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Study of Glomerular Filtration Rate and HS- CRP in Acute Coronary Syndrome

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I. Introduction

Acute coronary syndrome is the most important cardiac event in the golden years of life and therefore needs to be understood and managed well. The severity and its outcome has direct impact on the survival of mankind and therefore of great value .Rather than the traditional nomenclature of unstable angina , non-Q and Q wave myocardial infarction(acute coronary syndrome) are now classified based on ECG as either ST elevation or non ST elevation .This helps in stratifying patient who requires acute reperfusion therapy. The evolution of specific cardiac markers indicates whether myocardial infarction has taken place or not .This nomenclature underlines the mechanism of dynamic cardiac events which helps in better understanding and management.

High sensitivity C-Reactive Protein (hs-CRP) and Glomerular Filtration Rate (GFR) are two important investigations which has found its value in correctly predicting the outcome of such events in recent western literatures. However this has yet to find its true value in Indian subset of population and especially in eastern India.

It is characterized by imbalance between myocardial oxygen demand and supply that is usually but not always caused by atherosclerotic coronary artery disease. It is associated with increased risk of cardiac death and myocardial infarction. Angiographic and angioscopic studies suggest that acute coronary syndrome is often the result of distruption of atherosclerotic plaque and subsequent cascade of pathological process that decrease coronary blood flow .

Plague fissuring and rupture may be primary event in evaluation and progression and molecular mechanism are involved. Plague morphology is generally thought to be more important than degree of stenosis in identifying the likelihood of plaque rupture and thrombus formation leading to acute event. The degree of thrombus formation in coronary artery is responsible for severity of syndrome. If plaque rupture and thrombosis is extensive , complete occlusion of coronary artery can occur which manifests clinically as persistent chest pain and ST segment elevation, usually evolve in Q wave myocardial infarction . In some patients the amount of local thrombosis is extensive , but is not complete occlusion resulting in flow limiting coronary stenosis and myocardial ischaemia evolving as unstable angina , sometimes partial occlusion associated with myocardial necrosis represent as non Q wave myocardial infarction.

Both GFR and hs- CRP are associated with cardiovascular outcome. Impaired renal function in chronic kidney disease has consistently been demonstrated to be an independent risk factor for adverse cardiovascular outcome . Renal function is quantified by estimated GFR on the basis of serum creatinine value during hospitalalization. . Estimated GFR is calculated from serum creatinine using this equation (from Modification of diet in Renal Disease Study).

GFR=

186.3 x (serum creatinine).1.154 x (age)0.203 x C

High sensitivity C- reactive protein is the marker of vascular inflammation , which can predict cardiovascular events (myocardial infarction , sudden cardiac death) in healthy person as well as in patients with acute coronary syndrome . hs – CRP could reflect atherosclerotic burden ,vascular inflammation that potentiate atherosclerosis and its complications.

HS-CRP is generally increased in obese patient due to increase TNF –alfa and IL-6 in adipose tissue .It is also elevated in hypertensive and diabetic patients . If hs – CRP is 1.0 mg/L person has low risk of cardiovascular disease. Hs-CRP level is 1.0- 2.0 mg/l has moderate risk and patient with hs – CRP level is >3.0 mg/l at high risk of developing cardiovascular disease.

The high sensitive method usually use ELISA (enzyme linked immunosorbant assay) Nephalometric or Immunoturbidimetric methods. Here we are using immunoturbidimetric methods.

The west Scotland coronary prevention study indicated that acute coronary syndrome with or without hs-CRP more than 3.0 mg/l predicted definite difference in prognosis for future cardiac outcomes.

In contrast to several other biomarkers that also reflect biological aspect of inflammation , fibrinolysis, hs-CRP measurement is inexpensive, standardized and mildly available. Given the consistency of prognostic data for hs-CRP and particularly of its use in outpatient clinical setting , we believe the time has come for a careful consideration of adding hs-CRP as a clinical criterion for acute coronary syndrome.

AIM AND OBJECTIVE

1: To study hs-CRP level in case of acute coronary syndrome.
2.To estimate GFR in cases of acute coronary syndrome.
3. To determine if the risk associated with impaired GFR were independent of additive to serum levels of hs-CRP in patients after acute coronary syndrome .

II. Review Of Literature

Ischemic heart disease has long been known to be the clinical manifestation of atherosclerosis, however the recent understanding of conversion of stable atherosclerotic lesion to a ruptured plaque with thrombus provided the etiology of acute coronary syndrome.

Acute coronary syndrome represent a spectrum of disease , from Q wave myocardial infarction to unstable angina , in which the common pathogenic feature is rupture of an atherosclerotic plaque , followed by platelet aggregation and thrombus formation . Q wave myocardial is most strongly associated with complete arterial occlusion , whereas non Q wave myocardial infarction and unstable angina involve lesser degree of occlusion .

HISTORICAL REVIEW OF CORONARY ARTERY DISEASE

According to" shushruta "disease of heart was due to circulatory disorder , resulted from mismatch of three humour in body sat vatta , pitta and katta. These were incidence of sudden death in ancient era but it was not attributed to cardiac origin .

Lincisi (1658) referred to Hippocratic aphorism that cardiac pain frequently attacking old people , for tell sudden death and mentioned a patient who had died unexpectedly.

.In 1887 , Hammer , described a case with sudden onset of chest pain and steadily progress to death .He concluded , death could be thrombotic occlusion of major coronary arteries.

.Coronary artery disease is our modern epidemics i.e. a disease that affect the population not avoidable attribute to age (WHO 1982)

EPIDIMIOLOGY

Epidemics of CAD begins at different times in different countries. In United States ,epidemics began in early 1920s , in Britain in 1930s, in several European countries still later. And now the developing countries including India are catching up.

When CAD emerged as the modern epidemic , it was the disease of higher social classes in the most affluent societies .Fifty years later the situation is changing , there is strong inverse relation between social classes in the most affluent societies . Fifty years later situation is changing , there is strong evidence inverse relation between social class and CAD in developed countries .

In 1958 , WHO reported that 1 lac deaths per year due to acute coronary disease ..

In 1958 cardiovascular disease accounted 30.2% of all causes of mortality in India compared to 25.5% in 1990 (Reddy KS Yusuf 1998).

The 2016 Heart Disease and Stroke Statistics update of the American Heart Association (AHA) has recently reported that 15.5 million persons ≥20 years of age in the USA have CHD .whilst the reported prevalence increases with age for both women and men and it has been estimated that approximately every 42 seconds an American will suffer for an Myocardial infarction.

CORONARY RISK FACTOR

The etiology of coronary artery disease is multifactorial . Presence of any one of risk factors places an individual in a high risk category for developing coronary heart disease.

Not Modifiable	Modifiable
Age Sex Family Genetic Factor Personality	Cigratte, smoking High blood pressure Elation serum cholesterol Diabetes Obesity Sedentary habits Stress

The shift of biological consequences in life style – smoking ,physical activity , alcohol, rich fatty diet, psychological activity has major influence on coronary artery disease . These factors are:

Smoking: In Framingham study and the British Regional Heart Study ,the rate of ischemic heart disease is about three times that of non-smokers.

Hypertension: Hypertension is one of the most important established factors for ischemic heart disease .In Framingham study (USA) had showed that the individual with blood pressure more than 160/90 mm of Hg were two fold increase risk of coronary artery disease .

Lipid and Lipoprotein: The risk of coronary artery disease has related to LDL – cholesterol, lipoprotein (a), HDL –cholesterol and Triglyceride level. The Lipoprotein (a) level has atherogenic and thrombogenic properties.

Diabetes Mellitus and insulin resistance syndrome: The non insulin diabetes mellitus a strong factor for heart disease varies in different geographic regions.(Gupta R 1994). Symptomatic appear to be major independent major risk factor of coronary artery disease.(Gerald 1992) Insulin resistance state has been recognized as important risk factor in coronary artery disease (Mcheinge PM and Shah B 1991).

DEFINITION OF UNSTABLE ANGINA - This is largely based on the clinical presentation . Unstable angina is defined as angina pectoris (or equivalent type of ischaemic discomfort) with at least one of these features.

1. It occur at rest or with minimal exertion ., usually lasting more than 20 minutes. (if not interrupted by nitroglycerin).
2. It is severe and described as frank pain and new onset (with in one month).
3. It occurs with crescendo pattern (more severe , prolonged, or frequent than previously).

Some patients with this pattern of ischemic discomfort , especially those with prolonged , rest pain , develop evidence of myocardial necrosis on the basis of release of cardiac markers and thus have diagnosis of NSTEMI.

CLASSIFICATION

The term Unstable angina was first used in 1970 to define the condition referred to earlier publications as post infarction angina , crescendo angina , acute coronary insufficiency or intermediate coronary syndrome.

Braunwald first defined unstable angina in terms of its severity.

Class 1- Included new onset of severe accelerated angina.

Class 2 – Angina at rest with in past months but not with in preceding 48 hrs.

Class 3- Angina at rest with in 48 hrs.

PATHOPHYSIOLOGY OF UNSTABLE ANGINA

Unstable angina and NSTEMI are considered to be closely related condition s whose pathogenesis and clinical presentations are similar but of different severity. These conditions are characterized by an imbalance between myocardial oxygen supply and demand .There are five pathophysiological processs that may contribute to development of Unstable angina.

1. Plaque rupture with superimposed non occlusive thrombus: The most important cause of Unstable angina and NSTEMI is reduced coronary perfusion results from coronary artery narrowing caused by non occlusive thrombus that developed from disrupted atherosclerotic plaque and is usually non occlusive. Microembolization of platelet aggregates and components of atherosclerotic plaque are belived to be responsible for release of myocardial markers in many of patients.
2. Less common cause is Dynamic obstruction , which may be caused hyper intense focal spasm of segment of epicardial coronary artery (Prinzmental Angina) .This local spasm is caused by hypercontractility of vascular smooth muscle or by endothelial dysfunction.

3. A third cause of Unstable angina is severe narrowing without spasm or thrombus. This occurs in patients with progressive atherosclerosis or with re-stenosis after a PCI.
4. The fourth cause is arterial inflammation , perhaps caused by or related to infection , which may be responsible for arterial narrowing , plague destabilization , rupture . T -lymphocytes located at the shoulder of plaque increase the expression enzymes that may cause thinning and disruption of plaque , which in turn may lead to Unstable Angina/ NSTEMI.
5. The fifth cause is Secondary Untable Angina in which precipitating condition is extrinsic to coronary artery bed These patients have underlying coronary atherosclerotic narrowing that limits the myocardial perfusion , and they often have chronic stable angina. Secondary Unstable Angina is precipitated by the conditions that (1). Increases myocardial oxygen requirements such as fever , tachycardia andthyrotoxicosis. (2) Reduced coronary blood flow, as in hypotension . (3) Reduced myocardial oxygen delivery such as anemia or hypoxemia.

COMPLICATIONS OR EVENTS OF ACUTE CORONARY SYNDROME

If the patient of acute coronary syndrome remains untreated or inadequately treated, the following clinical events may occur:
Recurrent angina
Myocardial infarction
Death

DIAGNOSIS OF UNSTABLE ANGINA/NSTEMI

The diagnosis of unstable angina based on history of chest pain and in the absence of cardiac enzyme and ECG change to exclude acute myocardial infarction.
Clinical criteria
Most accepted, Braunwald classification has been used for diagnosis
1. On basis of severity
Class I - Included new onset of severe or accelerated angina
Class II-Angina at rest within past month but not within preceding 48 hours
Class III - Angina at rest within 48 hours
2. On basis of clinical circumstances:
Class A- Primary stable angina
Class B- Secondary unstable angina
Class C-Post infarction angina (within 2 weeks after presentation)
3. Intensity of treatment:
a. Absence of therapy
b. Standard therapy
c. Maximum therapy including nitroglycerine intravenously
4. Electrocardiographic changes:
a. ST-T abnormalities present
b. ST-T abnormalities absent

The diagnosis of unstable angina is clinical one, based on the patient's description of symptoms. The diagnosis of NSTEMI is made on the basis of a clinical history consistent with unstable angina/NSTEMI and positive circulating cardiac markers. The clinical profile of patient presenting with unstable angina differs from that of acute ST elevation MI. Unstable angina occurs more frequently in women, who comprise 30-45% of patients in studies of unstable angina compared with 25-30% of patients with NSTEMI and 20% of patient with STEMI. Chronic stable angina is usually described as a discomfort or pressure but rarely as a pain; it is usually located in the substernal region but sometimes is near the epigastrium, and it frequently radiates to the anterior neck, left shoulder and left arm. In unstable angina the discomfort, occurring either on exertion or at rest, is usually severe enough to be considered painful. Signs that suggest unstable angina with ischemia involving a large fraction of left ventricle are transient diaphoresis, pale cool skin, sinus tachycardia, a third or fourth heart sound, and basilar rales on lung examination.

Twelve lead Electrocardiographic changes

ECG changes are important diagnostic tool for unstable angina. In unstable angina, ST segment depression (or transient ST segment elevation) and T-wave changes occur in upto 50% of the patients. Three analyses have shown that in patient with the clinical presentation of unstable angina, new ST segment deviation, even of only 0.05 mv, is a specific and important measure of ischemia and prognosis. T-wave changes are sensitive but non-specific of acute ischemia, unless they are marked.

Thus transient, deep T-wave inversion (more than 0.3 mv) are considered to be relatively specific for acute ischemia, like ST segment deviations, and to signify high risk.
Continuous ECG monitoring can be used for two purposes in unstable angina:
(1)To detect arrhythmias in association with the acute episode.
(2)To monitor the ST segment s for evidence of recurrent ischemia. Although life-threatening arrhythmias are rare in unstable angina, they may be common among NSTEMI patients.

Cardiac enzyme
Cardiac enzyme, such as creatinine phosphokinase and its isoenzyme, creatinine-phosphokinase-MB and myofibrillar proteins Troponin-T and Troponin-I, have been identified as biochemical marker of cardiac injury. Cardiac enzyme CH-MB is usually detected 6 to 12 hours after the onset of prolonged ischaemic episode with cell necrosis. In approximately one-third patients of unstable ischaemia the CPK-MB level is elevated in absence of persistent ST elevation, is diagnostic of non-Q wave myocardial infarction.
Troponin-I and Troponin-T are more sensitive markers of myocardial cell necrosis and thus are able to help identify patient who are at high risk of future cardiac events especially when combined with exercise testing (Katus HA 1991).

C-reactive protein
C-reactive protein is an acute phase reactant systemic inflammatory marker. A CRP level above 3 mg per litre in a patient presenting with unstable angina predict a higher rate of death, acute myocardial infarction and need for revascularisation compared with patients without elevated level.
Two dimensional Echocardiography
A transient regional wall motion abnormalities during ischaemia by two-dimensional echocardiography us useful method to establish the presence of myocardial ischemia.

Coronary arteriographic findings
15 to 30 percent of patients who present with symptoms of unstable angina will have no significant coronary stenosis on coronary angiography. Approximately 1/3rd of patients with unstable angina without a critical epicedial obstruction will have impaired coronary flow, suggesting a pathophysiological role for coronary micro vascular dysfunction. The culprit lesion in unstable angina typically exhibits an eccentric stenosis with scalloped or overhanging edges and a narrow neck. These angiographic findings may represent disrupted atherosclerotic plaque, thrombus, or
Combination. Features suggesting thrombus include globular intraluminal masses with a rounded or polypoid shape.
Other laboratory tests chest roentgenogram may be useful in identifying pulmonary congestion or oedema, which would be more likely inpatient with NSTEMI involving a significant proportion of left ventricle or in those with prior known left ventricular dysfunction. The presence of congestion has been shown to confer and adverse prognosis.
Obtaining a same cholesterol level is useful in identifying an important, treatable cause of coronary atherosclerosis. Because serum cholesterol levels begin to fall 24 hours after acute MI or unstable angina, it should be measured at the time of hospital admission. Evaluation for other secondary causes of unstable angina may also be appropriate in selected patient (e.g. checking thyroid function in patient with unstable angina and a persistent tachycardia.

Features associated with coronary artery disease among patients with symptoms suggestive of unstable angina

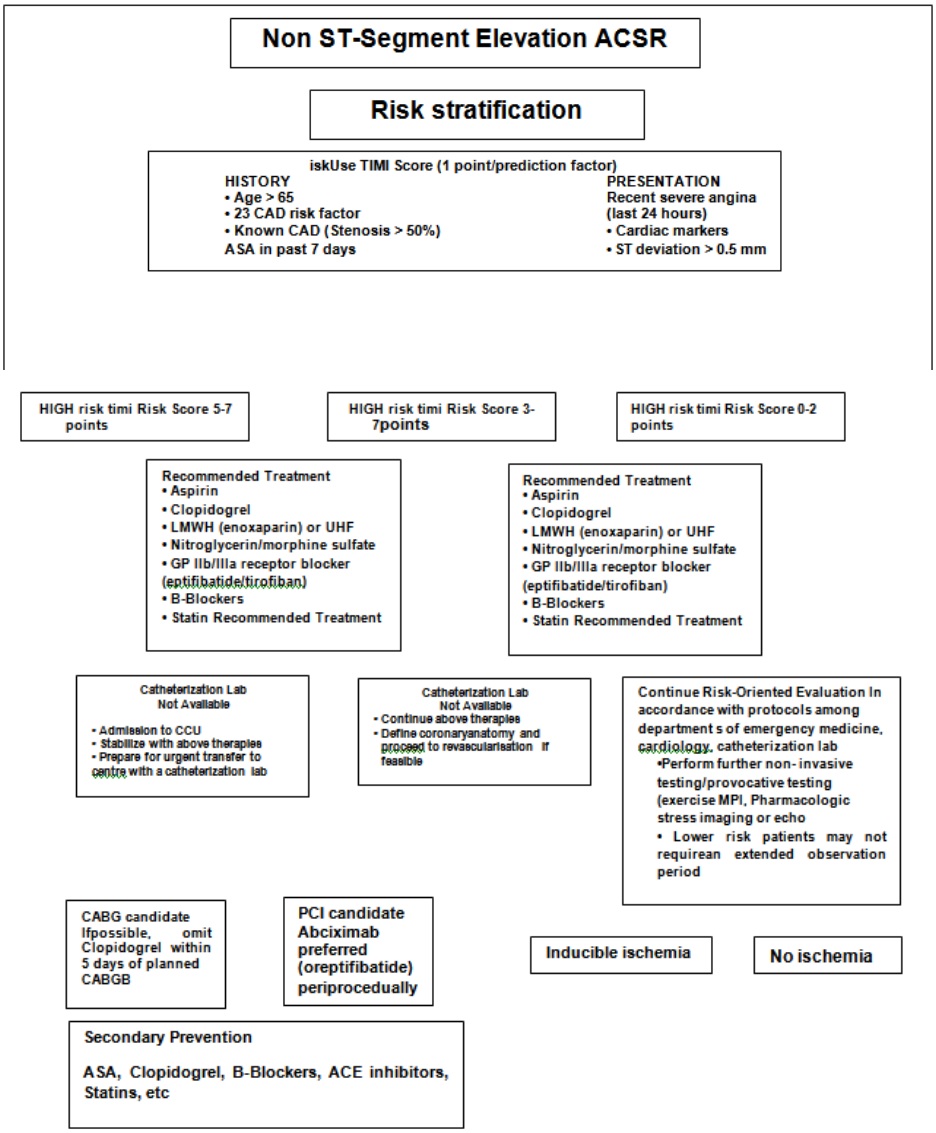
History
- pain as chief complaint similar to prior ACS symptoms Known Chest history of coronary
- Artery disease, myocardial infarction, percutaneous coronary intervention, coronary artery
- Bypass graft
- History of angina
- Age > 60
- Male gender
- More than two major cardiac risk factors
- Diabetes
- Extracardiac vascular disease (carotid or peripheral)

Physical examination
- Pulmonary rales, hypotension
- Transient mitral regurgitation
- Diaphoresis

Electrocardiogram
- New/presumably new ST deviation > 0.05 mv
- T-wave inversion > 0.1
- Q-waves, left bundle branch block

Cardiac markers
- Elevated CK-MB. Troponin I or T

Risk stratification of Acute Coronary Syndrome



TREATMENT

The background of coronary artery atheroma symptoms of unstable angina develops following the rupture of plaque, platelet activation and fibrin deposition leading to formation of overlying on-occlusive thrombus. Treatment of unstable angina targeted to both platelet-activation and thrombus formation. Medical management of unstable angina is:

1. Anti anginal drugs: Organic 'nitrate, B-adrenergic blocking agent and calcium channel blocker are commonly

TREATMENT-

The treatment of Unstable Angina targeted to both platelet activation and thrombus formation. Medical management of Unstable Angina is following.

1. Anti anginal drug-organic nitrate(usually intravenous intake) are prescribed and titrated until heart rate is 50 to 60 beats per minutes and blood pressure is well controlled. In patients, contraindicated to B-blockers, or with recurrent symptoms calcium channel blocker are used.

2. Anti-platelet agents: Aspirin is standard anti-platelet drug. In the dose of 75 mg per day and above, it reduces the vascular event and rate of complicating the unstable angina by 14% to 9% in 6 months. The Ticlopidine and Clopidogrel are two new anti-platelet drugs which act by ADP mediated platelet aggregation.

3. Antithrombotic drugs: The combination of aspirin and indanones unfractionated heparin is used to treat patients with partial thromboplastin time above 60 to 70 seconds.

4. New antithrombotic approaches: Recently 3 different classes of drugs are introduced low molecular weight heparin, direct thrombin inhibitor and platelet glycoprotein IIb/IIIa receptor inhibitor, and have been tested.

5. Direct thrombin inhibitor: They are resistant to binding by endothelial cells and plasma protein so more effective against circulating and clot bound thrombin. Hirudin and Hirulog are two newer drugs.

6. Platelet glycoprotein Ilb/III inhibitor: Abciximab, synthetic GP IIb/III inhibitor such as tirofiban and eptifibatide has been used prior to revascularisation in unstable angina.

7. Additional measure: The factors precipitating the unstable angina should be evaluated and treated.

Glomerular filtration Rate

Renal function, in nephrology, is an indication of the state of the kidney and its role in renal physiology. Glomerular filtration rate (GFR) describes the flow rate of filtered fluid through the kidney Glomerular filtration rate (GFR) is the volume of fluid filtered from the renal (kidney) glomerular capillaries into the Bowman's capsule per unit time.

Glomerular filtration rate (GFR) can be calculated by measuring any chemical that has a steady level in the blood, and is freely filtered but neither reabsorbed nor secreted by the kidneys. The rate therefore measured is the quantity of the substance in the urine that originated from a calculable volume of blood. The GFR is typically recorded in units of volume per time, e.g. millilitres per minute ml/min. Compare to filtration fraction.

$$GFR = \frac{\text{Urine Concentration x Urine Flow}}{\text{Plasma Concentration}}$$

Normal GFR is approximately 130 ± 20 mL/min/1.73 m² inmen, 115 ± 15 mL/min/1.73 m² in women.

In clinical practice, GFR is most commonly calculated based or estimated (so called estimated glomerular filtration rate, e GFR) using the Cockroft-Gault formula or the Modification of Diet in Renal Disease (MDRD) study formula.

Recent data suggest the MDRD formula is the most reliable and objective approach to estimate GFR. The use of the MDRD formula is recommended in the K/DOQI guidelines in all patients except those on a vegetarian diet and subjects with severely reduced body mass. In these groups, renal function evaluation should be based on the determination of creatinine clearance. Four modifications of the MDRD formula have been described, and the simplest of them is as follows:

eGFR(mL/min/1.73 m²] =

186.3 x (serum creatinine).1.154 x (age)0.203 x C

where C is a constant equal to 1 in men, 0.762 in women, and 1.21 in Afro-Americans.

Impact of Renal Dysfunction in Clinical outcome of acute coronary syndrome

The presence of any stage of chronic kidney disease is major risk factor for ischemic cardiovascular disease including occlusive coronary, cerebrovascular, and peripheral vascular disease. The increase prevalence of vascular disease in chronic kidney disease patient derives from both traditional and non-traditional (CKD related) risk factors. Traditional risk factors include Hypertension, Hypervolemia, Dyslipidemia, Sympathetic over activity and hyperhomocystinemia. The chronic kidney disease related risk factor comprise anaemia

hyperphosphatemia, hyper parathyroidism ,sleep apnoea and generalized inflammation. The inflammatory state associated with reduction in kidney function is reflected in circulating acute phase reactant, such as inflammatory cytokine and c-reactive protein with corresponding fall in "negative acute phase reactant", such as serum albumin and serum fetuin. The inflammatory state appears to accelerate vascular occlusive disease and low level of fetuin may permit more rapid vascular calcification especially in the phase of hyperphosphatemia. Other abnormality seen in chronic kidney disease may augment myocardial ischaemia, including left ventricular hypertrophy and microvascular disease. The most common cause of death in patients with chronic kidney disease was ischaemic heart disease. Although it did not completely exclude absolute impacts and many questions about the relationship between chronic kidney disease and mortality and morbidity after development of acute coronary syndrome, previous reports suggested that more severe renal dysfunction was significant independent predictors of cardiovascular event. Furthermore, recent studies suggested that mild renal impairment was an independent predictor of long-term mortality in patients with known or suspected coronary artery disease. The risk factors for high prevalence of ischaemic heart disease in chronic kidney disease patients suggested the importance of traditional risk factors(hypertension, diabetes mellitus, smoking, and hyperlipidaemia) as well as novel risk factors [C-reactive protein, fibrinogen, interleukin-6,factorVIIIC, lipoprotein(a) and haemoglobin].Consequently, Schiffrin et al. reported that aggressive risk factor modification in chronic kidney disease prevented the development of new cardiovascular event. Sarnak et al. More severe renal dysfunction was significantly associated with dyspnoea and high Killip class in clinical manifestations on admission and increased NT-pro BNP levels. Because increased NT-proBNP in patients with severe Renal Dysfunction was correlated with severity of heart failure, left ventricle dysfunction, volume overload and ischaemic heart disease, it was assumed that clinically severe manifestations like cardiogenic shock and pulmonary congestion with dyspnea were developed in patients with severe renal dysfunction Conversely ,LDL-C level was significantly lower in patients with more severe renal dysfunction. The age-related decline in Glomerular filtration rate and the lower prevalence of hyperlipidaemia might indicate increased malnutrition and inflammation in patients with severe renal dysfunction.

Individuals with chronic kidney disease become progressively malnourished, as evidenced by low levels of albumin, prealbumin,and transferrin, which has been suggested to be a mechanism for activation of inflammation. Between 30 and 50% of chronic kidney disease patients have elevated serum levels of inflammatory markers such as C-reactive protein, interleukin-6, and tumor necrosis factor-alfa. Progressive deterioration of renal function in chronic kidney disease may lead to dyslipidaemia or accumulation of uremic toxins, which can stimulate oxidative stress and inflammation, and hence, contribute to endothelial dysfunction and progression of atherosclerosis. Consequently, there have been numerous studies conducted on the relationship between inflammatory markers and cardiovascular disease in chronic kidney disease patients. Shlipak et al and Menon et al reported that increased inflammatory marker was a risk factor of cardiovascular event. The relationship between renal disease and cardiovascular mortality has also been shown to extend to subjects with more moderate degrees of renal functional impairment. The Framingham Heart Study was among the first to assess mild renal insufficiency and its association with death and adverse cardiovascular events in the general population. More recently, in a large study that incorporated a diverse population of adults, Go et al clearly demonstrated an independent and graded (inverse) correlation between decreasing levels of renal function and increasing event rates of cardiovascular morbidity and death.

The relationship between cardiovascular event and anemia in chronic kidney disease patients was a set of complex and interrelated phenomena, and remains to be further elucidated. Several mechanisms may contribute to the association between anaemia and adverse clinical outcomes. Low haematocrit may predispose to chronic myocardial hypoxia, left ventricular dilatation and dysfunction, which leads to increased frequency of cardiovascular disease.

The ability of estimated Glomerular filtration rate (eGFR) to predict cardiovascular events during 5-10 years of follow-up is assessed using data from the Strong Heart Study , a large cohort with a high prevalence of diabetes. Chronic kidney disease even when glomerular filtration rate is only mildly or moderately decreased increases risk for all-cause and cardiovascular disease mortality. Although an adverse cardiovascular disease risk factor profile is associated with declining kidney function , chronic kidney disease is independently associated with higher rates of cardiovascular disease even after adjusting for cardiovascular risk factors , suggesting contributions from non-classical cardiovascular risk factors associated with decreased GFR. Accurate assessment of kidney function is, therefore ,important for assessing cardiovascular risk.

Impaired renal function is a risk factor for cardiovascular disease and an adverse prognostic factor in patients with established cardiovascular disease. Many clinical and population studies demonstrated that impaired renal function is an independent prognostic factor during short- and long-term follow-up of patients with acute coronary syndromes, including acute myocardial infarction.

Table:. Proportions of patients with acute coronary syndromes and various stages of chronic kidney disease as defined based on impaired glomerular filtration rate. Source: PL. ACS Registry

Glomerular filtration rate			
	30.59mL/min/1.73m2 STAGEIII	15.29mL/min/ 1.73m2 STAGE ii	15mL/min/ 1.73m2 STAGE i
UA	23%	1.5%	1%
UNSTEMI	28%	3.9%	1.8%
STEMI	20%	2.4%	0.9%

UA- unstable angina; NSTEMI- non-ST segment elevation myocardial infarction; STEMI-ST segment elevation myocardial infarction.

Impaired renal function has a significant effect on the management and prognosis in patients with AMI. Worse renal function is associated with a significantly higher risk of complications, including adverse cardiovascular events and mortality, both in hospital and during long-term follow-up.

HIGH- SENSITIVITY C-REACTIVE PROTEIN (hs CRP)

The acute phase reactant, CRP, a simple downstream marker of inflammation, has now emerged as a major cardiovascular risk factors (Ridker PM,2003).

C-reactive protein (CRP) was first discovered in 1930. It was the first recognized acute phase reactant, binding to a number of molecules including phosphate esters, lipids, polyanions (DNApolylysin), polycations (histone, protamin) and a variety of polysaccharides. Composed of five 23 KD subunits, CRP is a circulating member of the pentraxin family that plays a major role in the human innate immune response. Although it is primarily derived from the liver, recent data indicate that cells within human coronary arteries, particularly in the atherosclerotic intima, can elaborate C-reactive protein (Calabro P et al, 2003; Jabs WJ et al,2003). More than simply a marker of inflammation, CRP may influence directly vascular vulnerability through several mechanisms, including enhanced expression of local adhesion molecules, increased expression of local adhesion molecules, increased expression of endothelial PAI-1, reduced endothelial nitric oxide bioactivity, altered LDL uptake by macrophages, and colocalization with compliment within atherosclerotic lesions (Venugopal SK et al, 2002; Devaraj S et al, 2003).

When discussing the role of CRP in the assessment of disorders liked to inflammation, it is important to distinguish between standard and high-sensitivity assays for the measurement of CRP. Standard CRP methods routinely available in the clinical laboratory have limits of detection of 3 to 5 mg/L. However, these methods are unsuitable for detecting CRP as a risk factor for coronary heart disease since the serum CRP concentration could be much lower than the cut-off levels in the standard tests. Therefore, only high-sensitivity or ultrasensitive tests for C-reactive protein are useful for this purpose. As a result, hsCRP assays have been developed that can detect concentrations down to 0.3 mg/L (MyersG.L. et al, 2004). These high-sensitivity methods usually use enzyme linked immunosorbent assay (ELISA), nephelometric or turbidimetric methods. The results are generally interpreted on a relative scale. This is often expressed in terms of percentiles. These may be quintiles (five divisions), quartiles (four divisions), or tertiles(three divisions). It is the hsCRP assays that have allowed assessment of the role of CRP as a marker for vascular inflammation and cardiovascular risk.

Mortality from coronary heart disease (CHD), cardiovascular disease (CVD) and other causes is greater in person with diabetes and pre-existing CVD. More recently, substantial evidence has emerged to suggest that inflammation plays a paramount role in the dynamic process of initiation, progression and eventual rupture of the atherosclerotic lesion. Chronic inflammation result in endothelial dysfunction and facilitates the interaction between modified lipoproteins, monocytes derived macrophages, T-cells and normal cellular elements of the arterial wall, inciting early and late atherosclerotic processes (Verma S et al, 2003).This pathophysiological concept has been translated successfully in to For clinical practice by evaluating inflammatory marker for atherosclerosis, of which high-sensitivity C-reactive protein (hsCRP)has emerged as one of the most important. Indeed, recent editorials stated that, the pawn has been promoted to queen', in other words initially considered a surrogate biomarker, CRP is increasingly being viewed as a mediator atherosclerosis (Verma S et al, 2004).CVD can precede the development of diabetes, the notion that both Conditions share some common genetic and environmental antecedents has been out forward (the 'common soil' hypothesis)(Stern M.P., 1995) raising the exciting possibility that inflammation could be the bridging link between the metabolic syndrome and atherosclerosis.

Inflammatory markers as predictors of cardiovascular disease

Of potential novel risk factors presently available, high-sensitivity C-reactive protein (hs-CRP), a marker of low-grade vascular inflammation, is among the most promising. Prospective epidemiologic studies consistently demonstrate that hs-CRP adds independent prognostic information at all levels of LDL cholesterol and at all levels of the Framingham Risk Score. The Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) published in January of 2003 the first set of guidelines to endorse use of hs-CRP as an adjunct to traditional risk factor screening (Pearson TA et al, 2003). The CDC/AHA report also

endorsed hs-CRP as the only inflammatory biomarker currently available with adequate standardization and predictive value to justify use in outpatient clinical settings. On the basis of data from available investigations, levels of hsCRP<1, 1 to 3, and >3 mg/L have been defined as lower, moderate, and higher cardiovascular risk. Taking a conservative approach, the CDC/AHA report suggested that the best use of hs-CRP was in patients at intermediate Framingham risk. In the year since publication of the CDC/AHA report, abundant data have emerged not only confirming the ability of hs-CRP to add prognostic information to the Framingham Risk Score but also linking hs-CRP to metabolic syndrome and the development of incident type 2 diabetes. Moreover, accumulating data suggest that both very low and very high levels of hs-CRP seem to provide independent prognostic information across a full spectrum of Framingham risk (Ridker PM et al, 2004).

ROLE OF HIGH SENSITIVITY C-REACTIVE PROTEIN IN ACUTE CORONARY SYNDROME

The role of elevated high-sensitivity (hs) C-reactive protein(CRP) as a risk marker for cardiovascular disease, including coronary heart disease (CHD) stroke and peripheral arterial disease is well established through consistent results from a number of prospective studies. Subjects presenting with unstable angina or non-ST elevation myocardial infarction (MI) and increased levels of hs-CRP are candidates for a variety of adverse events like recurrent angina, ST elevation MI or coronary death. Even in the presence of the results of troponin measurements, hs-CRP adds relevant prognostic information. Moreover, persistent elevation of hs-CRP levels after optimal treatment of unstable angina according to current strategies, measured at the time of hospital discharge, is predictive of recurrent events. Thus, from the clinical point of view, hs-CRP testing represents a valuable additional diagnostic tool. In patients with CHD, high hs-CRP levels suggest a risk of recurrent ischemic events, whereas low hs-CRP levels are associated with a good outcome (less myocardial infarction, sudden cardiac death, and need for further revascularization. An increase in hs-CRP in unstable angina, however, is not necessarily related to myocardial necrosis. Therefore, elevated hs-CRP levels in patients with acute coronary syndromes likely reflect inflammation in the coronary artery rather than in the ischemic. In patients with unstable angina or no-Q wave myocardial infarction, increased hs-CRP at presentation correlates with an increased 14-day mortality even in patients without elevation of troponin-T (TnT). Furthermore, persistently elevated hs-CRP level for more than 3 months after the warning symptoms is associated with recurrent cardiac events. In patients with unstable angina and non-Q wave myocardial infarction, high hs-CRP levels are associated with more cardiovascular events within 6 months. Kim et al observed that patients with an hs-CRP level more than 3.5 mg/L and NT-pro BNP level more than 500 pg/mL had an 11-fold higher risk fo9r cardiac events than those with hs-CRP level less than or equal to 3.5 mg/Land NT-pro BNP level less than or equal to 500 pg/mL.

Risk of acute coronary events associated with various levels of high-sensitivity C-reactive protein

hsCRP(mg/dl)	Risk
<0.7	Low
0.7-1.1	Mild
1.2-1.9	Moderate
2-3.8	High
3.9-5	Very high

Recent research on CRP has further established its role as a powerful marker for various CV end points in different settings; new potential indications are emerging, and experimental studies have provided new insights in a possibly important direct role of CRP in atherogenesis.

III. Material & Methods

A prospective observational study was done in outdoor and indoor patients of Department of Medicine, Rajendra Institute of Medical Sciences, Ranchi.

Period of study - 2008 to September 2009.

Case selection - Cases were taken from indoor patients admitted in medical wards, ICCU, ICU of Rajendra Institute of Medical Sciences.

Inclusion criteria

1. Cases of cardiovascular events diagnosed clinically and supported
by ECG and other cardiac enzymatic parameters of study.
2. Age > 30 years
3.Both sexes are included

Exclusion criteria - Patients were excluded from this trial of baseline serum creatinine is > 200 mg/dl or total cholesterol > 25mg/dl.

Control - Were selected from normal population, doctors, nurses, Medical students, healthy volunteers who were not suffering from cardiovascular and renal disease of corresponding age and sex.

PROFORMA

Name Age Sex

Unit

Address Occupation

Date of admission

Reg. No.69

Material &Methods

Presenting complain

- Chest pain, chest heaviness with profuse sweating with cold and calmy skin
- Chest pain on exertion
- Chest pain radiating towards left arm, shoulders

History of presenting complain

- Asymptomatic before how many days
- Aggravating factors
- Relieving factors
- Taken treatment

Past History

- History of similar episode earlier
- history of hypertension, Diabetes mellitus, Obesity etc

Personal history

- Addiction Habituation

Family history

- Diabetes mellitus ,Hypertension ,Heart disease, Dyslipidaemia

General examination

Built Oedema

Nourishment Icterus

Pallor Lymphadenopathy

Cyanosis Hair

Clubbing Nail

Weight

Vital signs

- Pulse Blood pressure
- JVP Respiratory rate
- Temperature

Systemic examination

Central nervous system:

- Higher mental function
- Sensory examination
- Motor examination
- Cranial nerve examination

Cardiovascular examination

- Precordium
- Apex beat
- Para sternal heave
- Heart sounds
- New onset murmur
- Sign of heart failure

Gastrointestinal system

- Organomegaly
- Bowel sound

Respiratory system

- Position of trachea
- Breath sounds
- Added sounds

INVESTIGATIONS

- Complete blood count
- Random blood sugar

Lipid profile

- ECG
- Echocardiography (if applicable)
- Cardiac enzymes (Trop T, CPK-MB)
- hs-CRP
- X-ray chest PA view
- GRF

Estimation of GRF (Glomerular filtration rate)

It is estimated by Modification of Diet in Renal Disease (MDRD) formula.

GFR = 186 x Sr. creatinine (-1.154) x Age (-0.203)

x 0.0.742 if females

Serum creatinine is determined by Alkaline Picrate method. Principle- Creatinine in a protein free solution reach with alkalinepicrate producing red coloured complex. This red coloured complexes measured calorimetrically.

Sample: -

a. Serum 1 ml

b. Urine - 24 hour urine is preferred

Reagent: -

1. Picric acid (saturated picric acid solution): wash 13 gm picric acid into measuring cylinder and add water to 1 litre. Allow the excess to remain in contact with water, Shaking time to time. The solution is filtered and kept in polythene bottle.

2. Sodium hydroxide (0.75N) (3 gm/100 ml)72

1. Stock creatinine standard (150 mg%)- dissolve 150 mg puredry creatinine in 100 ml concentrated hydrochloric acid and make to 100 ml with the acid.

Procedure:-

1.For colorimeter

Step A: Deproteinization

Serum 1.0 ml

Distil water 1.0 ml

Reagent 1: Picric acid 6.0 ml

Mix well, keep in a boiling water bath exactly for one minute. Cool immediately and centrifuge.

Step B:

	B Blank	S Standard	T Test
Filtrate from Step A	-	-	4.0 ml
Working standard	-	1.0 ml	
Distilled water	1.0ml	-	-
Reagent 1: Picric acid	3.0 ml	3.0 ml	
Reagent 2: Sodium Hydroxide	1.0 ml	1.0 ml	1.0ml

II. For Spectrometer

All the volumes mentioned above can be halved. Read Optical Density (OD) at 520 nm.

Calculations :

Serum creatinine in mg/100 ml

$$= \frac{ODT - ODB}{ODs - ODB} \times 3.0$$

Normal value:

Men 0.9 - 1.4 mg/100 ml

Women 0.8 1.2 mg/100 ml

High sensitivity C-reactive protein

The CRP protein is well known as an acute phase protein whose concentration increases as a result of inflammatory process.. The CRP seems indeed to be a strong predictor of vascular events. Standard CRP methods routinely available in a clinical laboratory have limits of detection of 3-5mg/1. However these methods

are unsuitable for detecting risk factor for coronary heart disease since the serum CRP concentration could be much lower than the cut off levels in the standard tests. Therefore only High sensitivity or ultra-sensitive test for C- reactive protein are useful for this purpose. As a result Hs-CRP assays have been developed that can detect concentration down to 0.15mg/1.These high sensitivity methods used enzyme linked immunosorbent assay(ELISA), Nephelometric and Immunoturbidimetric methods. Here we were used Immunoturbidimetric method.

Principle of the test

Particle enhanced immuno-turbidimetric assay- Human CRP agglutinate with latex particles coated with monoclonal anti-CRP antibodies .The precipitate is determined turbidimetrically.

Reagents-working solutions

R1-TRIS buffer with bovine serum albumin and immunoglobulin, preservative, stabilizers

R2-Latex particles coated with anti-CRP (mouse) in glycine buffer, preservative, stabilizer.

Sample: serum (separated immediately from clot and analyzed promptly).

Procedure: Centrifuge sample containing precipitate before performing assay.

Measuring range 0.15-20.0 mg/1.

Normal value of CRP is <1mg/1.

IV. Observation

The present study is a case control study was carried out with the objective of estimating level of hs-CRP and Glomerular Filtration Rate in 55 cases of Acute coronary syndrome .60 control subjects are also studied .

According to American Heart Association and the centre for Disease Control and Prevention , hs-CRP level of 1-2, 2-3, and greater than 3mg/l are interpreted as low, moderate and high vascular risk respectively. The results and observation of the present study has been presented in the following tables.

TABLE 1

DISRIBUTION OF CASES ACCORDING TO AGE/SEX

Case				Control			
Male	%	female	%	male	%	female	%
19	57.54	14	42.43	43	71.66	17	28.34
18	81.82	4	18.18	0	0	0	0

Table 1 shows in 55 cases of acute coronary syndrome, 57.54% male and 42.43% female were at age group 30-60 and 81.82% males and 71.81% female were more than 60 years .In control group , 71.66% males and 28.34% females were in the age group 30-60 years.

TABLE 2

ECG CHANGES IN ACUTE CORONARY SYNDROME

	Anterior Wall ischemia		Inferior Wall ischemia		Lateral Wall Ischemia		mixed	
Unstable Angina (12 case)	0	0%	3	25.09%	2	16.66%	7	15.33%
NSTEMI (19 case)	2	10.52%	4	21.05%	5	26.33%	8	42.10%
STEMI (24 case)	1	4.16%	6	25.02%	4	16.66%	13	54.16%

Table 2 shows out of 55 cases of acute coronary syndrome, 5.45% had anterior wall, 23.63% had inferior wall 20.0% had lateral wall and 50.9% had combined pattern of ischemia.

In NSTEMI 15.7% had anterior wall 21.45% had inferior wall 21.45% had lateral wall and 42.26% had combination pattern of ischemia.

In unstable angina 25.04% had anterior wall 8.3% had inferior wall 33.33% had lateral wall and 33.33% had combined ischemia.

In STEMI 25.1% had anterior wall , 20.8% lateral wall ,25.1% inferior wall and 29.13% had combined pattern of ischemia.

TABLE 3

ECHOCARDIOGRAPHIC CHANGES IN ACUTE CORONARY SYNDROME

Hypo/Dyskinesia	Anterior	Inferior wall	Lateral	Combined

	Wall		Wall	Pattern
Unstable angina	0	3	2	7
NSTEMI	2	4	5	8
STEMI	1	6	4	13

Table 3 shows out of 55 cases of acute coronary syndrome , 5.45% had anterior wall, 23.63 % had inferior wall 20 % had lateral wall and 50.9 % had combined pattern of wall motion abnormality .The area of ischemia correlates with ECG finding.

TABLE 4- LEVEL OF CARDIAC ENZYME IN ACUTE CORONARY SYNDROME

	No of patient	Trop-T		CPK-MB	
		<0.01 ng/ml	>0.01 ng/ml	<20 IU/l	>20 IU/l
Unstable angina	12	12	0	12	0
NSTEMI	19	0	19	0	19
STEMI	24	0	24	0	24

Table 4 shows in Unstable angina group all the patients had Trop –T value <0.01ng/ml and CPK –MB level was less than 20 IU/L.
In NTEMI group and STEMI group all the patient had Trop –T value >0.01ng/ml and CPK-MB level was more than 20 IU/L.

TABLE 5
LEVELS OF HS-CRP IN TYPES OF ACUTE CORONARY SYNDROME

Hs-CRP	Unstable angina		NSTEMI		STEMI		Control
1-2mg/dl	6	50.1%	7	36.82%	3	12.5%	0
2-3mg/dl	4	33.33%	5	26.31%	9	37.4%	0
>3mg/dl	2	16.66%	7	36.87%	12	50.1%	0

The mean hs-CRP level in unstable angina (1.899+/-0.84mg/l),
NSTEMI 3.13+/-0.93) STEMI (2.77+/0.956) vs control (0.509+/-0.187) p value is 0.01 , which is statistically significant compare to healthy control.
Most of patients with STEMI and NSTEMI had hs-CRP value 1-2mg/l ,2-3mg/l , >3 mg/l putting them in as low , moderate and high vascular risk respectively.
In 55 cases of acute coronary syndrome 21.03% cases are of unstable angina, 34.54% cases are of NSTEMI and 46.63%case are of STEMI. In Unstable angina 50.1% cases were in low risk 3.33% in moderate risk 16.66% in high vascular risk group.
In STEMI patients 12.5 were in low risk 37.4 in moderate risk 50.1 in high vascular risk group.

TABLE 6
LEVEL OF GFR IN TYPES OF ACUTE CORONARY SYNDROME

	GFR					
	30-59ml/min		60-89ml/min		>90ml/min	
Unstable Angina	6	54.54%	5	45.45%	1	9.09%
NSTEMI	17	89.47%	2	10.53%	0	0
STEMI	20	83.34%	4	16.66%	0	0
CONTROL	0	0	0	0	0	0

Mean GFR in unstable angina 60.07+/-8.2 ml/min, NSTEMI 50.32+/-7.05ml/min, STEMI 50.33+/-7.65 ml/min vs control 121.26+ /-3.522 ml/min . p value is 0.001 which is statistically significant .
In 55 cases of acute coronary syndrome , 78.18% cases had GFR found between 30-59 ml/min , 20.0 %had between 60-89ml/min and 1.82% had GFR >90ml/min.
RELATIONSHIP BETWEEN GFR AND HS –CRP IN ACUTE CORONARY SYNDROME

Hs-CRPLEVEL	GFR				
	30-59ml/min		60-89ml/min		>90ml/min
1-2mg/l	8	19.52%	6	46.16%	0
2-3mg/l	14	34.14%	5	38.46%	0
>3mg/l	19	46.34%	2	15.38%	0

Table 7 shows in 55 cases of acute coronary syndrome 74.54% cases have GFR ranges (30-59ml/min) among which 19.52% patients were in low vascular risk (hs-CPR level 1-2mg/l), 34.14% in moderate, 46.34% in high vascular risk group. 25.46% cases have GFR range (60-89ml/min), among which 46.16% were in low, 38.46% in moderate , and 15.38% were in high vascular risk group(hs-CRP 1-2mg/l, 2-3mg/l, >3mg/l) respectively.

V. Disscussion

The present work to study Glomerular filtration rate and High sensitivity C- reactive protein in patients of acute coronary syndrome intends to study the value of various factors which help stratifying patients of acute coronary syndrome and help predicting outcome in terms of death and prolonged hospital stay due to complications and thus prompt more intense management of patients suffering from acute coronary syndrome. Several epidemiological and interventional studies have shown the value of hs- CRP in cardiovascular disease as important guiding factor in acute cardiac illness such as acute coronary syndrome. American Heart Association has suggested measurement of hs- CRP with regards to individual risk prediction in acute coronary syndrome.(Henderson et al 2006)

. The hs –CRP is a marker of vascular inflammation and its value reflects ongoing vascular inflammatory process at the level of vascular endothelium. Increasing value of hs- CRP suggest impending vascular disaster and at a times sudden death .The hs-CRP has been associated with higher TNF- alfa, IL-6 like inflammatory cytokines which are other surrogate markers of vascular inflammation. This study has used immunoturbidimetric method in which human C reactive proteins agglutinates with latex particles coated with monoclonal anti CRP antibodies. This method has very high sensitivity and it can detect very small amount correctly.

The present study include 30 cases of acute coronary syndrome and 40 healthy individual as control in the age group of 30-70 years .

This study shows that higher mean level of hs-CRP (cases 2.69+/-1.023mg/l vs control 0.509 +/- 0.187mg/l, P<0.0001) wereobserved when acute coronary syndrome was present, and this was stastistically significant.The result was found to be similar to study conducted by Gazala et al 2008.

Amongst the patients presenting with acute coronary syndrome , 21.05% had unstable angina , 34.5% had NSTEMI , 43.63%had STEMI . In Unstable angina subgroup , 50.01% cases were in low risk (hs-CRP level 1-2mg/l), 33.3% moderate risk risk (hs-CRPlevel 2.1-3mg/l)and 16.6%high risk group (hs –CRP level >3 mg/l).

In NSTEMI subgroup , 36.82 were in low ,26.31% in moderate and36.87%were in high vascular risk group.

In STEMI subgroup 12.5%were in low , 37.4%in moderate and 50.1% were in high vascular risk.

Moukarbel et al carried out similar study correlating hs –CRP and complex angiographic lesion in acute coronary syndrome and noted direct association between degree of complexity in coronary angiography with measuring hs-CRP level.

Morrow and David et al 2006 attempted to stratify clical outcome and complications leading to longer hospital stay and noted its association with hs- CRP.

In our study we also recorded association of higher level of hs- CRP in death cases . Out of 55 cases of acute coronary syndrome , 10.9% died and 89.1% survived during their hospital stay. All patients who died had level of >3.0 mg/l of hs- CRP level and those who survived had hs –CRP level of 1-2mg/l in 22.4%, 2-3mg/l in 36.73% and more than 3mg/l in 40.81%.

De winter et al carried out the study correlating even higher leel of hs-CRP with death and recurrent myocardial infarction and suggesting intense endothelial inflammation.

Renal function was assessed by estimation of Glomerular filtration rate (GFR) using Modification of Diet in Renal Disease equation (MDRD Equation) , and patients were grouped into 3 categories according to baseline estimated GFR (30-59, 60-89, >90ml/min severe , moderate and mild renal dysfunction respectively) incorporating the guidelines of National Kidney Foundation.

According to Quesarline AR et al renal failure causes changes in plasma components and endothelial structure and function , thereby favouring vascular injury , which may play a role as a trigger for inflammatory response. Between 30-50% of chronic kidney disease patients have elevated serum level of inflammatory markers such as C-reactive protein, IL-6, TNF-alfa etc .Progressive detorioration of renal function in chronic kidney disease may lead to Dyslipidemia or aacumulation of uremic toxin , which can stimulate oxidative stress and inflammation and hence , contribute to endothelial dysfunction and progression of atherosclerosis.(Kaysen et al 2004).

The study shows there is reduction in GFR associated with acute coronary syndrome ,which indicate renal dysfunction.

Out of 55 cases of acute coronary syndrome , 78.18%of cases had GFR between 30-59ml/min, 20% had between 60-89ml/min, and 1.82% had GFR >90ml/min at the time of presentation.

Mean GFR (cases 52.35-/+8.802 vs control 121.26-/+3.522 ml/min , p value <0.0001) which is statistically significant when compared to healthy control.

This observation is similar to study conducted by Lisa M Mielniczuk et al(2007)and Pawell Josh et al 2006.

The present study shows that , out of 55 cases of acute coronary syndrome there were 10.9% death and those patients had very low GFR(30-59ml/min), where as those who survived had more than 60ml/min of GFR.

Study conducted by Frederick A.Masoudi et al 2004 and Go et al 2004 demonstrated the correlation between decreasing level of renal function and increasing events rate of cardiovascular morbity and death.

The present study shows that 74.54% case had GFR range(30-59ml/min), of which 19.52% patients were in low vascular risk (hs-CRP level 1-2mg/l) 34.14% in moderate (hs-CRP 2-3mg/l), 46.16%were in high vascular risk group(hs-CRP >3mg/l). 25.46%cases had GFR range 60-89ml/min of which 46.16% were in low , 38.46%in moderate , and 15.38% were in high vascular risk group (hs-CRP 1-2 mg/l, 2-3 mg/l, >3mg/l respectively). Suggesting poor outcome and hs-CRP in inverse relationship.

Several stusies conducted on relationship between inflammatory markers , cardiovascular status in chronic kidney disease patients. Shlipak et al and Menon et al concluded that increased inflammatory markers such as hs-CRP is a risk factor of cardiovascular events and is related to reducing GFR

III. Conclusion

1. The study attempted to find out the value of high Sensitivity C-Reactive Protein and Glomerular Filtration Rate in patients of acute coronary syndrome admitted at coronary unit of RIMS.
2. The study had 55 patients with acute coronary syndrome in the age group of 30-70 years of which 37 were male and 18 were female. 60 healthy matching controls were also included in studies.
3. To measure hs-CRP Immunoturbidimetric method was adopted which uses , latex particle coated with monoclonal antibodies of anti-CRP. For Glomerular Filtration Rate estimation MDRD formula was used.
4. This study shows that higher mean level of hs-CRP significantly correlated with death or complicated STEMI and NSTEMI events. Unstable Angina and Uncomplicated AMI (Acute Myocardial Infarction) had lesser hs-CRP levels.
5. Poor Renal function (30-59ml/min)estimated by Glomerular Filtration Rate had linear relationship with very poor outcome as indicated death and complicated hospital stay.

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