

Dedication

To my parents.

To my wife.

To my daughter.

To my family.

Fahmi

Acknowledgments

First and end thanks go to God "Allah" for helping me to complete this research.

I am so grateful to my supervisor Dr. Abdelgadir Ali Elmugadam assistant professor of clinical chemistry- College of medical laboratory sciences for his guidance, understanding and constructive advice and help.

Thanks to all my colleagues in College of medical laboratory sciences -Sudan university of science and technology , Alshaab teaching hospital and Sudan heart center for their help for selection of the patients and blood samples collection.

My thanks extend to the patients and donors whom provide samples .

A lot of thanks to my colleagues in Gadeer Laboratory-Makah-KSA for their help in troponin T measurement by their Elecsys2010.

List Of Contents

| | Subject | Page No |
|--------------------------------------------------------------------------|----------------------------------------------------------|---------|
| | Dedication | i |
| | Acknowledgments | ii |
| | List of contents | iii |
| | Abstracts | v |
| | المستخلص | vii |
| | List of tables | viii |
| | List of figures | ix |
| | A abbreviations | x |
| CHAPTER (one) Introduction , Rationale & Objectives | | |
| 1.1 | Introduction | 1 |
| 1.2 | Rationale | 3 |
| 1.3 | Objectives | 4 |
| 1.3.1 | General Objectives | 4 |
| 1.3.2 | Specific Objectives | 4 |
| CHAPTER (two) Literature Review | | |
| 2.1 | Human heart | 5 |
| 2.1.1 | Structure of the heart | 6 |
| 2.1.2 | Lifestyle and heart health | 7 |
| 2.2 | Blood Pressure | 7 |
| 2.2.1 | Normal Blood Pressure | 7 |
| 2.2.2 | Hypertension (HTN) or high blood pressure | 8 |
| 2.2.2.1 | Signs and symptoms of hypertension | 9 |
| 2.2.2.2 | Causes of hypertension | 10 |
| 2.2.2.3 | Path physiology of hypertension | 11 |
| 2.2.2.4 | Diagnosis of hypertension | 12 |
| 2.2.2.5 | Complications of hypertension | 12 |
| 2.2.3 | Hypotension | 13 |
| 2.3 | Other Heart diseases | 13 |
| 2.3.1 | Myocardial Infraction | 13 |
| 2.3.2 | Heart failure (HF) often called congestive heart failure | 13 |
| 2.3.3 | Cardiovascular disease or heart disease | 14 |
| 2.3.4 | Cardiomyopathy | 14 |
| 2.4 | Cardiac Troponin | 15 |
| 2.4.1 | The biology of troponin | 15 |
| 2.4.2 | Characteristics of troponin assays | 16 |
| 2.4.3 | Role of troponin in acute myocardial infarction | 18 |
| 2.4.4 | Prognostic value of troponin in acute coronary syndromes | 19 |

| | | |
|----------------------------------------------------------------------------|--------------------------------------------------------------------|----|
| 2.4.5 | Troponin and detection of reversible cardiac injury | 20 |
| 2.4.6 | Chest pain in the emergency department | 21 |
| 2.4.7 | Troponin and the detection of myocardial infarction | 22 |
| 2.4.8 | Troponin and infarct size | 22 |
| 2.4.9 | Troponin and renal failure | 22 |
| 2.4.10 | Other clinical situations in which troponin levels may be elevated | 24 |
| 2.5 | Other Cardiac Enzymes | 26 |
| 2.5.1 | Creatine kinase (CK) | 26 |
| 2.5.2 | Aspartate transaminase (AST) | 27 |
| 2.5.3 | Lactate dehydrogenase (LDH or LD) | 27 |
| 2.6 | Lipids | 28 |
| 2.6.1 | Cholesterol | 28 |
| 2.6.1.1 | Physiology of cholesterol | 29 |
| 2.6.1.2 | Function of cholesterol | 29 |
| 2.6.1.3 | HDL-C , LDL-C and Hypercholesterolemia | 31 |
| 2.6.1.4 | Hypocholesterolemia | 34 |
| 2.6.2 | Triglyceride | 34 |
| 2.6.2.1 | Role of triglyceride in disease | 35 |
| 2.6.2.2 | Reducing triglyceride levels | 35 |
| CHAPTER (three) Materials and Methods | | |
| 3.1 | Study Area | 37 |
| 3.2 | Study period | 37 |
| 3.3 | Ethical Consideration | 37 |
| 3.4 | Study Population and sample Size | 37 |
| 3.5 | Data and Questionnaire Information | 37 |
| 3.6 | Measurement of Troponin and lipid profile | 38 |
| 3.6.1 | Measurement of troponin T | 38 |
| 3.6.1.1 | Test principle | 38 |
| 3.6.1.2 | Assay | 38 |
| 3.6.2 | Measurement of lipid profile | 39 |
| 3.7 | Quality Control Method | 40 |
| 3.8 | Statistical Analysis | 40 |
| CHAPTER (four) Results | | |
| 4 | Results | 41 |
| CHAPTER (five) Discussion ,Conclusion &Recommendation | | |
| 5.1 | Discussion | 55 |
| 5.2 | Conclusion | 57 |
| 5.3 | Recommendations | 57 |
| References List | | 59 |
| Appendices | | 73 |
| | Questionnaire | 74 |

Abstract

Background. Cardiac troponin T (cTnT) is a cardiac regulatory protein that control the calcium mediated interaction between actin and myosin, TnT is a component of the contractile apparatus of the striated musculature. As a result of its high tissue-specificity, cardiac troponin T (cTnT) is a cardio-specific, highly sensitive marker for myocardial damage.

Objective. This study aimed to measure and evaluate the usefulness of Troponin T and lipid profile in hypertensive patients who had developed chest pain due to cardiac event .

Subjects and Methods. Cardiac troponin T(cTnT) and lipid profile were measured with a quantitative laboratory methods for one hundred hypertensive patients and 100 apparently healthy subjects as a control group. Cardiac troponin T was measured by Elecsys 2010 and lipid profile were measured by enzymatic method.

Results.

The results of this study revealed a significant elevation of troponin T and HDL-C levels in hypertensive patients and also showed a significant correlation between troponin t and total Cholesterol (P value= 0.001, R = 0.341) , there was a significant increase in the levels of troponin T and HDL cholesterol (p<0.05) in hypertensive patients as compared to those in the healthy controls. On applying Pearson's correlation,

in hypertensive patients there was significant correlation between Troponin T and total TC (P- value= 0.001, R = 0.341) , Troponin T and Triglyceride (P- value= 0.029,R = 0.218) , Troponin T and LDL (P- value =0.002 ,R = 0.309) , duration of disease and Troponin T (P-value 0.038 ,R = 0.208) , duration of disease and TC (P-value=0.041, R=0.205) , duration of disease and LDL (P- value= 0.017 , R = 0.238), systolic blood pressure and troponin T (P-value=

0.011 ,R = 0.254), systolic blood pressure and LDL (P-value=0.032, R=0.215), diastolic blood pressure and TC (p-value=0.010, R=0.257) and diastolic blood pressure and LDL (P-value=0.010, R=0.250).

A significant correlations between Troponin T and HDL, body weight and Troponin T, body weight and TC, body weight and TG, body weight and HDL, body weight and LDL, duration of disease and TG, duration of disease and HDL, systolic blood pressure and TC, systolic blood pressure and TG, systolic blood pressure and HDL, diastolic blood pressure and troponin T, diastolic blood pressure and TG and diastolic blood pressure and HDL, P-value >0.05 for all, which were statistically not significant.

Conclusion. This study confirms that the cardiac troponin T can be used as a predictor for the early detection of cardiac event along with the lipid profile markers in hypertensive patients .

المستخلص

كان الهدف من هذه الدراسة هو التحقيق في الفائدة السريرية لتروبوبينين تي (troponin T) ودهون الدم كعلامات لتشخيص حالة القلب بين مرضى ارتفاع ضغط الدم الذين يعانون من ألم في الصدر. وقد أجريت هذه الدراسة في مستشفى الشعب التعليمي ومركز السودان للقلب بالخرطوم في الفترة من شهر مايو ٢٠١١ إلى يونيو ٢٠١٢.

أجريت الدراسة على ١٠٠ مريض بارتفاع ضغط الدم كمجموعة دراسة (٥٩) من الرجال و (٤١) من النساء، تتراوح أعمارهم من ٢٦ إلى ٧٤ عام (و ١٠٠ متطوع كمجموعة تحكم (٥٤) من الرجال و (٤٦) من النساء، تتراوح أعمارهم من ٣١ إلى ٦٩ عام). و تمت مراعاة تقارب الأعمار الجنس والوضع الاجتماعي والاقتصادي بين المجموعتين.

تم جمع البيانات من خلال التقييم السريري و تعبئة الاستبيان لكل مريض ومتبرع، تم قياس التروبوبينين باستخدام Elycsys2010 والدهون بواسطة جهاز Humalyzer3000. أجري التحليل الإحصائي عن طريق الكمبيوتر بواسطة برنامج SPSS 16- لمقارنة النتائج بين المجموعتين.

كشفت نتائج هذه الدراسة عن وجود علاقة ذات دلالة إحصائية بين التروبوبينين والكوليسترول الكلي والتروبوبينين تي والدهون المنخفضة الكثافة (LDL) وليس هناك ارتباط كبير بين التروبوبينين والدهون العالية الكثافة (HDL) في مجموعة الاختبار.

كما هو مبين في الجدول رقم ١، كانت هناك زيادة كبيرة في مستويات الكوليسترول و التروبوبينين و HDL في مرضى ارتفاع ضغط الدم بالمقارنة مع تلك الموجودة في مجموعة التحكم. في مرضى ارتفاع ضغط الدم كان هناك ارتباط كبير بين التروبوبينين والكوليسترول والتروبوبينين والدهون الثلاثية ، التروبوبينين والدهون منخفضة الكثافة ، مدة المرض والتروبوبينين ، مدة المرض والكوليسترول ، مدة المرض والدهون منخفضة الكثافة ، ضغط الدم الانقباضي والتروبوبينين ، ضغط الدم الانقباضي والدهون منخفضة الكثافة ، وضغط الدم الانبساطي والكوليسترول وضغط الدم الانبساطي والدهون منخفضة الكثافة. وجميعها ذات دلالات ذات إحصائية معنيرة.

في الختام يمكن استخدام التروبوبينين تي باعتباره مؤشراً للكشف المبكر عن أمراض القلب جنباً إلى جنب مع الدهون في مرضى ارتفاع ضغط الدم لمنع الوفيات والإمراض التي ترتبط بارتفاع ضغط الدم.

List Of Tables

| Table | Title | Page No. |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 2.1 | Normal Range of lipid profile | 36 |
| 4.2 | Comparison between Troponin T, TC, TG, HDL, LDL and body weight between Hypertensive (patients) group and Non hypertensive (control) group. | 41 |
| 4.3 | Demographic data for patients and controls | 55 |

List Of Figures

| Figure | Title | Page No |
|---------------|-------------------------------------------------------------------------------|----------------|
| 4.1 | Correlation of troponin t and TC in hypertensive patients | 43 |
| 4.2 | Correlation of troponin t and TG in hypertensive patients. | 43 |
| 4.3 | Correlation of troponin t and HDL-C in hypertensive patients. | 44 |
| 4.4 | Correlation of troponin t and LDL-C in hypertensive patients. | 44 |
| 4.5 | Correlation of body weight and troponin t in hypertensive patients. | 45 |
| 4.6 | Correlation of body weight and TC in hypertensive patients | 45 |
| 4.7 | Correlation of body weight and TG in hypertensive patients. | 46 |
| 4.8 | Correlation of body weight and HDL-C in hypertensive patients. | 46 |
| 4.9 | Correlation of body weight and LDL-C in hypertensive patients. | 47 |
| 4.10 | Correlation of duration of disease and troponin t in hypertensive patients. | 47 |
| 4.11 | Correlation of duration of disease and cholesterol in hypertensive patient. | 48 |
| 4.12 | Correlation of duration of disease and triglyceride in hypertensive patients. | 48 |
| 4.13 | Correlation of duration of disease and HDL-C in hypertensive patients. | 49 |
| 4.14 | Correlation of duration of disease and LDL-C in hypertensive patients. | 49 |
| 4.15 | Correlation of systolic BP and troponin t in hypertensive patients | 50 |
| 4.16 | Correlation of systolic BP and TC in hypertensive patients. | 50 |
| 4.17 | Correlation of systolic BP and TG in hypertensive patients | 51 |
| 4.18 | Correlation of systolic BP and HDL-C in hypertensive patients | 51 |
| 4.19 | Correlation of systolic BP and LDL-C in hypertensive patients | 52 |
| 4.20 | Correlation of diastolic BP and troponin t in hypertensive patients. | 52 |
| 4.21 | Correlation of diastolic BP and TC in hypertensive patients | 53 |
| 4.22 | Correlation of diastolic BP and TG in hypertensive patients | 53 |
| 4.23 | Correlation of diastolic BP and HDL-C in hypertensive patients. | 54 |
| 4.24 | Correlation of diastolic BP and LDL-C in hypertensive patients | 54 |

Abbreviations

| | |
|--------------|----------------------------------------------------------|
| ACC | American College of Cardiology |
| ACS | Acute Coronary Syndrome |
| ADP | Adenosine Diphosphate |
| AHA | American Heart Association |
| AMI | Acute Myocardial Infarction |
| AST | Aspartate Transaminase |
| ATP | Adenosine Triphosphate |
| BP | Blood Pressure |
| BPM | Beet Pair Minit |
| CAD | Coronary Artery Disease |
| CHF | Congestive Heart Failure |
| CK | creatinine kinase |
| CK-MB | creatinine kinase Muscles and Brain |
| COPD | Chronic Obstructive Pulmonary Disease |
| CTnI | Cardiac Troponin I |
| CTnT | Cardiac Troponin T |
| CVD | Cardiovascular Diseases |
| DM | Diabetic Mellitus |
| ECG | Electrocardiograph |
| EHR | Embryonic Heart Rate |
| ESC | European Society of Cardiology |
| ESRD | End-Stage Renal Disease |
| HD | Heart Diseases |
| HDL-C | High Density Lipoprotein Cholesterol |
| HF | Heart Failure |
| HTN | Hypertension |
| LD | Lactate Dehydrogenase |
| LDH | Lactate Dehydrogenase |
| LDL-C | Low Density Lipoprotein Cholesterol |
| LMP | Last Menstruation Period |
| MI | Myocardial Infarction |
| M β CD | Methyl Beta Cyclodextrin |
| NT-proBNP | N-terminal pro-brain natriuretic peptide |
| PDAY | Pathobiological Determinants of Atherosclerosis in Youth |
| RF | Renal Failure |
| SGOT | Serum Glutamic Oxaloacetic Transaminase |
| STEMI | ST-segment Elevation Myocardial Infarction |
| TC | Total Cholesterol |
| TG | Triglycerides |
| TIMI | Thrombolysis In Myocardial Infarction |
| TPR | Total Peripheral Resistance |
| VLDL | Very Low Density Lipoprotein |

