International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 5s, 2025
https://www.theaspd.com/ijes.php

Studies On Cardiac Biomarkers And Coagulation Parameters In Normal And Obese Patients To Assess Coronary Heart Disease

AUTHOR DETAILS:
Ranjitha R [1]*, Surender L [2], K.G.Abinaya sri [3], Ganesamoorthy R [4],Sathishkumar V[5], Dr.G.Bhavani[6], Dr.Senthil kumar.T[7] .

1. Assistant Professor, Department of Biochemistry, School of Allied Health Science,Vims Hospital Campus, Vinayaka Missions Research Foundation (DU), Salem, Tamil Nadu.
E-mail: ranjinithybio@gmail.com
2. Assistant Professor, Department of Physician Assistant, School of Allied Health Science, Vims Hospital Campus, Vinayaka Missions Research Foundation (DU), Salem, Tamil Nadu.
E-mail: surender71098@gmail.com
3. Assistant Professor, Department of Physician Assistant, School of Allied Health Science, Dhanalakshmi Srinivasan University, Samayapuram, Trichy. E-mail: abinayasrikg.ahs@dsuniversity.ac.in
4. Assistant Professor and Head, Department of Chemistry, Vinayaka Missions Kirupananda Variyar Arts and Science College, Vinayaka Missions Research Foundation (DU), Salem , Tamil Nadu. E-mail: chemgmoorthy@gmail.com
5. Assistant Professor, Department of Microbiology, School of Allied Health Science,Vims Hospital Campus, Vinayaka Missions Research Foundation (DU), Salem, Tamil Nadu.
E-mail: vmkvmcsathish@gmail.com
6. Associate professor ,Dept of pharmacology ,Meenakshi Ammal dental college and hospital ,Maduravoyal, Chennai-95.E; mail : drbhavani.pharmacology@madch.edu.in
7. Associate professor DR.MGR Educational and Research Institute, Allied Health Science, Velappanchavadi, Thirvallur-600077.E; mail : senthil.mlt@drmgrdu.ac.in

COMPARATIVE STUDY ON INTESTINAL FLORA OF THE TYPE II DIABETES MELLITUS PATIENTS

ABSTRACT

Background: *To assess the cardiac biomarkers and coagulation parameters in normal and obese patients. To evaluate the cardiac biomarkers and coagulation parameters in normal and obese patients to assess coronary artery disease. To compare the CK, CK-MB, PT&APTT in normal and obese patients by drawing blood samples from the patients.*

Methods: *A cross-sectional study was conducted from November 2024 to May 2025, blood samples of age group 20-45 years included in this study. Sample groups are both male and female, normal and Obese patients are included in this study.*

Results: Data were analyzed with the help of the software program statistical package for social sciences (SPSS). The statistical differences between obese and control were determined by student t-Test. The p-value<0.005 were considered as statistically highly significant.

Conclusions: *The blood samples were collected on comparison of cardiac biomarkers between obese and control, there is no significant to obese subjects. PT, APTT was also tested, in comparison of coagulation parameters in obese and control, we found there is a significant in PT (p 0.029) in obese as compared with the control (p 0.221). APTT showed no significant.*

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 5s, 2025
https://www.theaspd.com/ijes.php

Keywords: *PT, INR, BMI, Biochemical test, Vitamin K, Cardiac biomarkers, obese.*

INTRODUCTION

Cardiovascular diseases (CVDS) are the leading cause of death globally. Nearly 17.9 million people died from CVDS in2019. Representing 32%ofallglobaldeaths. Of these deaths, 85% were due to heart attack and stroke. Over three quarters of CVD deaths take place in low- and middle-Income countries. Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet, and obesity, physical inactivity and harmful use of alcohol. It is important to detect cardio vascular disease as early as possible so that management with counseling and medicines can begin.
Cardio vascular diseases (CVDS) are a group of disorders of the heart and blood vessels.
They include:

- Coronary artery disease
- Cerebro vascular disease
- Peripheral arterial disease
- Rheumatic heart disease
- Congenital heart disease
- Deep vein thrombosis and pulmonary embolism

CORONARYARTERY DISEASE

Coronary heart disease is the most common type of heart disease, killing 360,900 people in 2019. About 18.2 million adults age 20 and have CAD (about 67%) about 2in10 deaths from CAD in adults less than 65 years old.Coronary artery disease (CAD) is an important disease entity in terms of both mortality and morbidity worldwide. The incidence of CAD can be reduced by preventive measure. Contact profile test (CPT) are helpful in deciding many risk factors for cardiac diseases.
Coronaryarterydisease– A disease of the blood vessels supplying the heart muscle.

The risk factors for CAD are:

- Diabetes mellitus
- Hyperlipidemia
- Hypertension
- Stress
- Smoking
- Obesity
- Dietary lifestyle and physical in-activity
- Sex

CARDIAC PROFILE TEST

Cardiac profile test (cardiac markers) plays an important role in diagnosis and prognosis of CAD. WHO criteria for diagnosis are the patient presents with at least two out of the following three criteria:

1. Clinical symptoms
2. ECG changes
3. Rise and fall in biochemical markers

Monitoring changes in cardiac markers are considered as the hall mark for the diagnosis of CAD. Rapid and real time analysis has become an important part in the laboratory for estimation of cardiac markers.
CREATINEKINASE(CK)–Bio chemical marker Creatine kinase also known as creatine phosphokinase (CPK). CK catalyzes the conversion of creatine and uses adenosine triphosphate (ATP) to create phosphocreatine (PCR) adenosine diphosphate(ADP).
CK enzymes consist of two subunits (K-B (brain type) and (K-M (muscle type). Which are combined into three distinct isoenzymes.CK-MM, CK-MB, and CK-BB. The genes for these subunits are located on different chromosomes. B on 14q32 and M on 19q13.

CK-BB is present in highest concentrations in brine and smooth muscle.
CK-MB appears in serum 4-6 hours after the onset of pain in an MI, peaks at 18-24hours, and returns to normal by 72 hours.
CK-MM skeletal muscles primarily contain the MM isoform.
Creatine kinase MB (CK-MB) has the most specificity for cardiac muscle. It takes atleast 4-6 hours from onset of chest pain before CK-MB activities increases to significant levels in the blood. Peak level occur at 12-24 hours, and serum activities usually return to baseline level with 2-3 days.
Creatine biomarkers used to evaluate heart function. Most of the early markers were identified were enzymes, as a result, the term cardiac enzymes is sometimes used.

CLINICAL SIGNIFICANCE OF CK:
i. Muscular dystrophy
ii. Myocarditis
iii. Alcoholic myopathy
iv. Acute rhabdomyolysis due to strenuous exercise

CK is associated with body mass index in population-based studies. In a study, higher ck levels were linked with higher BMI and waist to hip ratio.
Scientists may have found an explanation for this they discovered that obese and overweight people have faster –twitch (type-II) muscle fibers and less slow-twitch (type-I) muscle fibers. Fast twitch muscle fibers have higher CK activity.
Other causes:
1. Exercise/training
2. Under lying health issues
3. Medical interventions
4. Drugs and toxins

EVALUATION OF ROUTINE COGALUTION
Obesity is a major risk factor for developing cardiovascular disorder due to increased platelets count and platelet activation.
Despite all the improved knowledge on the pathogenesis and treatment of atherothrombosis associated with obesity. It is predicted that coronary disease well be the dominant cause of mortality worldwide by 2020.
A gradual development of atherosclerotic plaque takes place after the deposition of lipids in the arteries over the years. AM is most often caused by a disruption of an atheromatous plaque in coronary artery is the primary cause of AMI. The basis of pathogenesis of various complications of coronary artery disease (CAD) including recurrent MI is due to disturbance in the function related to haemostasis.
Prolongation of both PT and APTT indicates a problem with a common pathway factor (fibrinogen, factor II, factor V, and factor X).
PT and APTT are basis coagulation tests which measure integrated action of majority of coagulation factors in extrinsic and intrinsic pathways of coagulation cascade of blood.
Atherosclerosis is the main fact of disturbed coagulation which ultimately leads tolife threatening events.
PT measures the activation of clotting by tissue factors (thromboplastin) in the presence calcium (VII, X, V, II).
PT has been standardized using the international normalized ratio (INR) so that values can be compared from one laboratory or instrument to another.
ThisratioisusedtodeterminesimilardegreesofanticoagulationwithvitaminK antagonists, such as warfarin.
In APTT, coagulation is triggered with calcium and time to clot formation is recorded.
APTT refers the activity of coagulation factors of intrinsic and common pathway (XII, IX, X, VII, II & I).
Cause of PT and APTT:
- Oral anticoagulants or heparin

- Vitamin K deficiency
- Liver disease
- Coagulation factors deficiencies

COMMON HEALTH CONSEQUENCES OF OVER WEIGHT AND OBESITY

Raised BMI is a major risk factor for non-communicable diseases such as
>Diabetes
>Musculo skeletal disorder
>Some cancers

METHODOLOGY

Blood samples were collected from obese patients are medical collage & hospital. 30 obese patients were chosen for the study. They belong to the age group of 20 – 45 years in both sex (male and female). Another group of the normal control (30) in various age group from 20- 45 years were also selected. Body height and weight were measured to determine BMI. The present study was a carried out in the department of biochemistry and clinical pathology, Private medical college & hospital.chennai.

SAMPLE COLLECTION AND PROCESSING:

Approximately five ml blood sample was taken from each subject using disposable needle and syringe. The blood obtained by various arm puncture and 3ml decanted into labelled sodium citrate tube for PT, APTT analysis and the remaining put into a plain tube for analysis of the creatine kinase, MB. then the blood was subjected to centrifugation at 2500rpm for 10 to 15 mins to separate the serum and plasma.

BIO CHEMICAL AND CLINICAL PATHOLOGY PARAMETRES:

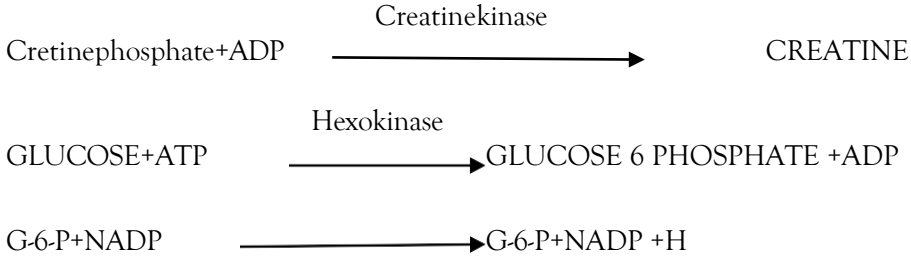
The table shows that the biochemical and coagulation estimation carried out in blood sample of human subject.

	HUMAN SUBJECT		PARAMETERS
1.	SERUM ;		CREATINE KINASE, CK-MB
2.	PLASMA	;	PT, APTT

TEST FOR CREATINE KINASE AND CREATINE KINASE, CK-MB:

Creatine kinase catalyses the reaction between creatine phosphate and ADP to from creatine and ATP. The ATP formed along with glucose is catalyzed by hexokinase to form glucose 6 phosphate.

The glucose 6 phosphate reduce NADD to NADPH the presense of glucose 6 phosphate dehydrogenase the rate of reduction of NADP to NADPH is measure as increase in absorbance which is proportional the ck activity in the sample.



REAGENTS:

-L1(ENZYME REAGENTS)
-L2(STARTER REAGENTS)

PROCEDURE:

Take a clean glass test tube

Add 800 ml of L1 enzyme reagents+200 microlitre L2 starter reagents (mixwell) Then add 50 microlitre sample (mix well)
Observe the result

- Test analyzed by semi autoanalyzer.

NORMAL RANGES:

- The values are expressed in U/L
- Total CK (Male)-lessthan195U/L

(Female)- less than 170U/L

- CK-MB–less than24 U/L
- CK-MB to total ck-less than 6-20%

TEST FOR PT AND APTT:

1. PROTHROMBINTIME(PT):

PRINCIPLE

The calcium in whole blood is bound by sodium citrate thus preventing coagulation tissue thromboplastin to which calcium has been added is mixed with the plasma and the clotting time is noted.

REAGENTS&REQUIREMENT

1. Thromboplastin
2. 3.2% Sodium citrate anticoagulant blood sample
3. Magnetic stirrer
4. Cuvette
5. Micropipette
6. Micropipettetip
7. Centrifuge

SPECIMEN AND COLLECTION & STORAGE:

Specimen collected by vein puncture usingvacutainer and mix the sample. centrifuge at2500 rpm for 15 mins

PROCEDURE

After centrifugation separate the plasma from the cells as soon as possible Add magnetic stirrer in cuvette before adding sample
Add 100 micro litre sample 180 sec incubation
ADD 200 ml uniplastin reagent
After getting beep sound measure the reading
Reference interval:>11-14 sec

ACTIVATEDPARTIALTHROMBOPLASTINTIME(APTT): PRINCIPLE

The plasma after centrifugation contain all intrinsic coagulation factor expect calcium and platelets .in the apt test partial thromboplastin and an activator are added to the plasma allowing the coagulation cascade to begin.
During incubation factor XI, pk and XII are activated, building up the levelofX1a in the reaction tube once cacl2 is added the rest of the coagulation cascade is allowed to continue and timing of the event is obtained the time required for the plasma to clot is the activated partial thromboplastin time.
REAGENTS:

1. liqucelin
2. calcium chloride

PROCEDURE

Add magnetic stirrer in cuvette before adding the sample Add 100 microlitre sample+100 microlitre liqucelien reagent
180sec incubation
Add 100 microlitre calcium chloride After getting beep sound measure the reading
Reference interval:>22-35sec
PT, APTT analyzed by heamostasis machineEthical consideration: This study obtained ethical clearance from the Institutional Review Board of ACS Medical College and Hospital, Dr. M.G.R. Educational and Research Institute, Chennai, Tamil Nadu, India, with the reference No. 935/2023/IEC/ACSMCH .

RESULTS

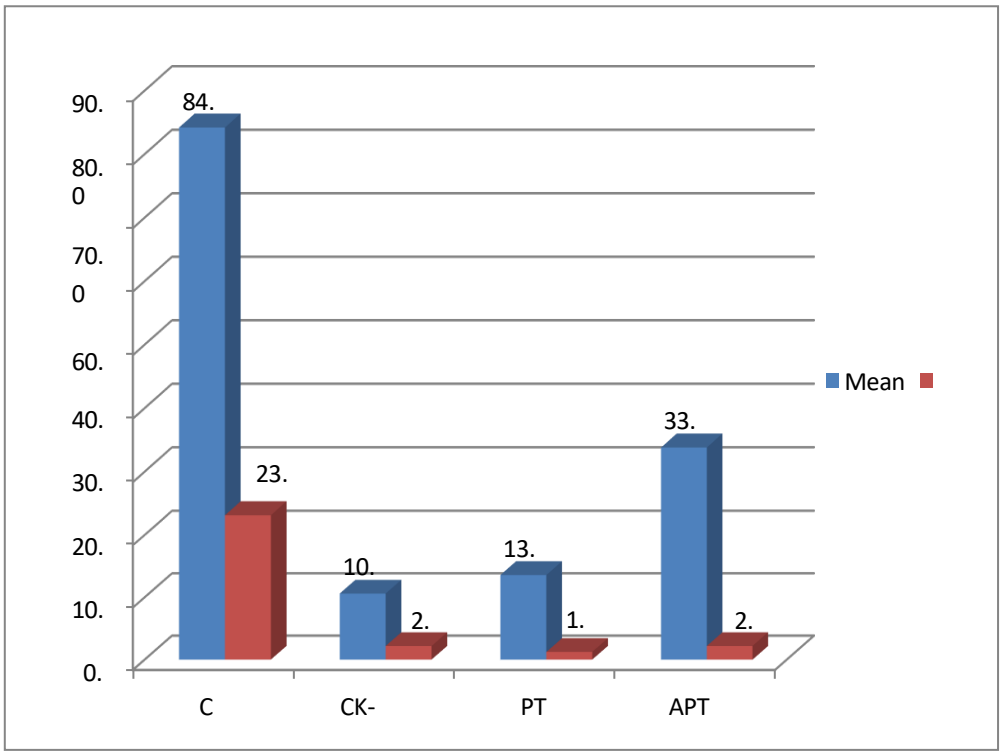
Data were analyzed with the help of the software program statistical package for social sciences (SPSS). The statistical differences between obese and control were determined by student t-Test. The p-value<0.005 were considered as statistically highly significant.

A total of 60 subjects were enrolled in this study, comprising of 30 obese and 30 controls. BMI was calculated taking into the account of height in cm and weight in kg as per the World Health Organization (WHO) criteria (BMI in kg/m2 was calculated by formula height (m2 and weight (Kg)) in obese and control group. The data of the present study was presented in the form of mean and standard deviation (SD) (Mean ± SD). The mean level of ck in obese was(103.3±32.75) and control was (84.2±23.14) p<0.28. The mean level of ck-mb in obese was (13.23±4.38) and control was (10.6±2.17) p<0.26. ck and ck-mb found to be statistically insignificant. we found there is an increased mean levels of PT (15.37±1.71seconds) in obese as compared with the respective controls(13.57±1.23seconds)and found to be statistical significant (p<0.02)shown in fig 1. The mean level of aptt in obese was (36.15±4.81) and control was (33.8±2.2) there is no significant (p<0.12).

VARIABLES	CONTROL	OBESE	P-VALUE
CK	84.2±23.14	103.3±32.75	0.28
CK-MB	10.6±2.17	13.23±4.38	0.26
PT	13.57±1.23	15.37±1.23	0.02**
APTT	33.8±2.2	36.15±4.81	0.12

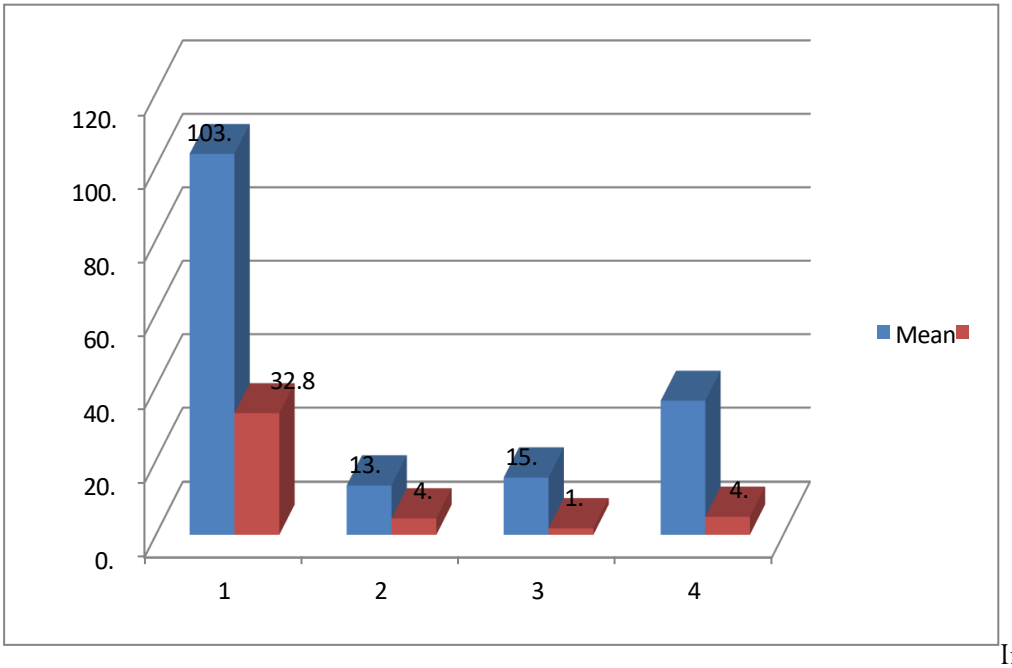
Table/fig1: Mean levels of cardiac biomarkers and coagulation parameters in obese and controls.
P<0.005: statistically significant; p>0.005: statistically non-significant;
FIG:2
CONTROL GRAPH

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 5s, 2025
https://www.theaspd.com/ijes.php



There is no significant found in control group.

FIG:2 OBESE GRAPH



In obese group- There is a significant in PT values(p<0.02).

DISCUSSION

A total of 60 subjects were enrolled in this study, comparing of 30 obese subjects and 30 control. Cardiac markers help physician to assess coronary artery disease and to identify and manage high risks. In the first

4-6 hours after a heart attack, the concentration of CK in blood begins to rise. It reaches maximum peak within12-24 hours and returns to normal after 2-3 days of onset.
The coagulation parameters (PT, INR, APTT) are used to monitor the effectiveness of the anticoagulants. PT is used to measure the integrity of extrinsic pathways and APTT is used to measure the integrity of intrinsic pathways. In the extrinsic pathway of coagulation, the coagulation parameters are one of the functional determinants. It is sensitive to the vitamin K dependent clotting factors.
Heparin is considered as a standard therapy in the management of coronary events. It helps to inhibit the formation of clot.

CONCLUSION

The blood samples were collected on comparison of cardiac biomarkers between obese and control, there is no significant to obese subjects. PT, APTT was also tested, in comparison of coagulation parameters in obese and control, we found there is a significant in PT (p 0.029) in obese as compared with the control (p 0.221). APTT showed no significant.

REFERENCE

1. Evaluation of Routine Coagulation Parameter in Suspected Acute Myocardial Infarction Patients Attending Emergency Department of Tertiary Care Hospital.
2. MritunjaykumarMishra(2021)
3. Serum levels of creatine kinase-mb in obese subjects attending university of Port Harcourt teaching hospital Ntuen N. A, Odum, E. P and Orih M.C (2015)
4. PopkimBM. The shift in stages ofthe nutritiontransition in the developing world differs from past experiences. Public Health Nutr 2002; 5: 205-214
5. WHO- obesity and overweight (online); Available from: URL:http://www.who.int/topics/obesity/en. Accessed Aug, 22nd 2010.
6. Malik S, Wong ND, Franklins SS. Impact of the metabolic syndrome on mortality from coronary heart disease, cardiovascular disease and all causes in United States adults. Circulation 2004; 110: 1245- 1250.
7. Shamsuzzaman AS, Winnicki M, Lanfranchi P. Elevated Creactive protein in patients with obstructive sleep apnea.Circulation 2002; 105 : 2462 – 2464.
8. Lundgren CH, Brown SL, Nordt TK. Elaboration of type -1 plasminogen activator inhibitor from adipocytes. A potential pathogenic link between obesity andcardiovascular disease. Circulation 1996; 93: 106-110.
9. Steppan CM, Bailey ST, Bhat S. The hormone resistin links obesity to diabetes. Nature 2001. 400; 307-312.
10. Rao SP, Miller S. RosenR.Cardiac troponin I and enzymes after electrophysiologic studies, ablasionand de fibrillator implications AM. J. cardiology1999;84(44) :470-475.
11. Wendi RS, BenjaminCE, Robert HC. Cardiac and muscle disease. In: Kaplan AL, Pesce AJ, Kazmierczac SC, eds. Clinical Chemistry: Theory, Analysis, Correlation 5th Ed. Mosby Inc.; 2010: 686-689.
12. Lynn RI. Cardiac function. In Micheal LB, Edward RF, Larry ES, eds. Clinicalchemistry, principles, procedures, correlation 5th Ed. 2005:504-508.
13. 10. Araoye MO. Research Methodology with Statistics for Health and Social Sciences. Nathadex Publishers;2004:115-120
14. 11. Fred SA, Allan SJ. Cardiac function. In Burtis AC, Ashwood RA, Bruns DE, eds. Tietz textbook of clinical chemistry and molecular diagnostics. 4th Ed. Elsevier inc.; 2006:1629-1653.
15. Karras DJ, Kane DL. Serum markers in the emergency department; diagnosis of acute myocardial infarction. Emerg. Med. Clin N Am 2001; 19(2) :321-337.
16. Lynn RI. Cardiac function. In Micheal LB, Edward RF, Larry ES, eds. Clinicalchemistry, principles, procedures, correlation 5th Ed. 2005:504-508.
17. Ooi D. S, IsataloP A,Veinto JP.Correlation of antemortem Serum Creatinine Kinase- MB, troponin Twith cardiac pathology. Clin. Chem. 2000; 46: 338-344.
18. CortiR, FarkouhME, BadimonJJ. The vulnerableplaque andacutecoronarysyndromes. Am J Med. 2002;113(8):668-80.
19. Fuster V, Badimon L, Badimon JJ, Chesebro JH. The pathogenesis of coronary artery disease and the acute coronary syndromes. N England J Med. 1992;326(5):242-50.
20. Hirsh J, Warkentin TE, Shaughnessy SG, Anand SS, Halperin JL, Raschke R, et al. Heparinand low-molecular weight heparin:Mechanisms ofaction, pharmacokinetics, dosing considerations, monitoring, efficacy, and safety. Chest. 2001;119(1 Suppl):64s-94s.
21. Brill-Edwards P, Ginsberg JS, Johnston M, Hirsh J. Establishing a therapeutic range for heparin therapy. Ann Intern Med. 1993;119(2):104-09.
22. Reganon E, Vila V, Martinez-Sales V, Vaya A, Aznar J. Inflammation, fibrinogen and thrombin generation in patients with previous myocardial infarction. Hematological. 2002;87(7):740-45.

23. Kostis JB, Baughman DJ, Kuo PT. Association of recurrent myocardial infarction with hemostatic factors: A prospective study. Chest. 1982;81(5):571-75.
24. SchraderJ."Strokeandhypertension,"DerInternist. 2009;50(4):423-32.
25. Blumenthal JA, Babyak MA, Hinderliter A, Watkins LL, Craighead L, Lin P-H, et al. Effects of the DASH diet alone and in combination with exercise and weight loss on blood pressure and cardiovascular biomarkers in men and women with high blood pressure: The ENCORE study. Archives of Internal Medicine. 2010;170(2)126-35.
26. AlhamamiOM,AL-MayahJY,AL-MousawiNR,AL-MousawiHI.Pleiotropiceffectsof antihypertensive drugs. The Islamic University Journal. 2007;15(1):01-12.
27. Martin F, Ingrid F, Judith M, Kety LH, Vlcek M, Losert H, et al. Platelet function predicts myocardial damage in patients with acute myocardial infarction. Circulation. 2004;110(11):1392-97.
28. Li YH, Teng JK, Tsai WC, Tsai LM, Lin LJ, Guo HR, et al. Prognostic significance of elevatedhemostatic markersinpatientswithacutemyocardialinfarction.JAmericanCollege of Cardiology. 1999;33(6):1543-48.
29. GalvaniM, FerriniD, OttaniF, Eisenberg PR.Earlyrisk stratificationofunstable angina/ non-Q myocardialinfarction: Biochemicalmarkersofcoronary thrombosis. Int JCardiology. 1999;68(1):S55-S61.
30. Saigo M, Waters DD, Abe S, Biro S, Minagoe S, Maruyama I, et al. Soluble fibrin, C- reactive protein, fibrinogen, factor VII, antithrombin, proteins C and S, tissue factor, D- dimer, and prothrombin fragment 1 + 2in menwithacute myocardial infarction≤45 years of age. Am J Cardiol. 2004;94(11):1410-13.
31. Ardissino D, Merlini PA, Bauer KA, Galvani M, Ottani F, Franchi F, et al. Coagulation activation and long-term outcome in acute coronary syndromes. Blood. 2003;102(8):2731- 35.
32. Kitchen S, Preston FE. Standarisation of prothrombin time in laboratory control and oral anticoagulant therapy. Semin Thrombo Hemost. 1999;25(1):17-25.
33. Mitrovaska S, Jovanova S. Low molecular weight heparin enoxaparin in the treatment of acute coronarysyndrome without ST segment elevation. Bratisi lek listy. 2009;100(1):45-48.
34. Khan HA, Alhomida AS, Rammah TYA, Sobki SH, Ola MS, Khan AA. Alterations in prothrombin time and activated partialthromboplastin time in patients with acute myocardial infarction. Int J Clinical Experiments. 2013;6(4):294-97.
35. Granger CB, Hirsch J, Califf RM, Col J, White HD, Betriu A, et al. Activated partial thromboplastin time and outcome after thrombolytic therapy for acute myocardial infarction: Results from the GUSTO-I trial. Circulation. 1996; 93(5):870-78.