



بسم الله الرحمن الرحيم

**Sudan University of Science & Technology**  
**College of Graduate Studies**



**Estimation of D dimer Level among Sudanese patients with Acute  
Coronary Syndrome attending Elobied Cardiac Care Unit**

تقدير مستوى D dimer بين المرضى السودانيين المصابين بمتلازمة الشريان التاجي الحادة  
بوحدّة عناية القلب بمستشفى الأبيض

*A dissertation Submitted in Partial fulfillment of the requirements for  
Master Degree in Medical Laboratory Science (Hematology and  
Immunoematology)*

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# الاية

قال تعالى:

(( وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ  
إِلَىٰ عَالَمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُم بِمَا كُنتُمْ تَعْمَلُونَ ))

صدق الله العظيم

سورة التوبة الآية (105)

## *Dedication*

*TO*

*My mother*

*My father*

*My husband*

*My daughters*

*My sisters*

## **Acknowledgment**

My Grateful Thank to ALLAH who guided me to the straightway in my life.

I would like to express my deep gratitude to **Dr.Musoor Mohammed Munsoor** my research supervisor, for his patient guidance and useful critiques of this research work.

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## **Abstract**

D dimer is a laboratory test used for assessing many diseases such as deep venous thromboembolism, cardiac diseases and cancer. Acute coronary syndrome is world wide disease and may lead to death. This prospective case-control study conducted to determine the association of D dimer with acute coronary syndrome, at CCU of Elobied teaching hospital during period from July to October 2018.

Sixty individuals were included in this study, thirty were cases and thirty were controls, 3ml of blood collected from each participant, all of them tested to D dimer by using ichroma™. The study showed that the mean of D dimer cases was (730.87) while the mean of D dimer controls was (145.20), there was statistical significance difference between the results of cases and controls when using independent T test with p.value (0.000). D dimer level is higher in patients with acute coronary syndrome than in healthy persons. D dimer level also tested among smokers, hypertensive and diabetes patients, there was insignificance difference between smokers and non smokers, hypertensive and non hypertensive, diabetes and healthy persons. D-dimer levels measurement should be included among the routine tests for patients complaining of chest pain.

## مستخلص الدراسة

D dimer هو تحليل يستخدم لترجمة عدة أمراض مثل الجلطات, أمراض القلب والسرطان. متلازمة الشريان التاجي الحادة مرض منتشر ويمكن أن يؤدي للوفاة. تهدف هذه الدراسة لمعرفة كمية D dimer في مرضى متلازمة الشريان التاجي الحادة , وأجريت هذه الدراسة من شهر يوليو الى شهر اكتوبر من عام 2018 بالعناية المكثفة للقلب في مستشفى الأبيض التعليمي. تم أخذ 60 عينة من 30 من المرضى و 30 من أشخاص أصحاء. 3 مل من دم المشاركين في الدراسة وتم تحليل هذه العينات باستخدام ichroma™. خلصت الدراسة الى أنه توجد فروقات ذات دلالة إحصائية بين المرضى والأصحاء قيمتها الإحتمالية 0.000. كما تم تحليل D dimer للمدخنين ومرضى ضغط الدم ومرضى السكري وخلصت الدراسة الى أنه لا توجد فروقات ذات دلالة إحصائية بين المدخنين وغير المدخنين , مرضى ضغط الدم والأصحاء , مرضى السكري والأصحاء. نوصي كل الاطباء بطلب فحص D dimer كفحص روتيني لكل مريض يعاني من ألم الصدر.

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## Abbreviation

<b>ACS</b>	A cute coronary syndrome
<b>CCU</b>	Critical care unit
<b>DM</b>	Diabetes mellitus
<b>RV</b>	Right ventricle
<b>LA</b>	Left atrium
<b>LV</b>	Left ventricle
<b>ECHO</b>	Echocardiography
<b>ECG</b>	Electrocardiogram
<b>SPSS</b>	Statistical package for social science
<b>AMI</b>	Acute myocardial infraction
<b>MI</b>	Myocardial infraction

# Chapter one

## 1.1 Introduction:-

As early as 2600 BC, Egyptian papyrus scrolls recorded that patients with acute chest pain were at high risk of death (**Hamm *et al* 2001**).

Today, Coronary artery disease, in which atherosclerotic plaque builds up inside the coronary arteries and restricts the flow of blood (and therefore the delivery of oxygen) to the heart, continues to be the number-one killer of many countries (**Fox *et al* 2002**). Coronary artery disease can lead to Acute Coronary Syndrome (ACS), which describes any condition characterized by signs and symptoms of sudden myocardial ischemia—a sudden reduction in blood flow to the heart.

The term ACS was adopted because it was believed to more clearly reflect the disease progression associated with myocardial ischemia. Unstable angina and myocardial infarction (MI) both come under the ACS umbrella (**Fox *et al* 2002**).

The American Heart Association(**2001**) estimates that 1.1 million myocardial infarctions occur in the United States alone and that 40% of these patients will die. Approximately half of the deaths occur prior to the patient receiving medical attention.

Taken together with corresponding figures for myocardial infarction in the UK these data suggest that the incidence of AMI is in the range of 1 per 250 to 1 per 500 of the population per year according to British Heart Foundation(**2004**)

The D-dimer, a high-weight molecule of the fibrinogen derivative produced by the division of cross-linked fibrin, reflects both thrombin production and the activation of fibrinolysis. High Ddimer levels occur in many diseases in which the coagulation system is activated, such as acute venous thromboembolism, ischemic heart disease, and cancer (**Loweet *al* 2004**).

Bayes-Genis *et al*(**2000**) have demonstrated that normal D-dimer levels may prove helpful in ruling out ischemia and the risks of adverse cardiovascular events in certain emergency department (ED) patients presenting with chest pain.

In this study, D-dimer levels were used as prognostic biomarkers that can be useful risk assessment tools in ACS diagnosis and monitoring.

## **1.2 Rationales:**

ACS is the major cause of morbidity and mortality, and loss of disability-adjusted life years worldwide, accounting for roughly 7 million death and Due to increased incidence of ACS, the use of D dimer test can assist in diagnosis of ACS, because ECG alone not sufficient to complete the diagnosis.

This study aimed to determine the association of D dimer with ACS patients. , This study helps authorities to evaluate the problem of acute coronary syndrome, and will be a prognostic and therapeutic base to reduce morbidity and mortality in patient with ACS.

### **1.3 Study objectives:**

#### **1.3.1 General objective:-**

\*To estimate D dimer in acute coronary syndrome .

#### **1.3.2 Specific objectives:-**

\*To detect the correlation between the age and D dimer

\*To detect the relationship between D dimer and Gender.

\*To detect the relationship between D dimer level and Smoking.

\*To detect the relationship between D dimer level and Hypertention.

\*To detect the relationship between D dimer and DM.

## **Chapter two**

### **Literature review**

#### **2.1 The heart:-**

The heart is a hollow muscular organ that is somewhat pyramid shaped and lies within the pericardium in the mediastinum, It is connected at its base to the great blood vessels but otherwise lies free within the pericardium.

##### **2.1.1 Anatomy of the heart:-**

The heart is located in the chest, directly above the diaphragm in the region of the thorax called mediastinum, specifically the middle mediastinum. The normal human heart varies with height and weight, The heart lies in the double walled fibro serous sac called pericardial sac, which is divided into: fibrous pericardium and serous pericardium, The fibrous pericardium envelops the heart and attach onto the great vessels, The serous pericardium is closed sac consisting of two layers, A visceral layer or pericardium forming the outer lining of the great vessels and the heart, and a parietal layer forming an inner lining of the fibrous pericardium. The two layers of the serous pericardium contain the pericardial fluid, which prevents the friction between the heart and pericardium.the wall of the heart is composed of three layers: epicardium, myocardium and endocardium. The epicardium is the outer lining of cardiac chambers and is formed by the visceral layer of the serous epicardium. The myocardium is the intermediate layer of the heart and is composed of three discernable layers of muscle, And include a subepicardial layer, a middle concentric layer and a subendocardial layer, The myocardium also contain important structures such as excitable nodal tissue and the conducting system, the endocardium the inner most layer of the heart is formed of the endothelium and sub endothelial connective tissue, The heart is divided into four distinct chambers with the muscular wall of different thickness, The left atrium (LA) and right atrium(RA) are small thin-walled chambers located just above the left ventricle(LV) and right ventricle (RV) respectively : the ventricle are larger thick walled chambers[**Richard S.snell(2012)**].

##### **2.1.2 Physiology of the heart:-**

The cardiovascular system delivers oxygen and nutrients to the tissues and carries a way waste material to be eliminated by organ such as: lung, liver and kidneys. This system is required to function under various normalized and disease condition. The

pulmonary and systemic circulations together help in fulfilling this role. The deoxygenated blood from the superior vena cava inferior vena cava and the coronary sinuses reaches the right atrium (RA): the RA is filled with deoxygenated blood, increasing pressure in the atrial chamber. When the atrial pressure exceed the pressure in the right ventricle (RV), the tricuspid valve opens allowing this blood to enter the RV. As a result of this filling, and as the RV starts to contract the pressure in the RV builds up forcing the tricuspid valve to close and the pulmonic valve to open, there by ejecting the blood into the pulmonary arteries and lungs. The oxygenated blood from the lungs reaches the left atrium(LA) via the pulmonary veins and as the result, pressure in LA builds up and when it exceeds that of the LA, the mitral valve opens allowing the blood to enter the left ventricle (LV). When the blood flow fills the LV, and as the LV starts to contract the LV chamber pressure increase forces the mitral valve to close and aortic valve to open, thus ejecting blood into the aorta, to be distributed throughout the body[.sukker et al(2008)].

## **2.2 Acute coronary syndrome:-**

### **2.2.1 Definition of acute coronary syndrome:**

Acute coronary syndrome (ACS) is a clinical spectrum of ischemic heart disease ranging from unstable angina , non ST segment elevation myocardial infarction (NSTEMI) and ST segment elevation myocardial infarction (STEMI) depending upon degree and acuteness of coronary occlusion. In unstable angina myocardial injury is absent and cardiac biomarker are normal in myocardial infarction (both ST and non ST segment elevation) cardiac biomarker are raised. Most cases of ACS are caused by rupture of an atherosclerotic plaque in coronary artery resulting in formation of thrombus restrict the flow of blood to the heart muscle[Overbaugh (2009)]. A prolonged lack of blood supply resulting in necrosis of heart muscle is defined as a myocardial infarction[Thygesen et al(2012)]. The degree of arterial blockage caused by the thrombus determine the amount of myocardial damage that occur and the type of acute coronary syndrome that result: unstable angina partial or intermittent occlusion no myocardial damage , in NSTEMI partial or intermittent occlusion and myocardial damage, in STEMI complete occlusion and myocardial damage[lalc et al(2011)]. Unstable angina and NSTEMI are closely related condition: their patho physiologic origins and clinical presentation are similar, but they differ in severity. In Unstable angina the clinical presentations are: prolonged angina pain at rest, new

onset severe angina, recent destabilization of previously stable angina, post MI angina. The typical clinical presentation of NSTEMI ACS is retro sternal pressure or heaviness (angina) radiating to the left arm, neck or jaw which may be intermittent or persistent. There are several a typical symptoms include epigastric pain, chest pain with pleuritic symptoms or increasing dyspnea.

### **2.2.2 Etiology of acute coronary syndrome:**

ACS can occur if there are embolic clots in the circulation, for examples caused by clots formed in the heart during atrial fibrillation. Arterial inflammation (infection) or vasospasm can also cause transient and/or sustained ischemia. Potentially, coronary arteries can spasm from the use of cocaine or methamphetamines, or increase cardiac workload secondary to thyrotoxicosis, anemia, hypoxemia, or fever.

### **2.2.3 Pathophysiology of acute coronary syndrome:**

ACS begins when a disrupted atherosclerotic plaque in a coronary artery stimulates platelet aggregation and thrombus formation. It is the thrombus occluding the vessel that prevents myocardial perfusion. In the past, researchers supposed that the narrowing of the coronary artery in response to thickening plaque was primarily responsible for the decreased blood flow that leads to ischemia, but more recent data suggest that it is the rupture of an unstable, vulnerable plaque with it is associated inflammatory changes- or as Hansson puts it in a review article in the New England Journal of Medicine, "most cases of infarction are due to the formation of an occluding thrombus on the surface of the plaque[Hansson (Med 2005)].

### **2.2.4 Classification of acute coronary syndrome:**

#### **2.2.4.1. Unstable angina:**

Occurs with minimal exertion or at rest and increased doses of nitroglycerin are needed to relieve the pain. Unstable angina is associated with chest pain, without ST-segment elevation 12 lead ECG and the serial laboratory cardiac enzymes will remain within normal limits. However, it is suggestive that the plaque has ruptured in the coronary artery, but did not occlude the artery to cause wide spread cardiac ischemia[Eric et al(2003)].

#### **2.2.4.2. NSTEMI:**

NSTEMI is define as chest pain symptoms with elevated troponin levels. The 12-lead may show ST segment depression and T-wave inversions, but it will NOT exhibit ST-segment elevations. Like UN, during NSTEMI there is a rupture of the plaque



within the coronary artery. The difference is that the heart is experiences more ischemia as evidenced by abnormal troponin levels[Eric et al(2003)].

#### **.2.2.4.3. STEMI:**

The presentation of a STEMI is similar to NSTEMI, but on a 12-lead ECG, only STEMI presents with ST- segment elevation reflects the ischemia that penetrate all three layers of the heart in STEM, with indicators of myocardial necrosis[Eric et al(2003)].

#### **2.2.4.4 Myocardial infarction(MI) :**

It is the death of cardiac myocytes due to prolonged ischemia. As such the natural course of coronary atherosclerosis. Progression of atherosclerosis is trigged and enhanced by several factors, which can cause mediating disease or directly affect the arterial wall[Eric et al(2003)].

#### **2.2.5 Risk factors of acute coronary syndrome**

There are two types of risk factor; non modifiable factor and modifiable factor. Non modifiable risk factors are: increasing age, age, gender, family history and genetic abnormality. They cannot modify non modifiable factors. Modifiable risk factors are; Smoking, hyperlipidemia, hypertension, diabetes obesity, and body mass index. These modifiable risk factors are avenues where patients can change their life style and reduce the risk of ACS [Boudi(2016a)].

**Smoking:** Cigarette smoking increases the risk of coronary heart disease (CHD) because it increase blood pressure and the tendency of blood to clot.

**Hypercholesterolemia:** Tow types of cholesterol are low-density lipoprotein (LDL) and high density lipoprotein (HDL). LDL cholesterol is considered "bad" and when there is too much, it will slowly build up on the intima of the arteries. As a result, because LDLs are sticky it is more likely circulating platelets will adhere to them.

**Hypertension:** Over the time high blood pressure causes damage to the arteries and the heart, specifically the coronary arteries. The increase pressure on the arteries cause microscopic tearing. The result of the body fixing these tears is scar tissue. The more scar tissue the arteries have the more likely cholesterol and platelets are able to stick to the wall.

**Diabetes:** People with diabetes(especially type 2) at greatest risk for developing CHD because type 2 diabetic patient typically are already obese and do not regularly exercise. Diabetics are two to eight times as likely to have heart disease or stroke as those who do not.

**Obesity:** Obesity is linked to heart disease, stroke, type 2 diabetes, and cancer. Obese patients are at risk for STEMI at younger age, and also have higher mortality rates in hospital following a STEMI[CDC(2016)].

#### **2.2.6 Symptoms of coronary heart disease:**

Any time a patient presents with right or left sided chest pain, discomfort pressure or tightness around the chest, they need to be immediately triaged in the emergency department. Other symptoms that call for immediate attention include: pain or discomfort of the shoulder, neck, jaw or back. Atypical symptom of ischemic chest pain are: dyspnea, nausea, vertigo, and diaphoresis.

#### **2.2.7 Diagnosis of acute coronary syndrome:**

The clinical presentation, electrocardiogram (ECG), echocardiography (ECHO), and elevated serum cardiac biomarkers levels[rudradev et al(2011)].

**.1 Clinical presentation:** Chest pain is usual symptom which brings these patients to medical attention.

**.2 Electrocardiogram:** ECG is generally the first investigation available for making a diagnosis in a patient presenting with acute severe chest pain. ST elevations are the hallmarks of early presentation within minutes of onset of chest pain

**.3 Echocardiography:** ECHO is helpful in evaluation of chest pain, especially during active chest pain. The absence of LV wall motion abnormalities during chest pain usually but not always excludes myocardial ischemia or infraction, and the presence of regional wall motion abnormalities helps in confirming the diagnosis.

**4. Biomarkers:** Cardiac biomarkers used for diagnosis of acute MI. these have been used in patients with NSTEMI and unstable angina for finding high risk individuals.

## **Chapter three**

### **Materials and methodes**

#### **3.1 Materials:-**

##### **3.1.1 Study design**

This is a prospective case-control study.

##### **3.1.2. Study area and period**

This study was conducted (in coronary care unit) in Elobeid Teaching Hospital in North Kordofan State, during the period from july to october 2018.

##### **3.1.3 Study population and sample size:**

Thirty patients with acute coronary syndromes were selected after taking their consents as (test group). Thirty apparently healthy subjects were selected as a control group who were age and sex matched to the acute coronary syndrome group (control group).

##### **3.1.4 Inclusion criteria:**

Patients admitted to the hospital with ACS who agreed to participate in the study.

##### **3.1.5 Exclusion criteria:**

- 1- patients presenting with chest pain who had adiagnosis and treatment initiated within the previous 7days.
- 2- patients who had undergone coronary artery bypass grafting, angioplasty, or open-heart surgery.

##### **3.1.6 Ethical considerations:**

- Permission of this study was obtained from local authorities in the study area and the objectives and benefits of the study were explained to the local authorities, patients and their relatives in the study area and a written informed consent was obtained from each participant.

##### **3.1.7 Data collection and analysis:**

###### **Interview and questionnaire:**

Clinical data was obtained from the history and then all data was collected in pre-formed questionnaire sheet.

## **3.2 Methods:-**

### **3.2.1 Sample collection and processing:**

2,5ml of venous blood was collected from each volunteer included in this study, after informed consent and used alcohol (70% ethanol) for the skin. Then mixed it with ethylene diaminetetraacetic acid (EDTA) anticoagulant.

### **3.2.2 Principle:-**

The test uses a sandwich immunodetection method; the detector antibody in buffer binds to antigen in sample, forming antigen-antibody complexes, and migrates onto nitrocellulose matrix to be captured by the other immobilized-antibody on test strip.

The more antigen in sample forms the more antigen-antibody complex and leads to stronger intensity of fluorescence signal on detector antibody, which is processed by instrument for ichroma™ tests to show D dimer concentration in sample.

### **3.2.3 Test procedure:-**

- 1- 10 microliter of sample was transferred [human whole blood, plasma, control] using a transfer pipette to a tube containing the detection buffer.
- 2- The lid of the detection buffer tube was closed and mixed the sample thoroughly by shaking it about 10 times.
- 3- 75microliter of a sample mixture was pipette and dispense it into the sample well on the cartridge.
- 4- The sample-loaded cartridge was putted at room temperature for 12 minutes.
- 5- The sample-loaded cartridge was inserted it into the cartridge holder of the instrument for ichroma™ tests.
- 6- 'Select' button on the instrument for ichroma™ tests was pressed to start the scanning process.
- 7- The test result on the display screen of the instrument for ichroma™ was read.

### **Interpretation of test result:-**

\* instrument for ichroma™ tests calculates the test result automatically and displays D-dimer concentration of the test sample in terms of ng/ml [FEU, fibrinogen equivalent units].

\* The cut-off [reference value]:500ng/ml.

\* Detection range: 50-10,000ng/ml.

All control measures concerning the performance of ichroma™ test and precautions of hazards during sample collection, handling, and analysis were considered.

### **3.3 Quality control:**

- \* The sample type must be human whole blood or plasma.
- \* The sample must be tested within 24hours after collection.
- \* The plasma should be separated from the clot by centrifugation within 3 hours after the collection of whole blood.
- \* Do not keep the sample in a freezer, which could affect the test value of D.Dimer.

### **3.4 Statistical analysis:**

The data was analyzed using SPSS (statistical package for social science ) version 11.5, T.test was used for comparison.  $P.value \leq 0.05$  were considered statistically significant) and the results presented in the form of tables and figures.

## Chapter four

### RESULTS

A total of 30 consecutive patients were included in this study, {21 male (70%) and 9 female (30%)}, (21 STEMI, 5 NSTEMI, 4UA), The mean of the age  $\pm$  (63.30) years and 30 healthy persons same in age and gender.

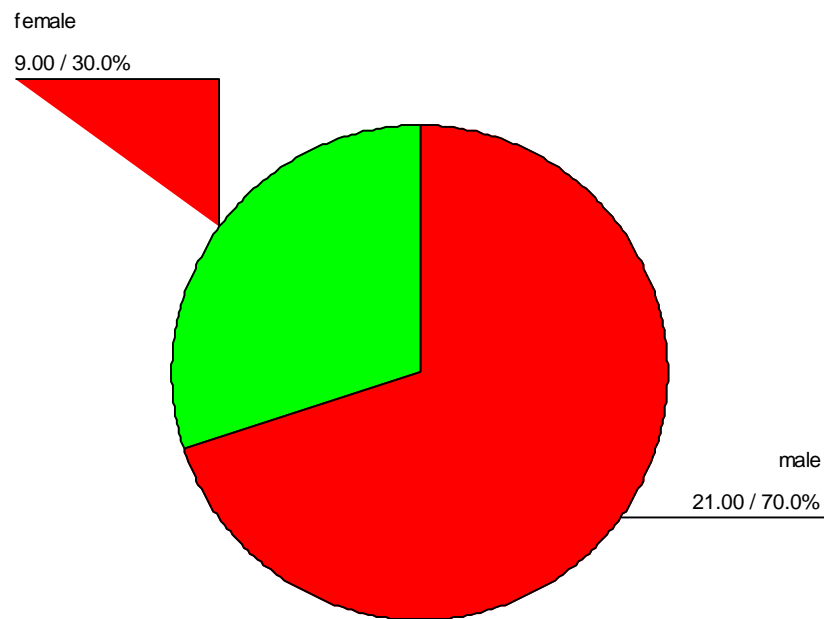


Figure (4.1) male to female percentage.

The mean of D dimer of cases (730,87), while the mean of D dimer of controls (145.20) with mean difference (585,67).

The independent t test used to compare between d dimer in patients and controls with p value 0.000 ,which less than {0.05}, that mean we accept the hypothesis of there was difference between two groups in D dimer level.(shown in table 4.1).

**(Table4. 1) comparison between D dimer in cases and controls**

<b>Groub</b>	<b>Number</b>	<b>Mean</b>	<b>SD deviation</b>	<b>P value</b>
<b>D dimer of cases</b>	<b>30</b>	<b>730.87</b>	<b>669.689</b>	<b>0.000</b>
<b>D dimer of controls</b>	<b>30</b>	<b>145.20</b>	<b>94.109</b>	

To know the pertinence between age and D dimer we used correlation test with P value (0.04), which less than {0.05}, that mean we accept the hypothesis of there was correlation between the age and D dimer.with pearson correlation(0.831),that mean there is positive and strong correlation between age and D dimer, that means when the age of person is high the D dimer of him will increased.

The mean of D dimer of males (139,81), while the mean of D dimer of females (166.56) .

The independent t test used to compare between d dimer in males and females with p value 0.538,which more than {0.05}, that mean we accept the hypothesis of there was no difference between two males and females in D dimer level.(shown in table 4.2).

**(Table 4.2) The difference of D dimer between males and females**

<b>Group</b>	<b>Number</b>	<b>Mean</b>	<b>SD deviation</b>	<b>P value</b>
<b>D dimer of males</b>	<b>21</b>	<b>139.81</b>	<b>70.206</b>	<b>0.538</b>
<b>D dimer of females</b>	<b>9</b>	<b>166.56</b>	<b>141.962</b>	

The mean of D dimer in smokers (145), while the mean of D dimer in non smokers was (144.29) .

The independent t test used to compare between d dimer in smokers and no smokers with p value 0.922, which more than {0.05}, that mean we accept the hypothesis of there was no difference between two groups in D dimer level.(shown in table 4.3).

**Table 4.3) The difference between D dimer in smokers and non smokers**

<b>Group</b>	<b>Number</b>	<b>Mean</b>	<b>SD deviation</b>	<b>P value</b>
<b>D dimer of smokers</b>	<b>2</b>	<b>145</b>	<b>11.314</b>	<b>0.992</b>
<b>D dimer of non smokers</b>	<b>28</b>	<b>144.29</b>	<b>99.261</b>	

The mean of D dimer in hypertensive patients was (141.00), while the mean of D dimer in normal persons was (146.88) .

The independent t test used to compare between d dimer in hypertensive and normal persons with p value 0.871, which more than {0.05}, that mean we accept the hypothesis of there was no difference between two groups in D dimer level.(shown in table 4.4).

**(Table 4.4) The difference between D dimer in hypertensive patients and non hypertensive**

<b>Group</b>	<b>Number</b>	<b>Mean</b>	<b>SD deviation</b>	<b>P value</b>
<b>D dimer of hypertensive</b>	<b>13</b>	<b>141.00</b>	<b>117.671</b>	<b>0.871</b>
<b>D dimer of non hypertensive</b>	<b>17</b>	<b>146.88</b>	<b>78.954</b>	



The mean of D dimer in diabetes mellitus patients was (119.60), while the mean of D dimer in normal persons was (149.28) .

The independent t test used to compare between d dimer in diabetes mellitus and normal persons with p value 0.537, which more than {0.05}, that means we accept the hypothesis of there was no difference between two groups in D dimer level. (shown in table( 4.5)

**(Table 4.5) The difference of D dimer between DM and non DM**

<b>Group</b>	<b>Number</b>	<b>Mean</b>	<b>SD deviation</b>	<b>P value</b>
<b>D dimer of DM</b>	<b>5</b>	<b>119.60</b>	<b>137.954</b>	<b>0.537</b>
<b>D dimer of non DM</b>	<b>25</b>	<b>149.28</b>	<b>88.119</b>	

## Chapter five

### 5.1 Discussion:-

Many thousands of people annually are admitted to emergency departments with chest pain in Sudan. Triage of these patients is important and often difficult for emergency physicians. In some patients with coexisting cardiac pathology, such as left ventricular hypertrophy or previous MI, the initial ECG is indeterminate and cannot be used to make a diagnosis (**Lee et al. 1987**).

In studies by (**Bounameaux et al.1991**) D-dimer testing was established as a useful aid in the diagnosis of deep vein thrombosis of the lower limbs and pulmonary embolism. The relationship between serum D-dimer levels and ACS is unclear and published data are contradictory. For example, small studies show that D-dimer levels are higher in patients with MI than in patients with other forms of ACS.(**Francis . et al. 1987**).In contrast,(**Gurfinkel et al.1995**)found normal D-dimer concentrations in patients with MI compared with healthy volunteers.

In this study, the mean of D- dimer concentration in the case group was (**730.87**

) and (**145.20**) in the control group. The statistical analysis revealed that there was a significance difference between the two groups with p value (**0.000**). This results was in accordance with study done by ( **Orak et al 2010**) whom found that serum Ddimer levels were significantly higher in patients admitted to the emergency department with chest pain with a diagnosis of ACS, compared with levels in those admitted with non-cardiac chest pain.

In this study , There was positive correlation between D dimer and the age and there was no difference in D dimer between( male or female) hypertensive, diabetes or normal persons) and this findings disagreement with previous study done by(**Zaki et al 2017**) who reported that D dimer was higher with increase age , female sex, diabetes, hypertensive.(

D Dimer may play an important role in the pathogenesis of ACS during the acute phase and initiation of clotting, and a measurement of this marker of the activation of coagulation may predict myocardial ischemia before myocardial necrosis has occurred (**Brügger-Andersen et al 2007**).

## **5.2 Conclusion:**

In conclusion, plasma D-dimer levels appear high in patients with acute coronary syndrome than normal range and also than D dimer in healthy persons, for that it will be useful for diagnosing ACS and might assist in the prediction of mortality, in patients presenting at the emergency department with acute chest pain.

there was no difference in D dimer between (males , females) ,(smokers , non smokers) ,(hypertensive ,non hypertensive) and (DM , non DM) .

## **5.3 Recommendations:**

1. Further studies are needed to estimate the concentration of D-dimer levels in other categories of cardiac disorders.
2. Another study should be conducted with more information to evaluate the D dimer among smokers, hypertensive and diabetes.
3. D-dimer levels measurement should be included among the routine tests for patients complaining of chest pain

## Chapter six

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# Appendices

Appendix 1

**Sudan University of science and technology**

**Questionnaire**

**D.dimer in acute Coronary syndrome**

1/ Age.....

2/ Gender.....

3/ Blood pressure.....

[a] normal

[b] hypertensive

4/ Diabetes.....

[a]yes

[b]no

5/ Smoking.....

[a] yes

[b] no

6/ Diagnosis.....

[a] UA

[B] N- STEMI

[C] STEMI

7/ D.dimer test.....



## Appendix 2

### جامعة السودان للعلوم والتكنولوجيا

#### موافقة للاشتراك في بحث علمي

أنت مدعو(ه) للمشاركة ببحث علمي بمستشفى الأبيض الرجاء أن تأخذ(ي) الوقت الكافي لقراءة المعلومات قبل أن تقرر(ي) إذا كنت تريد(ين) المشاركة أم لا .

بإمكانك طلب إيضاحات أو معلومات إضافية عن أي شئ مذكور في الإستمارة أو عن الدراسة ككل.

البحث عن/ متلازمة الشريان التاجي الحادة , ولاتوجد تأثيرات سلبية يمكن أن يسببها الإشتراك في هذه الدراسة.

في حال الموافقة علي المشاركة في هذه الدراسة سيبقى إسمك طئ الكتمان ولن يكون لإي شخص حق الإطلاع على ملفك بإستثناء الطبيب المسئول عن الدراسة ومعاونيه.

#### موافقة مشترك:

إسم المشترك.....

لقد قرأت إستمارة القبول وفهمت مضمونها وبناءاً عليه أوافق علي الإشتراك في هذه الدراسة وذلك بإعطاء كمية من الدم الوريدي كما أعرف أنني حر بالإنسحاب متى شئت حتى بعد التوقيع دون أن يؤثر ذلك على العناية الطبية المقدمة لي.

توقيع المشترك.....

التاريخ.....

## Appendix3

-Image of ichroma™

