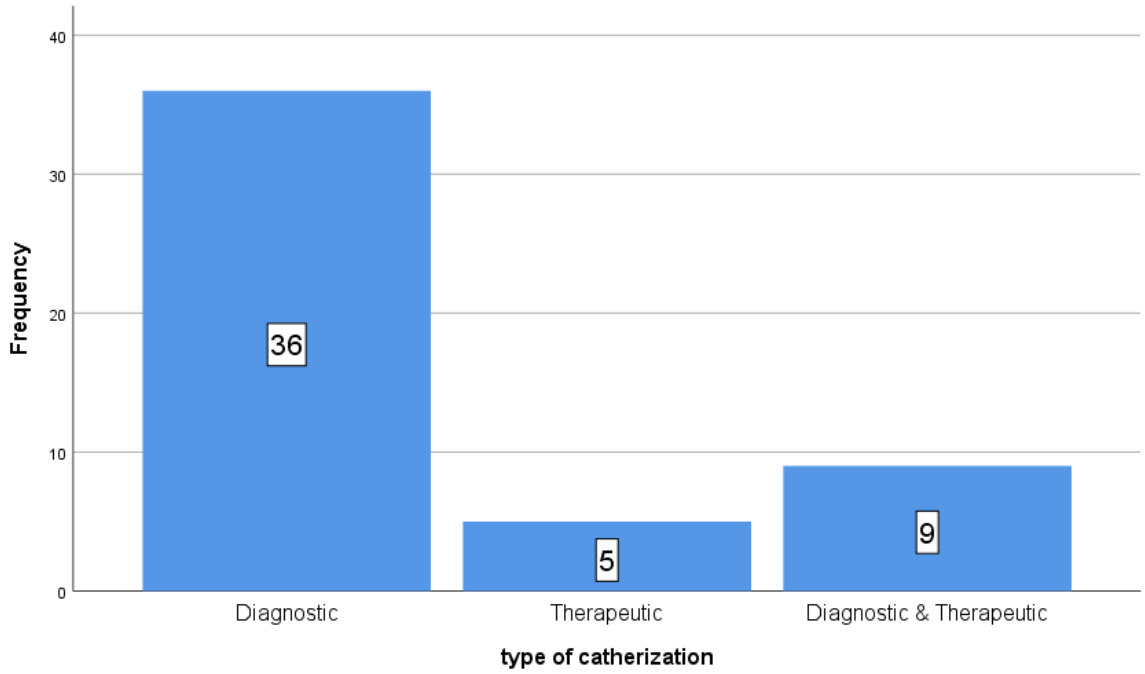



Figure (4.5) Shows frequency distribution of type of cauterization

**Table (4.6) Shows frequency distribution of area of PCI**:

| Area of PCI | Frequency | Percent |
|---|---|---|
| RCA | 10 | 20% |
| LAD | 19 | 38% |
| LCX | 8 | 16% |
| LAD, LCX | 13 | 26% |
| Total | 50 | 100% |

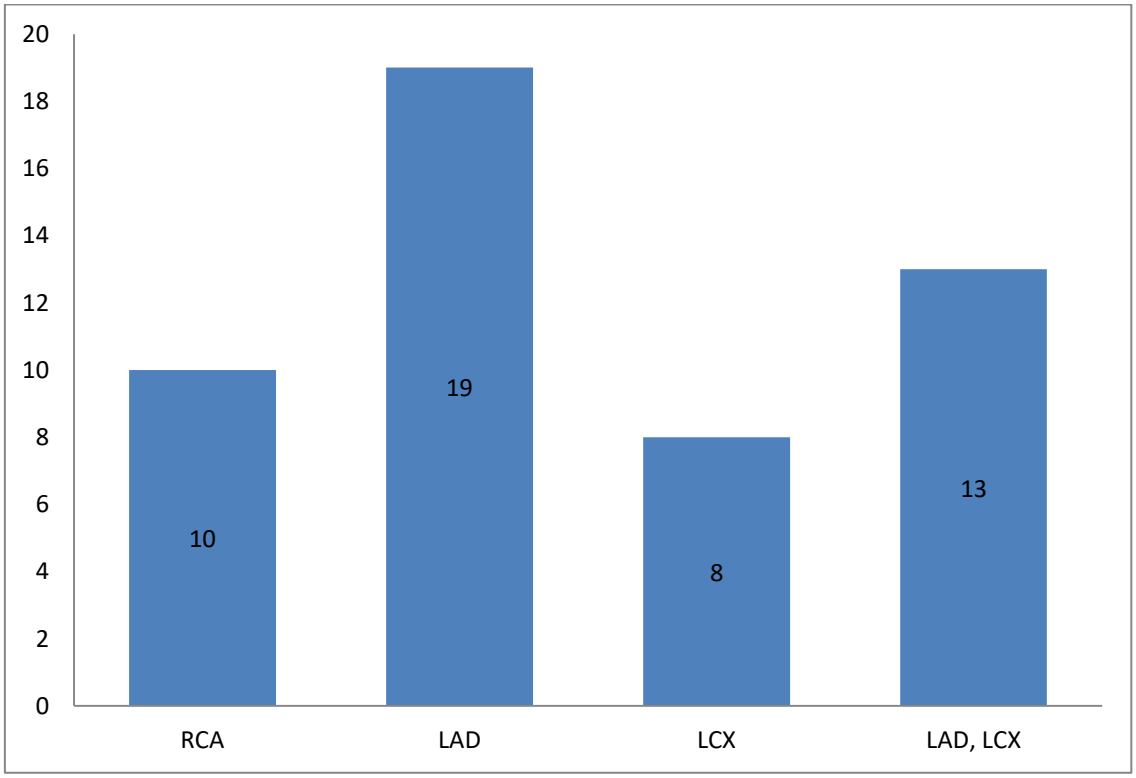



Figure (4.6) Shows frequency distribution of area of PCI

**Table (4.7) Shows correlations between area of abnormalities and gender age group, risk factor, type of catheterizations and area of PCI:**

| | | **Area of abnormalities** |
|---|---|---|
| **Gender** | Pearson Correlation | -0.173 |
| | Sig. (2-tailed) | 0.231 |
| | N | 50 |
| **Age group** | Pearson Correlation | 0.003 |
| | Sig. (2-tailed) | 0.983 |
| | N | 50 |
| **Risk factor** | Pearson Correlation | -0.215 |
| | Sig. (2-tailed) | 0.134 |
| | N | 50 |
| **Type of catheterizations** | Pearson Correlation | -0.395 |
| | Sig. (2-tailed) | 0.005 |
| | N | 50 |
| **Area of PCI** | Pearson Correlation | -0.391 |
| | Sig. (2-tailed) | 0.005 |
| | N | 50 |

From table above the results found there was statistically significant correlation between area of abnormalities and type of cauterization (p-value = 0.005), between area of abnormalities and area of PCI (p-value = 0.005), there was statistically insignificant correlation between area of abnormalities and gender age group, risk factor (p-value > 0.05).

# Chapter five

# Discussion Conclusion and Recommendations

# Chapter five

## Discussion Conclusion and Recommendations

### 5.1 Discussion:

This was descriptive analytic prospective study, aimed to evaluate of coronary artery disease by cardiac catheterization, carried out in catheter lab department of Ahmed Gasim Hospital during the period from November 2021 to June 2022. A total of 50 patients with coronary artery disease (50%) males and (50%) females. Table, Figure (4.1); agree with Mohammed (2013).

The study showed regarding to distribution of age group 15(30%) in age group (45-54) years, 22(44%) in group (55-65) years and 13(26%) in group (>65) years. Table, Figure (4.2).

In concern distribution of risk factor most patients had HTN & DM were 19(38%), patients had DM were 18(36%) and patients had HTN were 13(26%).Table, Figure (4.3). agree with Parsa et al., (2019).

The study found that from distribution of area of abnormalities 13(26%) in LAD, 7(14%) in LAD, LCX, 15(30%) in LAD, LCX, RCA (3VD), 10(20%) in LAD, RCA, 3(6%) in RCA, 1(2%) in LCX, 1(2%) in LCX, RCA. Table, Figure (4.4). this results agree with Kabashi (2018).

Regarding to distribution of type of catheterization the study found most patients with diagnostic catheterization were 36(72%), patients with diagnostic & therapeutic catheterization were 9(18%) and patients with therapeutic catheterization were 5(10%). Table, Figure (4.5).

From distribution of area of PCI the study found most patients had PCI in LAD were 19(38%), in LAD, LCX were 13(26%), in RCA were 10(20%) and in LCX were 8(16%). Table, Figure (4.6).

Finally the study found from correlations between area of abnormalities and gender age group, risk factor, type of cauterization and area of PCI there was statistically significant correlation between area of abnormalities and type of cauterization (p-value = 0.005), between area of abnormalities and area of PCI

(p-value = 0.005), there was statistically insignificant correlation between area of abnormalities and gender age group, risk factor (p-value > 0.05). Table (4.7).

## 5.2 Conclusion:

The study concluded to most patients had abnormalities in LAD, and LAD, LCX, RCA, with diagnostic catheterization, had PCI in LAD, there was statistically significant correlation between area of abnormalities and type of cauterization, between area of abnormalities and area of PCI and there was statistically insignificant correlation between area of abnormalities and gender age group, risk factor.

### 5.3 Recommendations:

The study recommended that:

- The routine screening for CAD in diabetic patient is not essential in asymptomatic patients, as it does not improve outcomes as long as CVD risk factors are treated.
- The researcher should increase the amount of data especially for CCTA to improve the results of future studies.
- The training and education for radiologic specialist on CCTA should continue to increase the number of radiologic centres that performing the CCTA to avoid radiation hazards and complications that involved in cardiac catheterization due to invasive procedure during exams.

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# Appendices

## Appendix (A)

## Data collection sheet

| Gender | Age | Risk factor | | Area of abnormalities | Type of catheterizations | Area of PCI |
|---|---|---|---|---|---|---|
| | | DM | HTN | | | |
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# Appendix (B)

## Coronary arteries cardiac catheterizations images

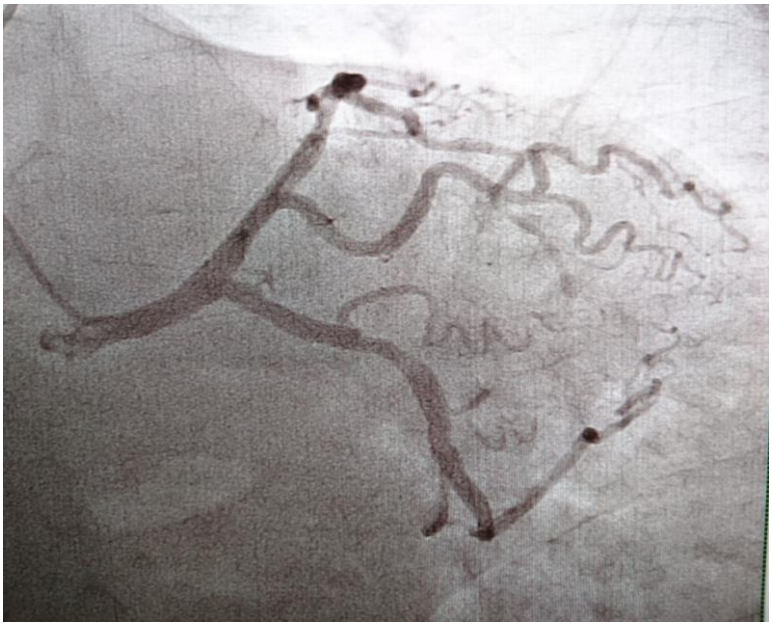

Image 1: AP caudal view of 45 yrs. female patient DM show normal left Coronary Arteries.

Image (2): Image show normal Right coronary Arteries of the same patient in image 1.

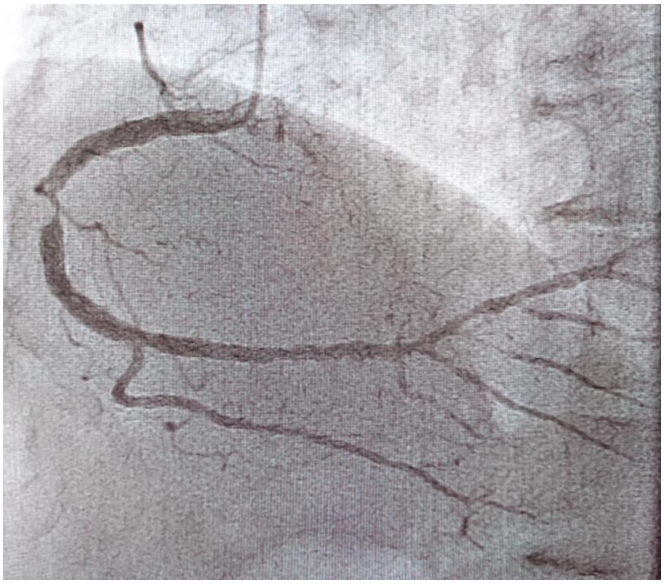

Image (3): 71 years old DM patient with poor control image show (97%) stenosis at the mid of R.t Coronary Artery.

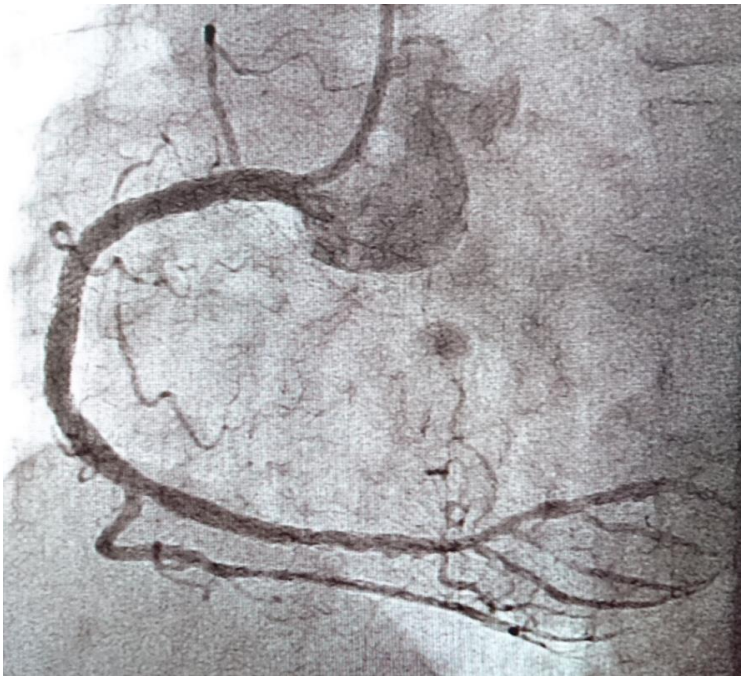

Image (4): image show R.t coronary Artery of the same patient in image 3 After PCI procedures and Stent induced.