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**Dedication**

To the souls

Of My Father and

Mother, to my sisters

and brothers, to my wife and daughter.

To my teachers and colleagues.

To all cardiac patients

and their families.

To people whom

`I love.`

*Mustafa*

# Acknowledgement

# List of Abbreviations

| | |
|---|---|
| **AHA** | **American Heart Association** |
| **AECG** | **Ambulatory** |
| **ED** | **Emergency Department** |
| **CP** | **Chest Pain** |
| **CPK** | **Creatine phosphokinase** |
| **CT** | **Computerized Tomography** |
| **ECG** | **Electrocardiogram** |
| **ESR** | **Erythrocyte sedimentation rate** |
| **GERD** | **Gastroesophageal reflux** |
| **GI** | **Gastrointestinal** |
| **HD** | **Heart disease** |
| **LVH** | **Left ventricular hypertrophy** |
| **MI** | **Myocardial ischemia** |
| **MR** | **Mitral regurgitation** |
| **MVP** | **Mitral valve prolapsed** |
| **PE** | **Pulmonary embolism** |
| **RWMA** | **Regional wall motion abnormality** |
| **S$_4$** | **Forth heat sound** |
| **TTE** | **Transthoracic Echocardiogram** |
| **VSD** | **Ventricular Septal Defect** |

# ABSTRACT

Many patients evaluated for chest pain in the emergency department (ED) are admitted to the hospital needlessly because of the difficulty in differentiating noncardiac chest pain from myocardial ischemia.

The objective of this study was to assess patients presenting to the emergency department with chest pain in Khartoum State in order to determine the nature of pain (cardiac or non-cardiac) and its associated factors.

This cross sectional hospital based study carried out in Alshabb Teaching Hospital, Khartoum. Sixty two patients presenting with chest pain were evaluated to rule out myocardial ischemia. Rest echocardiography was performed in the ED. The data collected by questionnaire and analyzed by computer using SPSS.

The study showed that Cardiac Patients were 41.9 % and non cardiac pain were 33,8% and others were 24% who need more investigation .The study showed that 50% of patients were from outside Khartoum state (migrant cases).The causes of seeking treatment in Khartoum included mainly lack of trained health care, and lack of equipment and drugs

The use of echocardiography in the evaluation of patients presenting with chest pain may improve screening for those who can be safely released from the ED and rapid, evaluation of patients presenting with chest pain.

# ملخص الدراسة

كثير من المرضي الذين يشكون من الم الصدر يتم تقييم حالتهم في الحوادث وتنويمهم بالمستشفي دون حوجة بسبب صعوبة التفريق بين الم الصدر بسبب القلب والالام غير القلبيه.

هدفت الدراسة الي ابراز دقه وعمليه الموجات الصوتية للقلب في تقييم المرضي الذين حضروا لقسم الحوادث بالم في الصدر في ولاية الخرطوم خلال العام 2015 حتي يتم تحديد نوع الالم لاسباب قلبيه او غير قلبيه.

هذه دراسه وصفيه مقطعيه تم اجراؤها في مستشفي الشعب التعليمي بولاية الخرطوم. تم تقييم حاله 62 مريض يشكون من الم الصدر لاستبعاد تأثر القلب. تم اجراء موجات صوتيه للقلب بدون مجهود بقسم الطواري.

شارك بالدراسه 62 مريض ( ذكور واناث) اعمارهم أكثر من 18 سنه يعانون من الم الصدر وتم تقييم حالتهم بواسطه الموجات الصوتية للقلب ووجد أن 41.9% منهم يعانون من أمراض قلبيه و 33.9% يعانون من الم صدر لاسباب غير قلبيه و 24.2% يحتاجون لمزيد من الفحوصات.

50% من المرضي كانوا من خارج ولايه الخرطوم وقد حضروا للعلاج بالخرطوم بسبب قله الكادر الطبي المدرب ونقص الاجهزة والادويه بولاياتهم.

خلصت الدراسه الي ان استعمال الموجات الصوتيه للقلب في تقييم حاله المرضي الذين يعانون من الم الصدر يصنف حاله المرضي الذين لا يحتاجون للتنويم بالحوادث ويعجل تقييم مرضي الم الصدر.

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## Chapter one

## 1. Introduction

## 1.1 Background:

Chest pain is one of the most common complaints that brings a patient to the emergency department (ED). The differential diagnosis of chest pain is broad and includes cardiac as well as non-cardiac diseases. Chest pain can result from many cardiac and noncardiac causes. In mature adults the most common clinical cardiac disorder presenting as chest pain is coronary artery disease. Other cardiovascular abnormalities that frequently cause chest pain, including hypertrophic cardiomyopathy, valvular aortic stenosis, aortic dissection, pericarditis, MVP, and acute pulmonary embolism, produce distinctive and diagnostic echocardiographic findings (Anderson et al., 2007)

Accurate assessment of chest pain in the emergency department requires a thorough knowledge of the differential diagnosis and appropriate use of diagnostic tools. It is essential not to miss an aortic dissection, pulmonary embolus, or acute myocardial infarction, and to avoid overtreating pericarditis or musculoskeletal pain. Transthoracic echocardiography (TTE) is often underutilized in this setting. TTE has the advantages of being readily accessible, portable, noninvasive, and fast; it may detect significant findings that are misdiagnosed or not detected on initial clinical evaluation (Am Heart J 2001). Chest pain accounts for approximately six million annual visits to emergency departments (ED) in the United States (US), making it the second most common ED complaint . Patients present with a spectrum of signs and symptoms reflecting the many potential etiologies of chest pain. Diseases of the heart, aorta, lungs, esophagus,

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stomach, mediastinum, pleura, and abdominal viscera may all cause chest discomfort (Pollack and Gibler, 2001).

In one study of 124 patients, it identified a patient with a significant abnormality with a sensitivity, specificity, positive and negative predictive value, and overall accuracy of 84, 88, 89, 83, and 86 percent, respectively (Shah et al., 2012).

The differential diagnosis of chest pain is broad and includes cardiac as well as non-cardiac diseases. One of the initial goals in the ED evaluation of a patient presenting with chest pain is to rapidly and accurately diagnose the presence or absence of acute coronary syndrome. The use of echocardiography for diagnosis of acute myocardial infarction is most helpful when the clinical history and ECG findings are nondiagnostic (Anderson et al., 2007).

In this study the use of early echocardiography with detailed assessment of wall motion and left ventricular function, for the evaluation of chest pain in the ED. Detailed left ventricular function assessment will be highly sensitive and specific for the diagnosis of myocardial ischemia, and will enable rapid triage of patients who present to the ED with chest pain. Chest pain is one of the most common complaints that bring a patient to the emergency department (ED). The differential diagnosis of chest pain is broad and includes cardiac as well as non-cardiac diseases. One of the initial goals in the ED evaluation of a patient presenting with chest pain is to rapidly and accurately diagnose the presence or absence of acute coronary syndrome and to sort out cardiac diseases from non- cardiac diseases (Kimura et al., 2001).

## 1.2 Problem of the study:

Chest pain (CP) is a very common presentation with a wide range of differential diagnoses, including life-threatening conditions, which need to be considered, diagnosed and treated urgently. Echocardiography is a valuable non-invasive tool that can help in diagnosing and treating patients presenting with CP.

## 1.3 Objectives of the study:

### 1.3.1 Main Objective

To evaluate patient chest pain using echocardiography.

### 1.3.2 Specific Objectives

- To determine the nature of pain (cardiac or non-cardiac).

- To identify the diagnosis of acute coronary syndromes and also in ruling out other serious conditions.

- To assess regional wall motion abnormality **(RWMA)**.

- To identify the complication.

## Chapter two

### 2.1 Literature Review

Chest pain accounts for approximately six million annual visits to emergency departments (ED) in the United States (US), making it the second most common ED complaint (McCaig..et al 2003). Patients present with a spectrum of signs and symptoms reflecting the many potential etiologies of chest pain. Diseases of the heart, aorta, lungs, esophagus, stomach, mediastinum, pleura, and abdominal viscera may all cause chest discomfort. Patients present with a spectrum of signs and symptoms reflecting the many potential etiologies of chest pain. Diseases of the heart, aorta, lungs, esophagus, stomach, mediastinum, pleura, and abdominal viscera may all cause chest discomfort (McCaig and Burt, 2003).

One of the most common causes of chest pain in patients who present for evaluation is acute coronary syndrome, accounting for approximately 12 to 15 percent of all cases of chest pain in the emergency department setting. The term "acute coronary syndrome" (ACS) is applied to patients in whom there is evidence of myocardial ischemia or infarction.Chest pain is one of the most common complaints that brings a patient to the emergency department (ED). The differential diagnosis of chest pain is broad and includes cardiac as well as non-cardiac diseases. One of the initial goals in the ED evaluation of a patient presenting with chest pain is to rapidly and accurately diagnose the presence or absence of acute coronary syndrome. Chest pain can result from many cardiac and noncardiac causes. In mature adults the most common clinical cardiac disorder presenting as chest pain is coronary artery disease. Other cardiovascular abnormalities that frequently cause chest pain, including hypertrophic cardiomyopathy, valvular

aortic stenosis, aortic dissection, pericarditis, MVP, and acute pulmonary embolism,produce distinctive and diagnostic echocardiographic findings (Atar et al., 2000).

Chest pain is a very common complaint. Many patients are well aware that it is a warning of potential life-threatening disorders and seek evaluation for minimal symptoms. Other patients, including many with serious disease, minimize or ignore its warnings. Pain perception (both character and severity) varies greatly between individuals as well as between men and women. However described, chest pain should never be dismissed without an explanation of its cause (Lintner et al., 2016).

## 2.2 Pathophysiology

The heart, lungs, esophagus, and great vessels provide afferent visceral input through the same thoracic autonomic ganglia. A painful stimulus in these organs is typically perceived as originating in the chest, but because afferent nerve fibers overlap in the dorsal ganglia, thoracic pain may be felt (as referred pain) anywhere between the umbilicus and the ear, including the upper extremities.Painful stimuli from thoracic organs can cause discomfort described as pressure, tearing, gas with the urge to eructate, indigestion, burning, aching, stabbing, and sometimes sharp needle-like pain. When the sensation is visceral in origin, many patients deny they are having pain and insist it is merely discomfort (Rollefstad et al., 2015).

**2.3 Etiology**

Many disorders cause chest pain or discomfort. These disorders may involve the cardiovascular, GI, pulmonary, neurologic, or musculoskeletal systems. Some disorders are immediately life threatening:

- Acute coronary syndromes (acute MI/unstable angina)
- Thoracic aortic dissection
- Tension pneumothorax
- Esophageal rupture
- Pulmonary embolism (PE)

Other causes range from serious, potential threats to life to causes that are simply uncomfortable. Often no cause can be confirmed even after full evaluation.

Overall, the most common causes are:

- Chest wall disorders (ie, those involving muscle, rib, or cartilage)
- Pleural disorders
- GI disorders (eg, esophageal reflux or spasm, ulcer disease, cholelithiasis)
- Idiopathic
- Acute coronary syndromes and stable angina (Gilks, 1999).

## 2.4 Causes of Chest Pain:

| Cause* | Suggestive Findings | Diagnostic Approach[†] |
|---|---|---|
| Cardiovascular | | |
| [1]Myocardial ischemia(acute MI/unstable angina/angina) | Acute, crushing pain radiating to the jaw or arm<br><br>Exertional pain relieved by rest (angina pectoris)<br><br>$S_4$ gallop<br><br>Sometimes systolic murmurs of mitral regurgitation<br><br>Often red flag findings [‡] | Serial ECGs and cardiac markers; admit or observe<br><br>Stress imaging test or CT angiography considered in patients with negative ECG findings and no cardiac marker elevation<br><br>Often heart catheterization and coronary angiography if findings are positive |
| [1]Thoracic-aortic dissection | Sudden, tearing pain radiating to the back<br><br>Some patients have syncope, stroke, or leg ischemia<br><br>Pulse or BP that may be unequal in extremities<br><br>Age > 55 | Chest x-ray with findings suggesting diagnosis<br><br>Enhanced CT scan of aorta for confirmation<br><br>Transesophageal echocardiography |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| | Hypertension<br><br>Red flag findings [‡] | |
| [2] Pericarditis | Constant or intermittent sharp pain often aggravated by breathing, swallowing food, or supine position and relieved by sitting leaning forward<br><br>Pericardial friction rub<br><br>Jugular venous distention | ECG usually diagnostic<br><br>Serum cardiac markers (sometimes showing minimal elevation of troponin and CPK levels)<br><br>Transthoracic echocardiography |
| [2] Myocarditis | Fever, dyspnea, fatigue, chest pain (if myopericarditis), recent viral or other infection<br><br>Sometimes findings of heart failure, pericarditis, or both | ECG<br><br>Serum cardiac markers<br><br>ESR<br><br>C-reactive protein<br><br>Usually echocardiography |
| GI | | |
| [1] Esophageal rupture | Sudden, severe pain following vomiting or instrumentation (eg, esophagogastroscopy | Chest x-ray<br><br>Esophagography with water- |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| | or transesophageal echocardiography:<br><br>Subcutaneous crepitus detected during auscultation<br><br>Multiple red flag findings [‡] | soluble contrast for confirmation |
| [2] Pancreatitis | Pain in the epigastrium or lower chest that is often worse when lying flat and is relieved by leaning forward<br><br>Vomiting<br><br>Upper abdominal tenderness<br><br>Shock<br><br>Often history of alcohol abuse or biliary tract disease | Serum lipase<br><br>Sometimes abdominal CT |
| [3] Peptic ulcer | Recurrent, vague epigastric or right upper quadrant discomfort in a patient who smokes or uses alcohol excessively that is relieved by food, antacids, or both<br><br>No red flag findings [‡] | Clinical evaluation<br><br>Sometimes endoscopy<br><br>Sometimes testing for *Helicobacter pylori* |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| [3] Esophageal reflux (GERD) | Recurrent burning pain radiating from epigastrium to throat that is exacerbated by bending down or lying down and relieved by antacids | Clinical evaluation<br><br>Sometimes endoscopy<br><br>Sometimes motility studies |
| [3] Biliary tract disease | Recurrent right upper quadrant or epigastric discomfort following meals (but not exertion) | Ultrasonography of gallbladder |
| [3] Esophageal motility disorders | Long-standing pain of insidious onset that may or may not accompany swallowing<br><br>Usually also difficulty swallowing | Barium swallow |
| Pulmonary | | |
| [1]Pulmonary embolism | Often pleuritic pain, dyspnea, tachycardia<br><br>Sometimes mild fever, hemoptysis, shock<br><br>More likely when risk factors are present | Varies with clinical suspicion |
| [1]Tension pneumothorax | Significant dyspnea, hypotension, neck vein distention, unilateral diminished breath sounds and hyperresonance to percussion<br><br>Sometimes subcutaneous air | Usually clinical<br><br>Obvious on chest x-ray |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| [2] Pneumonia | Fever, chills, cough, and purulent sputum<br><br>Often dyspnea, tachycardia, signs of consolidation | Chest x-ray |
| [2] Pneumothorax | Sometimes, unilateral diminished breath sounds, subcutaneous air | Chest x-ray |
| [3] Pleuritis | May have preceding pneumonia, pulmonary embolism, or viral respiratory infection<br><br>Pain with breathing, cough<br><br>Examination unremarkable | Usually clinical evaluation |
| Other | | |
| [3] Musculoskeletal chest wall pain (eg, due to trauma, overuse, or costochondritis) | Often suggested by history<br><br>Pain typically persistent (typically days or longer), worsened with passive and active motion<br><br>Diffuse or focal tenderness | Clinical evaluation |
| [3] Fibromyalgia | Nearly constant pain, affecting multiple | Clinical evaluation |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| | areas of the body as well as the chest<br><br>Typically, fatigue and poor sleep<br><br>Multiple trigger points | |
| [2]Various thoracic cancers | Variable<br><br>Sometimes chronic cough, smoking history, signs of chronic illness (weight loss, fever), cervical lymphadenopathy | Chest x-ray<br><br>Chest CT if x-ray findings are suggestive<br><br>Bone scan considered for persistent, focal rib pain |
| [3] Herpes zoster infection | Sharp, band-like pain in the midthorax unilaterally<br><br>Classic linear, vesicular rash<br><br>Pain may precede rash by several days | Clinical evaluation |
| [3] Idiopathic | Various features<br><br>No red flag findings [‡] | Diagnosis of exclusion |
| *Seriousness of causes varies as indicated:<br><br>[1] Immediate life threats. | | |

| Cause* | Suggestive Findings | Diagnostic Approach [†] |
|---|---|---|
| [2] Potential life threats.<br><br>[3] Uncomfortable but usually not dangerous. | | |
| [†] Most patients with chest pain should have pulse oximetry, ECG, and chest x-ray (basic tests). If there is suspicion of coronary ischemia, serum cardiac markers (troponin, CPK) should also be checked. | | |
| [‡] Red flag findings include abnormal vital signs (tachycardia, bradycardia, tachypnea, hypotension), signs of hypoperfusion (eg, confusion, ashen color, diaphoresis), shortness of breath, asymmetric breath sounds or pulses, new heart murmurs, or pulsus paradoxus > 10 mm Hg. | | |
| $S_4$ = 4th heart sound (Rollefstad et al., 2015). | | |

Echocardiography also known as cardiac ultrasound is a diagnostic test that uses ultrasound waves to create an image of the heart muscle. Ultrasound waves that rebound or echo off the heart can show the size, shape, and movement of the heart's valves and chambers as well as the flow of blood through the heart. Transthoracic Echocardiograms (TTE) are used to evaluate structural heart disease, ventricular function and valve function. In children and small adults TTE provides accurate anatomic definition of most congenital heart diseases. Coupled with Doppler hemodynamic measurements, Transthoracic Echocardiograms (TTE) usually provides accurate diagnosis and noninvasive serial assessment. Echocardiography has a high sensitivity and specificity for the diagnosis of acute myocardial infarction (Jneid et al., 2012).

Echocardiography plays an important role in the diagnosis and triage of patients with AMI. It defines the region and extent of ischemic damage and aids in evaluating the prognosis of patients after MI. It is a most useful bedside tool to help in the diagnosis, monitoring and guiding subsequent management of the critically ill patients who develop complications of MI. In fact, in 2003 American College of Cardiology/American Heart Association/American Society of Echocardiography guideline update for the clinical applications of echocardiography, the use of echocardiography in assessment of mechanical complications of MI is a class 1 indication (Cheitlin et al., 2003b).

In patients with chest pain known to be of noncardiac origin, further cardiac testing is usually unnecessary. In patients for whom the character of chest pain or the presence of risk factors raises concern about possible coronary artery disease, the role of echocardiography has grown over the last 5 years. Echocardiography can be performed when possible during chest pain in the emergency room; the presence of regional systolic wall motion abnormalities in a patient without known coronary artery disease is a moderately accurate indicator of an increased likelihood of acute myocardial ischemia or infarction by pooled data with a positive predictive accuracy of about 50%. The absence of regional wall motion abnormalities identifies a subset of patients unlikely to have an acute infarction with a pooled negative predictive accuracy of about 95%. In a patient with previous myocardial infarction (either clinically evident or silent), the resting echocardiogram can confirm that event and evaluate its functional significance (Jneid et al., 2012).

Accurate assessment of chest pain in the emergency department requires a thorough knowledge of the differential diagnosis and appropriate use of diagnostic tools. It is essential not

to miss an aortic dissection, pulmonary embolus, or acute myocardial infarction, and to avoid overtreating pericarditis or musculoskeletal pain. Transthoracic echocardiography (TTE) is often underutilized in this setting. TTE has the advantages of being readily accessible, portable, noninvasive, and fast; it may detect significant findings that are misdiagnosed or not detected on initial clinical evaluation. In one study of 124 patients, it identified a patient with a significant abnormality with a sensitivity, specificity, positive and negative predictive value, and overall accuracy of 84, 88, 89, 83, and 86 percent, respectively (Kimura et al., 2001).

In 2003, a task force of the American College of Cardiology (ACC), the American Heart Association (AHA), and the American Society of Echocardiography (ASE) recommended echocardiography in patients with chest pain in the following settings (Cheitlin et al., 2003a). For diagnosis of underlying cardiac disease in patients with chest pain and clinical evidence of valvular, pericardial, or myocardial disease

- For evaluation of chest pain in patients with suspected acute myocardial ischemia, when baseline ECG and other laboratory markers are nondiagnostic and when the study can be obtained during pain or within minutes after its abatement
- For evaluation of chest pain in patients with suspected aortic dissection.

The ability of Doppler echocardiography to provide unique noninvasive information with minimal discomfort or risk without using contrast material or ionizing radiation, coupled with its portability, immediate availability, and repeatability, accounts for its use in virtually all categories of cardiovascular disease. However, two-dimensional Doppler echocardiography is best used after a careful history, physical examination, appropriate electrocardiogram (ECG), and

chest radiograph have been obtained so that the appropriate questions can be asked (Anderson et al., 2007)

**2.5 Ischemic Heart Disease**

Echocardiography has become an established and powerful tool for diagnosing the presence of coronary artery disease and defining its consequences in patients with acute ischemic syndromes and those with chronic coronary atherosclerosis. Transthoracic imaging and Doppler techniques are generally sufficient for evaluating patients with suspected or documented ischemic heart disease (Anderson et al., 2007).

**2.6 Acute Ischemic Syndromes (Acute Myocardial Infarction and Unstable Angina)**

Echocardiography can be used to rapidly diagnose the presence of regional contraction abnormality resulting from acute myocardial infarction, evaluate the extent of associated regional dysfunction, stratify patients into high- or low-risk categories, document serial changes in ventricular function, and diagnose important complications. Some patients with acute chest pain have unstable angina; in these individuals, echocardiography can also be helpful in diagnosis and risk assessment.

The use of echocardiography for diagnosis of acute myocardial infarction and it complication is most helpful when the clinical history and ECG findings are nondiagnostic.

Complication of myocardial infarction which can be detected by echocardiography:

**2.7 Mechanical complications**

### 2.7.1 Left ventricular dysfunction

### 2.7.2 Ventricular septal rupture and free wall rupture

- Risk factors: older age, female gender, non-smoker, anterior infarction

- Postinfarction VSD is relatively infrequent but life-threatening.[ May develop as early as 24 hours after myocardial infarction but often presents 2-7 days afterwards. Mortality rates are greater than 90% (Moller et al., 2001).

### 2.7.3 Ventricular septal rupture

Patients may initially have no clinically significant cardiopulmonary symptoms but rapid recurrence of angina, hypotension, shock or pulmonary oedema develops.

Signs of ventricular septal rupture include a new harsh pansystolic murmur best heard at the left lower sternal border, with worsening haemodynamic profile and biventricular failure.

Diagnosis is by transoesophageal echocardiography or by showing a step-up in oxygen saturation in the right ventricle on pulmonary artery catheterisation. Post infarction ventricular septal defects require urgent surgical closure (Moller et al., 2001).

### 2.7.4 Free wall rupture

Rupture of a free wall causes bleeding into the pericardium, leading to cardiac tamponade, with progressively poorer cardiac function. Death is often immediate.

Emergency pericardiocentesis and cardiac surgery are essential for any hope of survival (Topaz and Taylor, 1992).

### 2.7.5  Pseudoaneurysm (false aneurysm)

A pseudoaneurysm is caused by a contained rupture of the left ventricular free wall.

The pseudoaneurysm communicates with the body of the left ventricle through a narrow neck.

Pseudoaneurysms may remain clinically silent and be discovered during routine investigations but some patients may have recurrent tachyarrhythmia, systemic embolisation, and heart failure.

The diagnosis is confirmed by echocardiography, MRI or CT scan.

Spontaneous rupture can occur without warning in approximately one third of patients with a pseudoaneurysm. Therefore, surgical intervention is recommended for all patients (Topaz and Taylor, 1992).

### 2.7.6  Acute mitral regurgitation

Most common with an infero-posterior infarction and may be due to ischaemia, necrosis, or rupture of the papillary muscle.

Mitral regurgitation following myocardial infarction predicts a poor prognosis but is often transient and asymptomatic.

Rupture of papillary muscle or chordae tendinae:

Causes severe mitral regurgitation within the first week after infarction and is a life-threatening complication. It is most often seen with inferior infarctions.

One study found a median time for papillary muscle rupture in patients treated with fibrinolysis to be 13 hours after AMI.Echocardiogram is required to confirm the diagnosis, especially to differentiate from rupture of the interventricular septum, and to assess severity. This occurs more commonly in the setting of inferior MI, since the RCA and circumflex arteries supply the postero-medial head of the papillary muscle, which is more prone to rupture than the antero-lateral head. Diagnosis is made by detection of a new systolic murmur, and by the documentation of giant "V-waves" on the pulmonary capillary wedge tracing. Diagnosis may also be made via transthoracic or transesophageal echocardiography, by visualization of the "flail" posterior mitral valve leaflet (Topaz and Taylor, 1992).
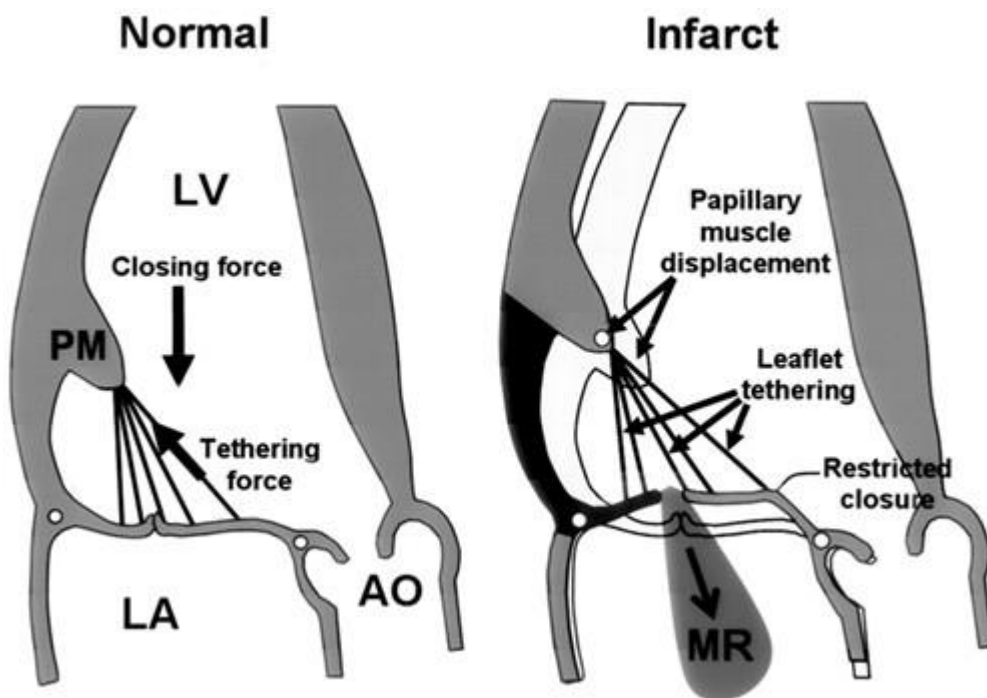
### 2.7.7 Left ventricular aneurysm

The vulnerable myocardium following an AMI is susceptible to wall stress, resulting in infarct expansion. Subacute cardiac rupture is an extreme form of infarct expansion, whereas ventricular aneurysm is its chronic form. Occurs after 2-15% of infarcts. Patients who do not receive reperfusion therapy are at greatest risk (10% to 30%). [2] Five-year survival is 10-25 % (Hole et al., 2003).

### 2.7.8 Right ventricular failure

Right ventricle myocardial infarctions accompany inferior wall ischaemia in up to one half of cases. Mild right ventricular dysfunction is common after infero-posterior infarcts but right heart failure only occurs in a minority of these patients.

May present with hypotension, jugular venous distention with clear lungs and no dyspnoea. Severe right ventricular failure may present with a low cardiac output state, including oliguria and altered mental state. Diagnosis is made by echocardiography. Nitrates, diuretics and any other drugs that reduce preload should be avoided (Hole et al., 2003).

### 2.7.9 Left ventricular outflow tract obstruction

Dynamic left ventricular outflow tract obstruction can independently result from various causes such as left ventricular hypertrophy, reduced left ventricular chamber size (dehydration, bleeding, or diuresis), mitral valve abnormalities, and hypercontractility (stress, anxiety, or inotropic agents such as dobutamine). Echocardiography is the diagnostic test of choice (Hole et al., 2003).

### 2.7.10 Mural thrombosis and systemic embolism

Echocardiography may reveal intraventricular thrombi. Left ventricular thrombus occurs in 20% after infarction but in up to 60% of those after a large anterior infarction. The thrombus may be large and may be associated with embolisation (Karaarslan et al., 2012).

# CHAPTER THREE

# 3. MATERIALS & METHODS

**3. Materials & Methods**

**3.1Study area:**

This study was conducted in Elshabb Hospital, Khartoum.

**3.2 Study design:**

This is a descriptive cross sectional hospital based study.

**3.3 Study period:**

The study was conducted during the period from October $1^{st}$ till December $31^{th}$ 2015.

**3.4 Study population:**

Sixty two patients, males & females, presented with chest pain their age were 18 years or older were included in the study.

**3.4.1 Inclusion Criteria**

- Age 18 or older

- Chief complain on presentation to ED or echocardiology : chest pain

- Differential diagnosis included acute coronary syndrome as determined by the Emergency physician or admission attending.

- Admission to the hospital required for further cardiac work up.

### 3.4.2 Exclusion Criteria

- Obvious non cardiac cause of the chest pain.

- Patient required urgent intervention before echo performance.

- Failure to obtain informed consent

### 3.5.1 Data collection tool:

The data were collected by pre-designed questionnaire which included a data sheet on history and echocardiography findings.

### 3.5.2 Data collection method:

Interview of the participants, and review of patients' records.

### 3.5.3 Data analysis:

Data were analyzed with the Statistical Package for Social science (SPSS) soft ware. The results obtained presented in tables and figures.

### 3.6 Instrumentations:

Different types of ultrasound machine with 3.5 cardiac probes, with facility of computerized reporting system.

### 3.7 Ethical consideration:

This study was approved by ethical clearance committee board, college of medical radiologic science, Sudan University of Science & Technology, Khartoum, Sudan. Also permission of state health authority and Administration Statistic Unit in the Hospital were taken. And consent was taken from all patients included in the study before filling the questionnaire.

# CHAPTER FOUR

# RESULTS

## 4. Results:

This study was conducted in Elshabb Teaching Hospital Department of cardiology. Sixty two patients, males & females, presented with chest pain their age were 18 years or older were included in the study. Gender distribution showed 34 patients (54.8%) were male and 28 were female (45.2%) as shown in (Figure 4.1).
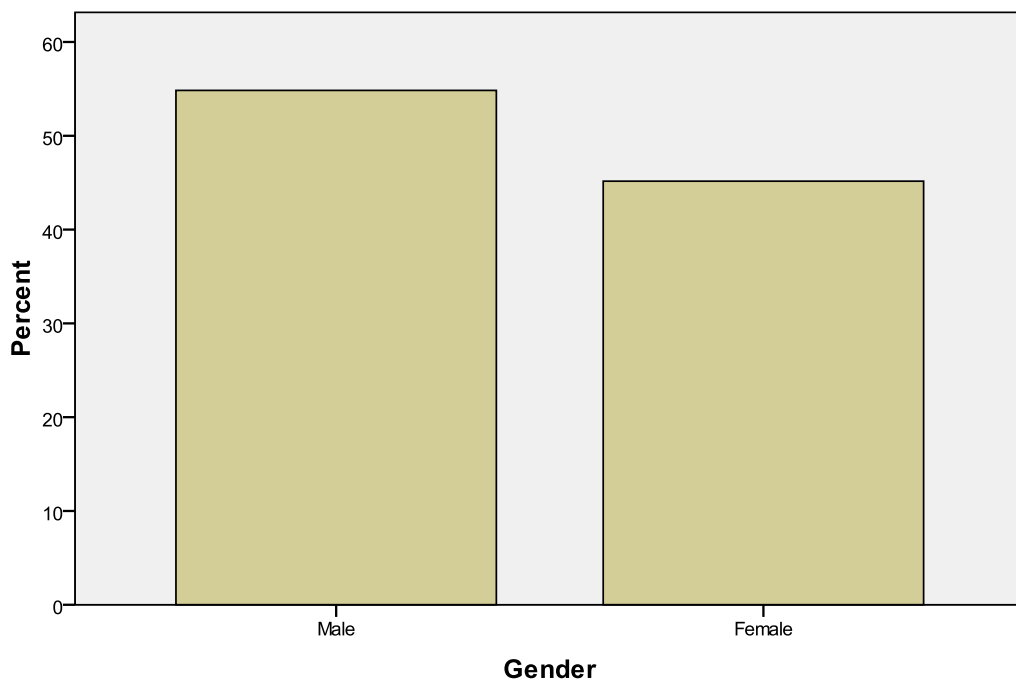


**Figure 4.1:** Gender distribution

Age groups of patients showed that most of the study population 31patient (50%) are above 60year (Figure 4.2).
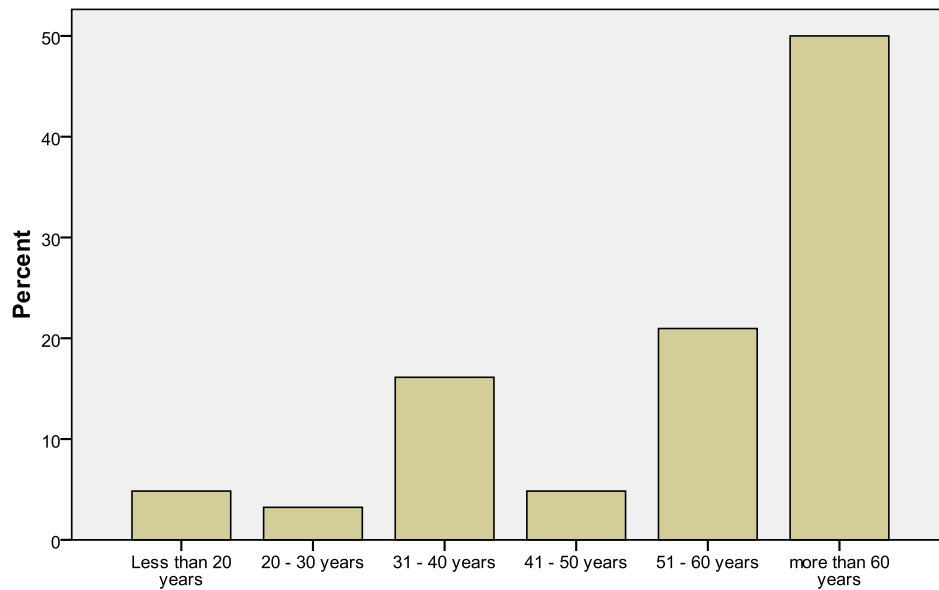


Figure 4.2: Age group

Regarding risk factors of heart disease hypertension represent 19% of study cases and diabetic cases were 8 % (Table 4.1).

**Table 4.1: Risk factors for all patients**

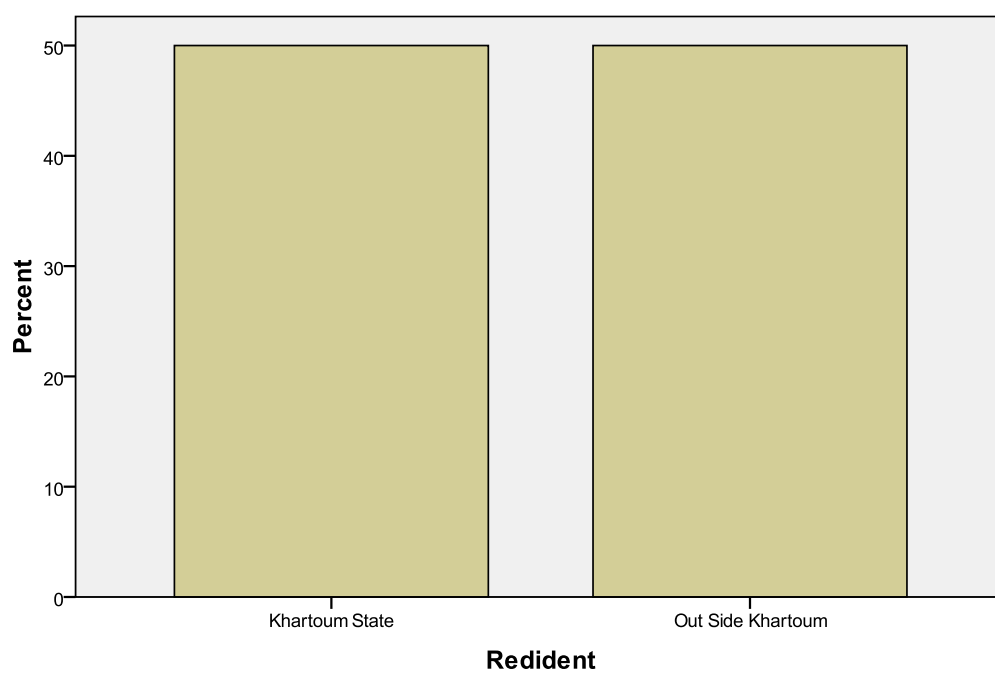| Medical condition | percent |
|---|---|
| hypertension | 19% |
| Diabetes mellitus | 8% |
| Gender | 14% |
| Smoking | 5% |
| Hypertension + diabetes mellitus + gender + ph | 4% |
| Diabetes mellitus + gender | 8% |
| All | 2% |
| Hypertension + gender + smoking | 10% |
| Hypertension + diabetes mellitus | 2% |
| Hypertension + diabetes mellitus + gender + smoking | 7% |
| Gender + hypertension | 7% |
| Hypertension + smoking | 2% |
| Hypertension + diabetes mellitus + gender | 2% |
| none | 13% |

**Table 4.2**: regional wall motion abnormality

| | Frequency | Percent |
|---|---|---|
| **RWMA** | 17 | 27% |
| **Normal** | 45 | 73% |
| **Total** | 62 | 100% |

Study shows 27% of study cases have regional wall motion abnormality

## Table 4.3 RWMA and age

| Age | Percentage |
|---|---|
| Less than 20 years | Zero% |
| 20-30 | Zero% |
| 31-40 | Zero% |
| 41-50 | 12% |
| 51-60 | 29% |
| Above 60 | 59% |
| Total | 100% |

| Cases | Frequency | Percent |
|---|---|---|
| Cardiac Cases | 26 | 41.9 |
| Non Cardiac Case | 21 | 33,9 |
| Cases Need more investigation | 15 | 24 |
| Total | | |
| | 62 | 100,0 |

**Table 3: : Cardiac cases among all patient (n=62)**

**Figure 4.3: residency of patients**

Fifty patients (50%) were from Khartoum state while fifty patients (50%) were from other states (migrant cases) as shown in (**Figure 4.3**) concerning the causes of seeking treatment in Khartoum state for the lack of facilities at their original homes.
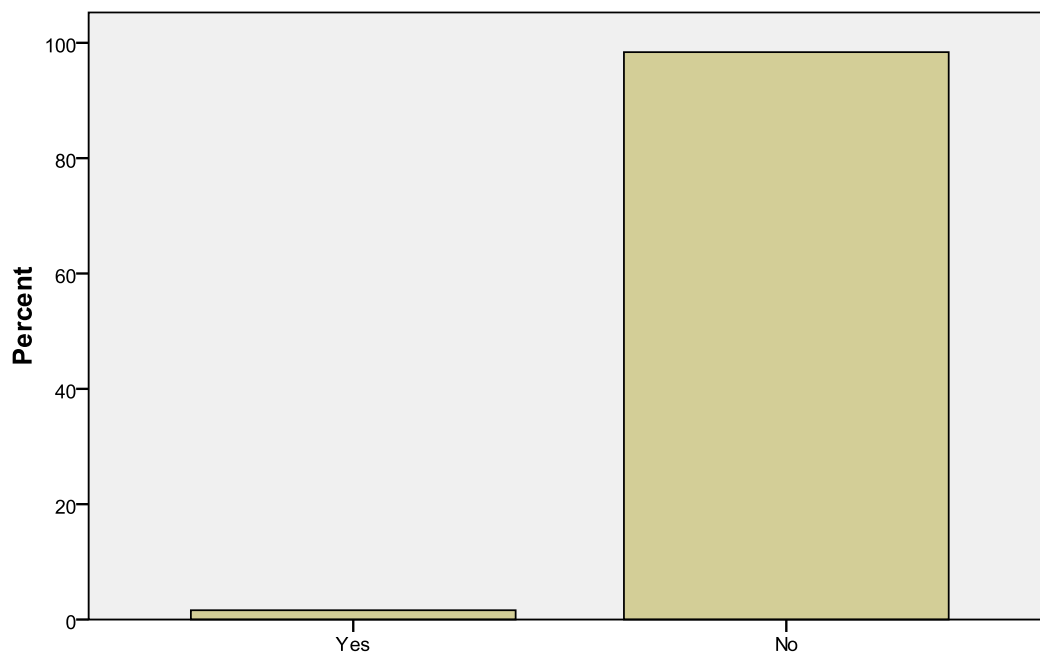


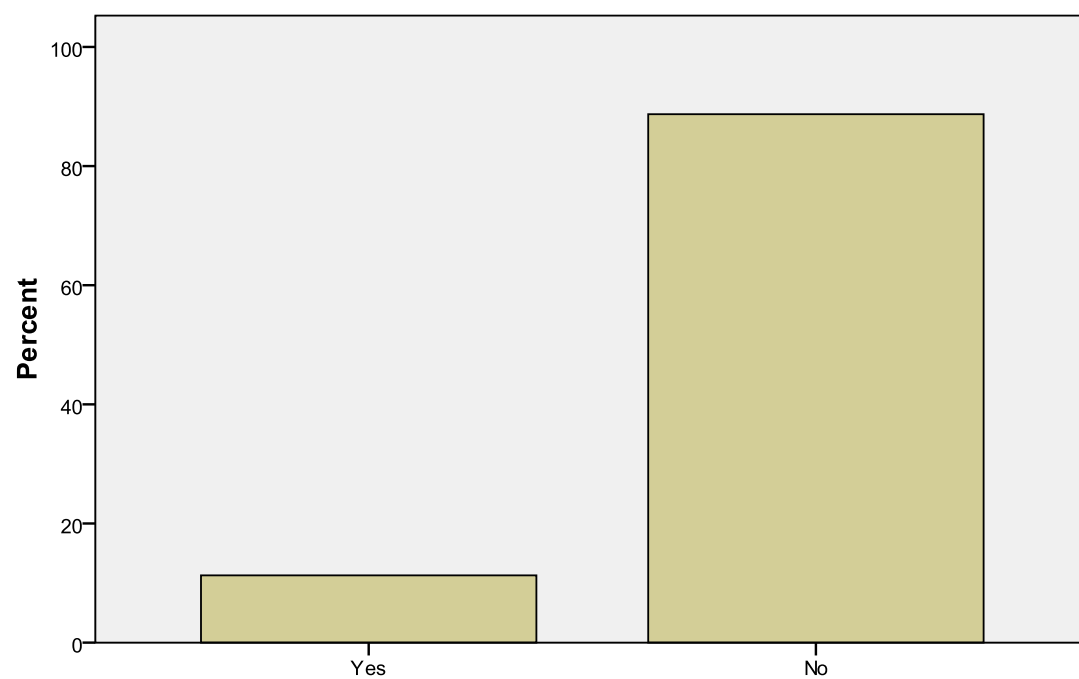**Figure 4.4**: Valvular Heart Disease for all patients
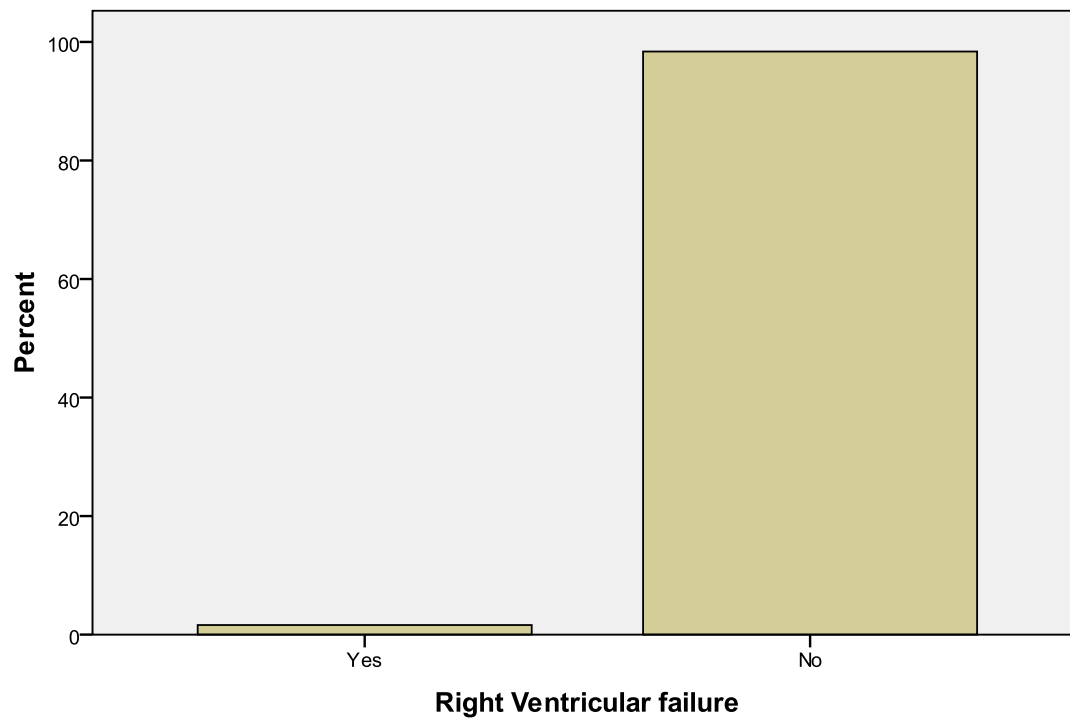
**Figure 4.5**: Mitral Regurg for all patients

**Figure 4.6: Right Ventricular failure for all patients (n=62)**

# CHAPTER FIVE

# DISCUSSION, CONCLUSION AND RECOMMENDATIONS

## 5.1 Discussion

This is a cross-sectional study has been conducted in Alshab teaching hospital Khartoum State to evaluate patient presented with chest pain using echocardiography during the year 2015. Age groups of patients showed that most of the study population 31 patient (50%) are above 60 years, which is known risk of factor of cardiac disease (**Figure4.2),** The risks for coronary artery disease increase with age. As most of study showed about 85% of people who die from heart disease are over the age of 65 (Becker et al., 2008). Regarding risk factors of heart disease hypertension represent 19% of study cases and diabetic cases were 8%, previous study shows myocardial ischemia is common in patients with hypertension and Diabetes mellitus is associated with a markedly increased prevalence of Coronary artery disease. The prevalence of coronary artery disease as assess by various diagnostic methods is as high as 55% among adult patients with diabetes mellitus as compared to 2–4% of the general population (Fisman et al., 2003). It is well established that coronary artery disease is a major complication of diabetes mellitus, representing the ultimate cause of death in more than half of all patients with this disease (Weiner et al., 1991). Chest pain is certainly the predominant symptom of ischemic heart disease and the one most commonly used to establish the type and the efficacy of treatment. However, several studies suggest that many individuals with severe coronary artery lesions do not have angina pectoris (Barthelemy et al., 2007). The silent ischemic events considerably outnumber the symptomatic ones, and it is generally accepted that nearly 75% of the transient ischemic episodes recorded during ECG monitoring are asymptomatic in patients with stable angina pectoris

(Deedwania, 1999). This Study showed that 27% of cases have regional wall motion abnormality. The study found that 50% of included patients were migrant cases and 50% were living in Khartoum Concerning the causes of seeking treatment in Khartoum state to lack of facilities (specialized doctors, skill nurses, lack of trained health care, CCU and ICU, equipments) at their original homes. Most patients are older above 60 year. There is delay in diagnosis and unnecessary admission because echocardiography in not done on the same day of admission which can help in sort-out the cases

**5.2 Conclusion**

Serious complication of chest pain increase with age. Echocardiography play important role in evaluation patient presented with chest pain. The prevalence of migrant patients presented with chest pain among cases seen in Khartoum state was high. The reasons of seeking treatment in Khartoum included mainly lack of trained health cadre, lack of equipment and drugs at other states. The use of echocardiography in the evaluation of patients presenting with chest pain may improve screening for those who can be safely released from the ED. The use of echocardiography in the ED enables rapid, evaluation of patients presenting with chest pain. Implementation of this program appears to be practical in the clinical setting but requires cooperation and commitment on the part of emergency physicians, cardiologists, nurses and sonographers. Normal results on echocardiography in the ED may obviate the need for hospital admission in patients presenting with noninfarction chest pain as we know IC U and CCU is precios bed in the ward and it is unfair to be occupied by unnecessary admission.

## 5.3 Recommendations

General measures to improve health workers skills, conducted by the federal ministry of health, so as to aid the early diagnosis and treatment, to stop the cycle of misdiagnosed and to prevent complications in patient presented with chest pain by Early evaluation all patient by echocardiography in ER.

Early evaluation of patients presenting with chest pain should be implemented and well established at least in the capitals and big cities of all Sudan states and this require training staff (doctor ,nurses ,technician ) ,equipment and others facilities.

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# Appendix

# Questionnaire

Personal data:

Age:   (   )   Gender:        male (   )                      female (    )

Resident: Khartoum state          (   )      Out side Khartoum    (   )

Duration of chest pain  ……………………………………………

Patient history of heart disease:……………………………………

History of heart disease risk factor:

Hypertension   (   )        diabetes mellitus   (   )      gender      (   )

Smoking          (   )        hyperlipidemia      (   ) Others  ………………

Past history of ischemic heart disease        (    )…………………………

      Family history of heart disease: Yes (    )          no   (    )

## Echocardiography Report

**LVH  (    ) ,           Valvular  HD (   ) ....................RWMA (          )**

**MR  (    )   , ventricular septal defect (VSD)  (    ) left ventricular ejection fraction (     )**

**Pseudoaneurysm  (     ) Left ventricular aneurysm  (    )  Right ventricular failure ( )**

**Left ventricular outflow tract obstruction  (    ) Mural thrombosis (   )**
*pericardial effusion        Left Ventricular Free Wall Rupture (     )*

**Others  ……………………………………………………**

**Conclusion;……………………………………………………………………………………………**