FREQUENCY OF RAISED CRP IN ACUTE HEART FAILURE

SHOAIB SARWAR[1], MUHAMMAD WALI[2], KASHIF ZAFAR[2], ZOHAIB SADIQ[2], MUHAMMAD FAISAL[3], JUNAID RASHID[4]

[1]University of Lahore. [2]Punjab Institute of Cardiology Lahore. [3]Major Second in Command Medical Battalion. [4]Resident Histopathology PGMI / LGH Lahore

ABSTRACT

C-reactive protein (CRP) is a marker for cardiovascular and cerebrovascular diseases. It is also proven that it has role in long-term development of heart failure and mortality in patients with cardiovascular diseases.

Objective: To analyze the CRP levels in patients presenting with acute heart failure and determine the frequency of patients with raised CRP levels.

Material and Methods: This cross-sectional study was conducted at Punjab Institute of Cardiology for a period of six months after approval from the hospital ethical committee. Three hundred and forty five patients presenting with acute heart failure were taken. After Informed consent their venous blood samples were drawn for measurement of CRP levels. All the data was collected on a predefined proforma. The data was entered and analyzed in SPSS Ver. 23.0.

Results: The mean age of patients was 45.5 l ± 10.64 years. There were 192 (55.7%) males and 153(44-3%) females. The mean duration of heart failure was 6.46 ± 3.53 hours. The mean CRP in these cases was 6.27 ± 4.70 mg/L. There were 153(44.3%) patients who had raised CRP while 192(55.7%) patients had normal CRP levels.

Conclusion: Increased CRP levels were seen in high number of cases and this may be established as significant risk factor for in hospital mortality. Particular attention should be given for prior management in presence of raised CRP.

Keywords: Heart failure, biomarker, C-reactive protein

INTRODUCTION

Patients with acute heart failure (AHF) usually present with breathlessness, elevated jugular venous pressure, ankle swelling, and fatigue[1]. According to the studies, its outcome is very poor with ninety days re-hospitalization and that the one year mortality ratio is up to 10-30%[2]. According to American Heart Association around 58,309 deaths occurred due this disease in 2013 and that it consumes around one to two percent of the healthcare expenditures making it a principal cause of mortality and morbidity. In Asian countries especially developing countries due to urbanization and industrialization the lifestyle of the people has changed dramatically leading to increased ratio of diabetes and cardiovascular diseases[3,4].

Inflammation plays a key role in the complex pathophysiology of heart failure along with myocardial stretch, injury and hormonal activation[5]. According to WHO, biomarker is defined as the substance or mechanism, that can be measured and help in predicting a particular disease. Recent studies are focusing on the fact that inflammation biomarkers can be confirmatory in diagnosis of heart failure cases as these are low cost and have minimal risks. Further, it can help the clinicians in risk stratification and planning certain managements[5,6].

C-reactive protein (CRP) is one of the most important inflammatory biomarkers and that it is an acute phase reactant. According to the studies, it is a sensitive and accurately reflects the acute phase response in certain cardiovascular diseases including heart failure[7,8]. In the current clinical practices, CRP is widely used for diagnosis and management of these cases. Recent studies on acute heart failure reflect that in 34% of the cases (9), CRP is raised i.e. >6 mg/L and that in certain conditions its level can increase 10,000 fold i.e. 50 µg/L to 500 mg/L[7].

The purpose of this study is to analyze the CRP levels in patients presenting with acute heart failure and determine the frequency of patients in which it is raised and compare this increase with different factors in local population. This study will help clinicians in diagnosis and management of heart failure cases.

MATERIAL AND METHODS

This cross-sectional study was conducted at Punjab Institute of Cardiology for a period of six months i.e. November 4th 2017 to May 4th 2018 after approval from the hospital ethical committee. Three hundred and forty five patients were taken through non-probability consecutive sampling. Patients of either gender having age 18-60 years and presenting with acute heart failure within 12 hours were included in this study. Patients with history of any recent infection, known or suspected neoplastic disease, recent (less than 3 months) major trauma or recent surgery, inflammatory disorders such as arthritis or known cases of bronchial asthma and COPD were excluded from this study. Informed consent was taken from patients or attendants. The patients were enrolled in emergency department of Punjab institute of cardiology. The basic demographic information such as age, gender and contact details were taken. After receiving the patients their venous blood samples were drawn for measurement of CRP levels. All the data was collected on a predefined proforma.

The data was entered and analyzed in SPSS Ver. 23.0. For quantitative variables like age, CRP levels, BMI and duration of acute heart failure mean and standard deviation were calculated. For qualitative variables like gender and raised CRP were presented as frequencies and percentages. The data was stratified for age, gender, BMI and duration of acute heart failure (< 6 hours and 6-12 hours). Chi-square test was applied. *P* value of ≤0.05 was taken as significant.

RESULTS

The mean age of the patients was 45.51±10.64 years with minimum age of 18 years and the maximum age of 60 years. There were 192 (55. 7%) male and 153(44.3%) female patients. The mean duration of heart failure was 6.46 ± 3.53 hours with minimum duration of one hour and maximum duration of twelve hours. The mean CRP in these patients was 6.27±4.70 mg/L with minimum level of 0.1 mg/L and the maximum value of 28 mg/L. There were 153 (44.3%) patients who had raised CRP while 192 (55.7%) cases had normal CRP levels. The data was distributed according to the age groups, gender, duration of heart failure and BMI (Table-I)

Table-I: Distribution of raised CRP cases according to age groups, gender, duration of heart failure and BMI.

Variable		Raised CRP		Total	
		Yes	No		
Age Groups (years)	18-40	48 (31.4%)	70 (36.5%)	118 (34.2%)	chi-square = 0.97 p-value = 0.323
	41-60	105 (68.6%)	122 (63.5%)	227 (65.8%)	
Gender	Male	79 (51.6%)	113 (58.9%)	192 (55.7%)	chi-square = 1.79 p-value = 0.180
	Female	74 (48.4%)	79 (41.1%)	153 (44.3%)	
Duration of Heart Failure	< 6 months	66 (43.1%)	78 (40.6%)	144 (41.7%)	chi-square = 0.22 p-value = 0.638
	6-12 months	87 (56.9%)	114 (59.4%)	201 (58.3%)	
BMI	Obese	66 (43.1%)	102 (53.1%)	168 (48.7%)	chi-square = 3.4 p-value = 0.065
	Non-Obese	87 (56.9%)	90 (46.9%)	177 (51.3%)	

DISCUSSION

C-reactive protein is an acute phase reactant of hepatic origin (10). According to different studies, patients with heart failure may show different signs that are observed in different inflammatory conditions i.e. pro-inflammatory cytokines might be a causative factor in pathogenesis. This theory urged the researches to investigate its role in acute heart failure. Different pathologies including low cardiac output, ventricular dysfunction, and venous congestion can lead to the increment of interleukin-6 production hence leading to the raised CRP levels[7,9].

The etiology of increase in CRP levels in patients presenting with acute heart failure is unknown. According to the studies, under hypoxic stress interleukin-6 is produced in different cells i.e. endothelial cells, monocytes as well as in cardiac myocytes and this interleukin-6 then leads to the production of CRP in liver cells that leads to raised CRP levels in the body[8,11].

In the current study the mean CRP level was 6.27±4.70 mg/L and 153 (44.3%) patients had raised CRP levels. These results are in accordance with Kausadikar SR et al., which reported that 34% of the patients presenting in the emergency department with heart failure had raised CRP levels[9]. In a study by

Stumpf et al., 92% of the patients presenting with heart failure has raised CRP level the mean CRP level at the time of admission was 15.1 ±27.7 mg/L[12]. In a study by Anand et al., the mean CRP levels in the patients presenting with acute heart failure were found to be 3.23 mg/L and it was significantly raised in female patients (23.4%) i.e. the patient with raised CRP was more likely to be a female[13]. However in our study, the proportion of raised CRP level is more in males (51.6%) than in the females (48.4%).

When compared to the age groups, raised CRP levels were found in patients having ages between 41 to 60 years. These results are in accordance with the study by Stumpf et al. In our study no significant correlation was seen between duration of heart failure, gender or BMI with raised CRP levels.

There are certain limitations to our study. We measured the CRP levels immediately after the admission of patients in the department and didn't measure the subsequent levels i.e. after one hour, two hours or six hours. The number of patients was low and that the study was single-centered. A multi-centered study considering these limitations should be conducted.

CONCLUSION

Raised CRP levels were noted in higher number of patients and that it can be considered as an important diagnostic factor in patients presenting with acute heart failure. Particular attention should be given in the management of patients in case of raised CRP.

REFERENCES

1. Harjola VP, Mullens W, Banaszewski M, Bauersachs J, Brunner-La Rocca HP, Chioncel O, Collins SP, Doehner W, Filippatos GS, Flammer AJ, Fuhrmann V. Organ dysfunction, injury and failure in acute heart failure: from pathophysiology to diagnosis and management. A review on behalf of the Acute Heart Failure Committee of the Heart Failure Association (HFA) of the European Society of Cardiology (ESC). European journal of heart failure. 2017 Jul;19(7):821-36.
2. Savarese G, Lund LH. Global public health burden of heart failure. Cardiac failure review. 2017 Apr;3(1):7.
3. Sidney S, Quesenberry CP, Jaffe MG, Sorel M, Go AS, Rana JS. Heterogeneity in national US mortality trends within heart disease subgroups, 2000–2015. BMC cardiovascular disorders. 2017 Dec;17(1):192.
4. Shimokawa H, Miura M, Nochioka K, Sakata Y. Heart failure as a general pandemic in Asia. European journal of heart failure. 2015 Sep;17(9):884-92.
5. Ueland T, Gullestad L, Nymo SH, Yndestad A, Aukrust P, Askevold ET. Inflammatory cytokines as biomarkers in heart failure. Clinica Chimica Acta. 2015 Mar 30;443:71-7.
6. Fujii S, Ito A, Watanabe Y. Biomarkers for Cardiovascular Diseases. Annals of Nuclear Cardiology. 2016 Aug 31;2(1):94-8.
7. Shrivastava AK, Singh HV, Raizada A, Singh SK. C-reactive protein, inflammation and coronary heart disease. The Egyptian Heart Journal. 2015 Jun 1;67(2):89-97.
8. Syyeda A, Fatima J, Hyder AM. Acute phase reactants and lipid profile in acute chest pain presentations: a multimarker approach. International Journal of Research in Medical Sciences. 2016 Aug;4(8):3336.
9. Kausadikar SR, Mehra HA, Pathak KP. Study of C-reactive protein in patients with acute myocardial infarction attending tertiary care teaching hospital in Saurashtra region of Gujarat, India. International Journal of Advances in Medicine. 2016 Oct;3(4):1024.
10. Kushner I. Acute phase reactants. UpToDate [Internet]. Waltam, MA. 2015.
11. Aulin J, Siegbahn A, Hijazi Z, Ezekowitz MD, Andersson U, Connolly SJ, Huber K, Reilly PA, Wallentin L, Oldgren J. Interleukin-6 and C-reactive protein and risk for death and cardiovascular events in patients with atrial fibrillation. American heart journal. 2015 Dec 1;170(6):1151-60.
12. Stumpf C, Sheriff A, Zimmermann S, Schaefauer L, Schlundt C, Raaz D, Garlichs 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. Archives of medical science: AMS. 2017 Aug;13(5):1086.
13. Anand IS, Latini R, Florea VG, Kuskowski MA, Rector T, Masson S, Signorini S, Mocarelli P, Hester A, Glazer R, Cohn JN. C-reactive protein in heart failure: prognostic value and the effect of valsartan. Circulation. 2005 Sep 6;112(10):1428-34.