

Research Article



Evaluation of High-sensitivity C-reactive Protein Levels in Patients of Acute Coronary Syndrome

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ABSTRACT

Acute coronary syndrome (ACS) is one of the life-threatening conditions of coronary artery disease (CAD). ACS is one of the major causes of death and disability worldwide. The greater risk of death is within one hour of clinical presentation of ACS. A reliable, speedy diagnostic tool for detection of ACS is need of time. In the recent past, the serum high-sensitivity C-reactive protein (hs-CRP) is being utilized, as a marker, for detection of ACS. The present study was done with the objective to evaluate diagnostic value of hs-CRP for detection of ACS. The prospective study was conducted in tertiary care hospital over the period of one year during the period July 2021 to May 2022. The 50 patients presented with clinical presentation and confirmed diagnoses of ACS with angiography and Troponin T/CPK-MB test, were included in this study. 25 control cases of non-ACS were compared with 50 ACS cases. The serum hs-CRP level were obtained from all participated 75 cases. The hs-CRP results of ACS cases were compared with controls. The hs-CRP showed the sensitivity (90.00 %), specificity (88.00 %), accuracy (89.33 %), positive predictive value (93.75 %) and negative predictive value (81.48 %) for detection of ACS. It is concluded from this study that the increased serum hs-CRP level is reliable marker for patients presenting with acute coronary syndromes and it helps in early detection of patients, who may present with cardiovascular complications.

Keywords: hs-CRP, ACS, acute coronary syndrome, marker.

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INTRODUCTION

ACS includes a group of disorders - unstable Angina, non-ST-segment elevation Myocardial Infarction and ST-segment elevation Myocardial Infarction. ACS is one of the commonest clinical presentations of cardiovascular diseases. Now days, the cardiovascular diseases are pandemic. There is tendency of Indian population to develop CAD at early ages.¹Hence, sooner the India will become the largest coronary artery disease burden country in the world.²

C-reactive protein (CRP) is acute phase protein, which works as inflammatory marker. The pathogenesis of ACS is the inflammation process and hence, CRP acts as predictor of cardiovascular risk.³ Recent studies had confirmed that CRP level increases in adverse outcomes conditions related to acute coronary syndromes and is independent marker, than that of commonly used markers of like ECG changes and troponin T or troponin I release.^{4,5}

The accuracy of CRP level for prediction of vascular risk detection is in between 0.1 to 0.5 mg/dl, and this level is commonly present in majority of the healthy individuals.

Hence, a high sensitive CRP (hs-CRP) assay is needed; as it can detect low level of CRP of 0.02g/d.⁶

There are many studies worldwide which showed that hs-CRP has more accuracy than other conventional markers, in earlier prediction of, adverse outcomes of ACS. Also, it was observed that hs-CRP concentrations increase early in ACS, prior to the tissue necrosis and hence, it works well for to avoid cardiovascular co-morbidities.^{6,7,8}The present study was conducted to analyze diagnostic value of hs-CRP in the diagnosis of ACS.

MATERIALS AND METHODS

The prospective study was conducted in tertiary care hospital Clinical Pathology laboratory during the period from July 2021 to May 2022.

The inclusion criteria for labeling the case as ACS case were as follows: The classical patient presentation with complaints like chest pain radiating towards chest and/ arm with a typical history. Patient may present with complaint of vomiting, breathlessness and sweating, etc. Patient should have angiographically proven coronary artery disease and accordingly ECG changes. Patient Laboratory finding should be found positive CPK-MB or cardiac troponin-T by rapid immuno-chromatographic method.

The exclusion criteria for ACS cases were as follows: Patients on medications like estrogens/hormonal tablets, aspirin, beta-blockers, niacin and statins therapy were excluded. Patients suffering with inflammatory conditions



like, pancreatitis, pneumonia, arthritis, bronchitis and cardiac diseases like valvular heart disease and cardiomyopathies etc., were excluded from the study.

The hs-CRP estimation was done for all ACS cases and controls, at the time of presentation and the analysis was performed by ELISA method. The Cut-off for hs-CRP was set at 3.00 mg %. The cases in which hs-CRP level was more than 3 mg % were labeled as ACS positive and vice versa.

The Statistical analysis were done with the SPSS software, for hs-CRP level accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for detection of ACS case positivity.

RESULTS AND DISCUSSION

Out of 50 ACS cases, 37 were from male and 13 were female patients and their age ranges from 44 to 62 years.

Table 1: hs-CRP level test evaluation for ACS cases

	ACS Cases	Non- ACS cases (Control)	Total	Predictive value (PV)
hs- CRP Positive	45	03	48	PPV (93.75 %)
hs- CRP Negative	05	22	27	NPV (81.48 %)
Total	50	25	75	
	Sensitivity (90.00 %)	Specificity (88.00 %)	Accuracy (89.33 %)	

For the hs- CRP cut off level 3 mg %, the analysis of hs- CRP activity was done for all 50 ACS cases and 25 control cases. The hs- CRP level of 3 mg % and above were considered as ACS positive and vice versa. (Table 1)

The hs- CRP level was more than 3 mg %, in 45 cases out of 50 ACS cases. Out of 25 control cases, the 3 control cases presented with hs- CRP level was more than 3 mg % and thus, showed their false positivity. Concluding, with the cut of 3 mg %, the hs- CRP level showed Sensitivity, Specificity, Accuracy, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of 90.00 %, 88.00 %, 89.33 %, 93.75 % and 81.48 % respectively for detection of ACS. (Table 1)

Throughout the world, now days the ACS is emerging as a global health issue. Hence, there is a need of novel marker for early diagnosis of ACS. C-reactive protein is a pentameric protein synthesized in the liver, has proved itself as authentic marker for inflammation. Recently, it was demonstrated that cells within human coronary arteries especially cells in the atherosclerotic intima can elaborate CRP.⁹ Several studies conducted in the past had proved that hs-CRP is sensitive and good predictive marker for cardiovascular risk.^{10,11} The biggest advantage of hs- CRP is that it is a stable compound and its serum level is independent of circadian rhythm of human body. The other markers like IL-6 values are of based on circadian rhythm and hs- CRP has got upper hand on IL-6 like markers for the detection of ACS.¹²

There are some studies which submitted that CRP worked well as mortality predictor in cardiovascular system, however, it is not capable for work independently of troponin early diagnosis of a high risk subgroup patients of ACS.¹³

Tommasi et al¹⁴ found that CRP level was increased and was > 2.55 mg/ dL, at hospital admission time, for patients of myocardial infarction (MI) without any complications like residual ischemia. Anzai et al¹⁵ submitted that patients

showed very high level of CRP, who suffered with post MI complications like, cardiogenic shock, cardiac rupture. The similar findings were found in this study.

It is found that women blood level of CRP is higher than the men. The postmenopausal women who are on hormone replacement therapy will have higher level of CRP^{7,16} and hence, they were excluded from our study.

The limitation of this study is low number of ACS cases. More studies needed worldwide, for validation of hs- CRP role in diagnosis of ACS cases.

CONCLUSION

Hs-CRP is a noble reliable marker for early prediction of ACS. The hs-CRP is related with pathophysiology of ACS cases in their earlier phase. Hence, it can be utilized to find of potentially high risk patients of ACS, who have high chances of complications and are going to need aggressive management. Hence, in view of excellent accuracy, hs- CRP should be incorporated as routine tool, for earlier diagnosis of ACS cases.

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