

Original Research Article

Quantification of C-reactive protein, differential count and blood glucose in acute coronary syndrome

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Received: 14 January 2020

Accepted: 06 February 2020

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ABSTRACT

Background: The study was done to investigate whether the raised levels of C-reactive protein (CRP), differential count and random blood glucose, besides echocardiogram, enhances the assessment process of acute coronary syndrome (ACS).

Methods: This prospective study was done on 100 patients with typical chest pain attending to the department of medicine at K.A.P.V Medical College and Hospital, Trichy during the period from 2015 to 2017. The serum was assayed on admission for CRP, differential count and random blood glucose. Correlation of these parameters with incidence of ACS was calculated.

Results: Male preponderance was seen in the study. Out of 100 patients, majority of about 60% of ACS patients had raised JVP. Elevated level of CRP was seen in 73% patients, 70% had elevated level of ejection fraction percentage. 71% had elevated level of WBC and 58% had elevated level of RBS. Statistically significant correlation was observed with the level of CRP ($p=0.044$), differential WBC count ($p=0.037$) and random blood glucose levels ($p=0.001$).

Conclusions: Our study indicates that elevated CRP levels, increased random blood sugars and leucocytosis in ACS patient are positively correlated with decreased ejection fraction. Hence, measuring the levels of these parameters will help in identifying incidence of acute coronary syndrome without echocardiogram.

Keywords: Acute coronary syndrome, Blood glucose level, C-reactive protein, Differential count

INTRODUCTION

Acute coronary syndromes (ACS) are unpredictable events that occurs in patients with coronary artery disease that arises due to intravascular thrombosis on an acutely disrupted atherosclerotic plaque.¹ C-reactive protein (CRP) is an extremely important inflammatory factor that helps in the diagnosis of cardiovascular diseases. CRP is produced mainly by the liver in response to interleukin 6 that contributes importantly to atherogenesis, plaque disruption, and thrombosis.² Recent studies confirm that the association of elevated CRP concentrations with adverse outcomes in acute coronary syndromes is

independent of commonly used markers of risk, including ECG characteristics and troponin release.³⁻⁵

Elevated leukocyte count, a marker of inflammation, has long been identified as an independent predictor of an increased risk for long term mortality and myocardial infarction both in individuals without cardiovascular disease at baseline and in patients with established coronary artery disease.⁶⁻⁸

Hyperglycemia is common and associated with increased mortality rates in patients with ACS. Several studies supported this association but considered as

underappreciated risk factor, and currently not treated in ACS patients.⁹

The main objective of the present study was to investigate the amount of glucose in the blood, WBC count, CRP in ACS disease and to correlate these parameters with the severity of the disease.

METHODS

After getting approval from institutional ethics committee, this prospective study was done on 100 patients of both sex with typical chest pain, admitted in the department of medicine, K.A.P.V Medical College and Hospital, Trichy during the period from 2015 to 2017.

Inclusion criteria

Patients with typical chest pain not relieved by rest, STEMI and NSTEMI with CPK-MB positive were included in the study.

Exclusion criteria

Patients with known CAD, severe renal or liver disease, hematologic disorders, infectious or inflammatory disease and patients on statin therapy were excluded.

Patients who were admitted with history of typical chest pain, characterized by pressure, tightness, squeezing, heaviness, or burning and retrosternal location, after radiating to neck, jaw, shoulder or arms, sometimes epigastric regions associated with S4 gallop, mitral regurgitation, murmur, with S3 or rales. Severe ischemia and complication of myocardial infarction are confirmed by electrocardiogram and raised creatine phosphokinase-myocardium bound, and duration of pain.

The patients were classified as category I (ST segment elevated myocardial infarction), category II (nonSTEMI) and category III (unstable angina).

Management of category I patients was done using streptokinase injection (1.5 lakh international unit by 1 hour) who had elevated ST segment in electrocardiogram and for category II and III patients was done with inj. low molecular weight heparin 5000 IU sixth hourly. Aspirin, clopidogrel and atorvastatin was given for all three category patients.

After initiation of treatment, blood samples were collected and random blood glucose, cholesterol profile and renal function tests were done using standard techniques. Complete blood haemogram, total and differential leukocyte counts were measured with an automated Advia 2120 hematology analyzer (Roche). Serum CRP and other metabolic profile were measured at hospital arrival.

After stabilization of patients with proper treatment then patients were shifted to ECHO room for evaluating cardiac status from that utilized ejection fraction to analyze the cardiac performance after myocardial injury in acute coronary syndrome. Then patients were assessed for failure symptoms in the form of pulmonary edema, reduced urine output and raised jugular venous pressure and blood pressure.

The collected data was analyzed using Microsoft excel and presented in number and percentages.

RESULTS

The study included 100 patients with acute coronary syndrome. Table 1 presents the demographic and clinical data of the patients. Majority of the patients belongs to the age group of 46-55 years. Males (79%) are more affected than females (21%). Out of 100 patients, raised jugular venous pressure was observed in 60 patients, lung signs in 53, pulmonary edema in 43 and decreased urine output in 42 patients. In our study, abnormal levels of CRP were seen in majority of the cases (73%), followed by elevated levels of WBC (71%), raised RBS (58%) and abnormal ejection fraction percentage (EF%) (30%).

Table 1: Demographic and clinical characteristics of patients (n=100).

Variable	N	Percentage (%)
Age (in years)		
Below35	9	9.0
36to45	27	27.0
46to55	30	30.0
56to65	23	23.0
66to75	8	8.0
76to85	3	3.0
Sex		
Male	79	79.0
Female	21	21.0
Failure symptoms		
JVP	60	60
Lung signs	53	53
Pulmonary edema	43	43
Decreased urine output	42	42
Abnormal parameters		
CRP	73	73
EF%	30	30
WBC	71	71
RBS	58	58

Figure 1 presents the significant association between CRP and their EF% ($\chi^2=4.061$ Df=1, $p=0.044$). Out of 30 patients, majority (86.7 per cent) of the patients had shown elevated level of CRP when compared to EF%, that indicates CRP will have more influence over

EF%. Out of 30 patients with EF%, about 83.3% of the patients had shown elevated level of WBC when compared to EF%. This association was found to be significant ($X^2=4.287$, $Df=1$, $p=0.037$) (Figure 2).

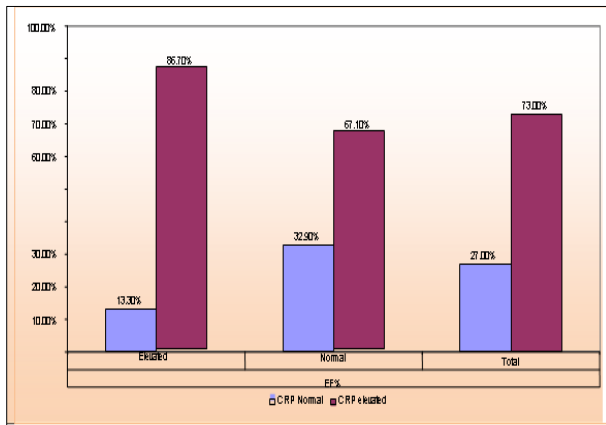


Figure 1: Association between CRP and their EF%.

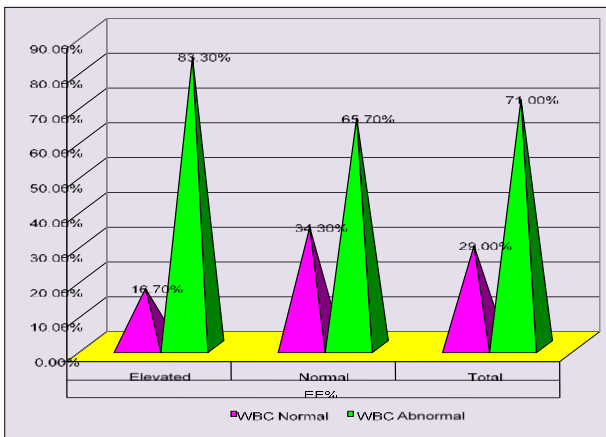


Figure 2: Association between WBC and their EF%.

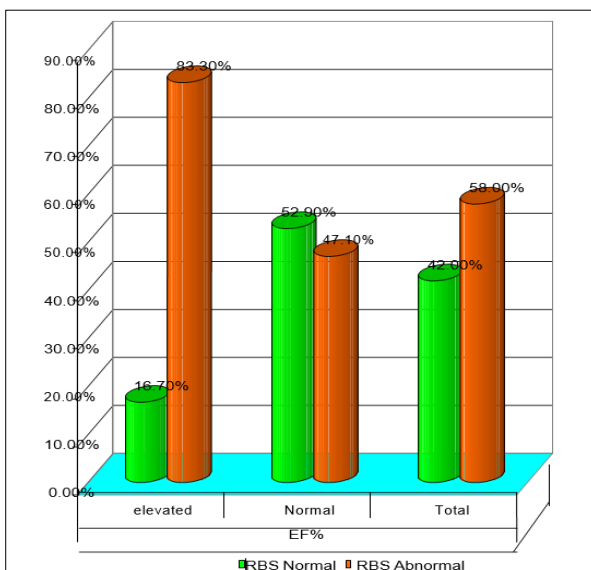


Figure 3: Association between RBS and their EF%.

Figure 3 shows, significant association was noticed between RBS and their EF% ($X^2=11.291$, $Df=1$, $p=0.001$). Elevated RBS level (83.3%) was seen in majority of the cases when compared to EF%.

DISCUSSION

This study quantified the effects of c-reactive protein, white blood cells and random blood sugar in ejection fraction in ACS patient. The study included 100 patients with male preponderance. Majority belongs to the age group of 46-55 years. Similar findings was observed in the study of Wilby et al.¹⁰

In our study we found that the serum level of these C-reactive protein was higher in ACS patient. This was in accordance with the study conducted by Anand et al. They performed a retrospective analysis of the predictive value of baseline CRP level which is measured in heart failure patient. Higher level are associated with features of more severe heart failure and are independently associated with mortality and morbidity.¹¹

In our study, significant association between CRP and ejection fraction was also observed. Patient with low ejection fraction showed significant raise in serum CRP when compared to normal ejection fraction. Similar observation was made by Stump et al.¹² On contrast to this, Kennon et al, conclude that CRP measurement provides only little incremental prognostic information. there is no evidence that CRP is helpful for identifying groups who benefit from particular treatment in ACS.¹³ They suggest that only ECG changes and troponin measurement remain the principle tools for risk stratification and there is no evidence that CRP measurements provide additional independent information.

According to Hoffman et al, they suggest that inflammation has been demonstrated to be an important risk factor for the development of cardiovascular events.¹⁴ Patients with increased levels of WBC counts have been shown to have a higher risk of developing an AMI and to be at higher risk for adverse events during the acute cases. Similar observations were noticed in our study. According to Murtagh et al, the higher level of myeloperoxidase secreted by the activation and degranulation of leucocytes is an important prognostic factor in cardiac patient.¹⁵ This was in consistent with our study.

A strong association between hyperglycemia and EF was found. As EF decreases, the hyperglycemia increase. Result was similar to the study conducted by Deedwania et al.⁹ The findings of our study recommends that improved glucometabolic care reverse the negative effect of hyperglycemia on cardiovascular complications.

Limitations of the study includes small sample size. All complication of acute coronary syndrome patients was

not included. Correlation between the heart failure signs with these parameters was not done and justified. Comparison of these parameters before and after treatment of ACS patient was done.

CONCLUSION

The findings of the study conclude that elevated CRP levels, increased random blood sugars and leucocytosis in ACS patient are positively correlated with decreased ejection fraction (<50%). So, quantification of these three parameters in acute coronary syndrome will predict the morbidity and mortality and helps roughly, to estimate the ejection fraction without echocardiogram.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Tahhan AS, Hammad M, Raad M, Almwaqqat Z, Alkhoder A, Sandesara PB, et al. Progenitor Cells and Clinical Outcomes in Patients With Acute Coronary Syndromes. *Circulation Res.* 2018;1565-75.
2. Kennon S, Timmis AD, Whitbourn R, Knight C. C reactive protein for risk stratification in acute coronary syndromes? Verdict: unproven. *Heart.* 2003;89:1288-90.
3. Lindahl B, Toss H, Siegbah A, Venge P, Wallentin L. FRISC Study Group. Markers of myocardial damage and inflammation in relation to long-term mortality in unstable coronary artery disease. *N Engl J Med.* 2000;343:1139-47.
4. Sabatine MS, Morrow DA, de Lemos JA, Gibson CM, Murphy SA, Rifai N, et al. Multimarker approach to risk stratification in non-ST-elevation acute coronary syndromes. *Circulation.* 2002;105:1760-3.
5. Mueller C, Buettner HJ, Hodgson JM, Marsch S, Perruchoud AP, Roskamm H, et al. Inflammation and long-term mortality after non-ST elevation acute coronary syndrome treated with a very early invasive strategy in 1042 consecutive patients. *Circulation.* 2002;105:1412-5.
6. Cervellin G, Mattiuzzi C, Bovo C. Diagnostic algorithms for acute coronary syndrome-is one better than another? *Ann Transl Med.* 2016;4:193.
7. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, et al. Executive summary: heart disease and stroke statistics--2010 update: a report from the American Heart Association. *Circulation.* 2010;121:948-54.
8. Danaei G, Singh GM, Paciorek CJ, Lin JK, Cowan MJ, Finucane MM, et al. The Global Cardiovascular Risk Transition: Associations of Four Metabolic Risk Factors with National Income, Urbanization, and Western Diet in 1980 and 2008. *Circulation.* 2013;127:1493-502.
9. Deedwania P, Kosiborod M, Barrett E, Ceriello A, Isley W, Mazzone T, et al. Hyperglycemia and Acute Coronary Syndrome. *Circulation.* 2008;117(12):1610-9.
10. Wilby KJ, Elmekaty E, Abdallah I, Habra M, Al-Siyabi K. Blood glucose control for patients with acute coronary syndromes in Qatar. *Saudi Pharmaceutical J.* 2016;24(1):35-9.
11. Anand IS, Latini R, Florea VG, Kuskowski MA, Rector T, Masson S, et al. C-reactive protein in heart failure. *Circulation.* 2005;112(10):1428-34.
12. Stumpf C, Sheriff A, Zimmermann S, Schaefauer L, Schlundt C, Raaz D, Garlich CD, Achenbach S. C-reactive protein levels predict systolic heart failure and outcome in patients with first ST-elevation myocardial infarction treated with coronary angioplasty. *Arch Med Sci: AMS.* 2017;13(5):1086.
13. Kennon S, Timmis AD, Whitbourn R, Knight C. C reactive protein for risk stratification in acute coronary syndromes? Verdict: unproven. *Heart.* 2003;89(11):1288-90.
14. Hoffman M, Blum A, Baruch R, Kaplan E, Benjamin M. Leukocytes and coronary heart disease. *Atherosclerosis.* 2004;172(1):1-6.
15. Murtagh BM, Anderson HV. Inflammation and atherosclerosis in acute coronary syndromes. *J Invasive Cardiol.* 2004;16(7):377.

Cite this article as: Padmanaban UB, Lenin, Kumar GS. Quantification of C-reactive protein, differential count and blood glucose in acute coronary syndrome. *Int J Adv Med* 2020;7: 371-4.