



Leucocytosis is A Predictor of Severe Left Ventricular Systolic Dysfunction in Patients With Acute Coronary Syndrome

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ABSTRACT

Aim: The present study was undertaken to determine the association between leucocytosis on admission and Left ventricular systolic dysfunction (LVSD) in patients with Acute Myocardial infarction(AMI). Design/Methods: A total of 100 patients with AMI (both with ST segment and Non ST segment elevation) were included, of which 73 were male and 27 were female patients. Blood samples were collected at the time of admission and analyzed for cardiac enzyme levels and cell count. Echocardiography was performed on 3-5days and left ventricular ejection fraction (LVEF) was measured. Results: 25 patients had severe LVEF. Elevated WBC(white blood cell) count was observed in 29 patients of whom 16 patients (55%) had severe LVEF. Conclusions: Statistically significant association was observed between elevated leukocyte count and underlying severe LV dysfunction in patients with AMI. Since WBC count is an inexpensive tool it can be used for risk stratification of patients with acute coronary syndrome.

KEYWORDS : Leucocytosis, Acute myocardial infarction, Left ventricular systolic dysfunction and left ventricular ejection fraction

I. Introduction

Cardio vascular disease is the leading global cause of death worldwide accounting for 17.3 million deaths / year and is commonly associated with myocardial infarction¹.

Acute myocardial infarction is characterized by loss of contractile tissue and changes in ventricular geometry. Complications of MI include ischemic, mechanical, arrhythmic, embolic and inflammatory of which LV dysfunction accounts for most fatalities. Despite the progress in the diagnosis and treatment of AMI 40% of the patients develop LVSD after AMI².

Elevated WBC count is a non-specific reaction to MI³. Studies have shown that WBCs are major contributors of micro vascular injury⁴. Studies have found that high leukocyte counts

were significantly associated with the development of congestive heart failure(CHF)⁵. In view of the probable relationship between leucocytosis and AMI with its complications, esp LVSD, The present study was undertaken to investigate the association between leucocytosis and LVSD in patients with AMI.

II. MATERIALS AND METHODS

Ila. Experimental Design

One Hundred patients in the age group of 30-80 admitted in the intensive care unit of Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu were included in the study. This includes 73 male and 27 female patients with acute myocardial infarction in whom a provisional diagnosis was made with specific changes in electrocardiogram, indicating STEMI and NSTEMI patients. Patients demographic data, including sex, age, and risk factors for cardiac events including high-risk age (men >45, women >55 years old), smoking history, medical history of hypertension, hyperlipidemia, diabetes, and a positive family history, drug history, presence of arrhythmia, laboratory data, ECG, and echocardiography findings, were recorded. Blood samples were collected at the time of admission and analyzed for cardiac enzyme levels and cell count. Echocardiography was performed on 3-5days and left ventricular ejection fraction (LVEF) was measured.

The inclusion criteria for the patients with acute coronary syndrome (ACS) were.

The criteria for STEMI were as follows⁶:

An increase in the levels of myocardial necrosis (troponin >1 ng/ml);

New ST elevation from the J point in two or more contiguous leads with an elevation of at least 0.2 mV in leads V1, V2 and V3 or at least 0.1 mV in the remaining leads during the first 24 hours following the onset of the symptoms.

Patients were also included if a new ST-segment elevation in the presenting electrocardiogram was associated with a recent episode of chest pain but in whom it was not possible to obtain analysis of myocardial necrosis.

The criteria for defining of NSTEMI⁶ were:

Increased levels of markers for myocardial necrosis (as for STEMI) along with the presence of either symptoms of ischemia or alterations of ST-segment (except persistent ST-segment) elevation.

Exclusion Criteria

Patients with history of infection or systemic inflammation during the last 15 days, or with hepatic, renal or haematologic disease at admission, and those who did not sign the informed consent proforma were excluded from the study.

IIb. Echocardiographic studies :

Echocardiographic measurements were obtained by using the HP Sonos 5500 echocardiography machine on 3-5 days of admission. Left ventricular end diastolic volume, end systolic volume and ejection fraction, were assessed from the apical four-chamber view using Simpson's rule. Based on LVEF patients were divided into

Normal- LVEF>50%
Mild- LVEF 40-50%
Moderate-LVEF 30-40%
Severe-LVEF<30%

WBC count was measured using Mindray BC 5300 hematology auto analyzer. The patients were categorized into three groups based on WBC counts⁵

Group-I - WBC count-<10000 cells/ mm³
 Group-II – WBCcount-10000-14900 cells/ mm³
 Group-III- WBCcount-> 15000 cells / mm³

III. Statistical Analysis

Datas were analyzed using the SPSS software package, version 17.0 (SPSS Inc., Chicago, Illinois, USA).. Qualitative data were analyzed using the χ^2 -test;. The Pearson coefficient was used to analyze the correlation between any two variables. P value was assumed to be statistically significant at0.05.

IV. ETHICAL CONCERN

Ethical clearance was obtained from the Ethical committee meeting conducted at Meenakshi Medical College and Research institute, Kanchipuram, Tamil Nadu, India

V. Results

Of the Total 100 patients, 73 were male and remaining 27 were female (Fig.1). The age of the patients ranged from 30-80 years(Fig.2)

Fig 1 -Sex Distribution

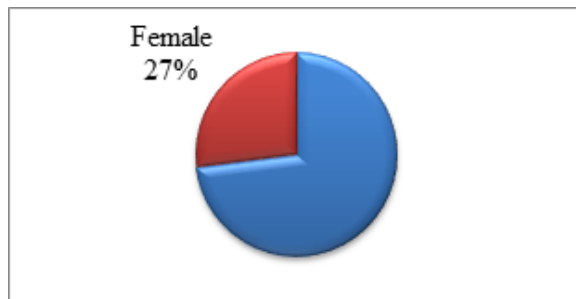
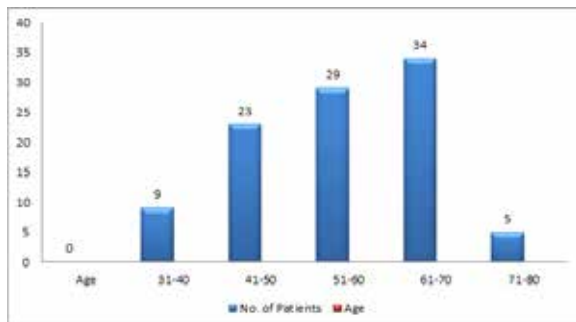


Fig 2 -Age Distribution



STEMI and NSTEMI Myocardial Infarction

Table 1 shows that Anterior wall MI was diagnosed in 53 patients followed by inferior wall MI in 27 patients. NSTEMI was diagnosed in 20 patients.

Table 1 : Diagnosis at the time of presentation n = 100

Diagnosis	No. of patients	Percentage
Anterior-wall MI	53	53%
NSTEMI	20	20%
Inferior wall M1	27	27%

LVEF measured showed 25 patients with severe LVEF(LVEF<30%),- followed by 30 patients with moderate LVEF(30-40%) and 25 patients had mild LVEF (LVEF-40-50%) 20 patients had normal LVEF

WBC count in different levels of LVEF

Table . 2. Shows that WBC count in different levels of LVEF. The range of WBC count was from 4000-30,000 cells /mm³ High TLC was observed in 29 patients of which 16 patients (55%) had severe LVEF. 39 patients had WBC count10000-14900 cells of which 15 patients(38%) had moderate LVEF.32 patients had normal count of which 12(37.5%) patients had mild LVEF and 12(37.5%) had normal echo study. Statistically significant association of high TLC (<<0.05) with severe LVEF was

observed.

Table 2 : WBC count in different levels of LVEF

LVEF	WBC COUNT <10000	WBC COUNT 10000-14900	WBC COUNT >150000	TOTAL
SEVERE	1	8	16	25
MODERATE	7	15	8	30
MILD	12	10	3	25
NORMAL	12	6	2	20
TOTAL	32	39	29	100

P value=0.0001, $\chi^2 =30.99,df=6$.statistically significant association of high WBC count with severe LVEF .

VI. Discussion :

The role of leucocytes in the initiation and progression of atherosclerosis, atherothrombosis and microvascular injury is a well known phenomenon⁴. Mohammad Madjid,et al and Coller et al ^{7,10} in their articles have reviewed many studies which correlates leucocyte count and patients with AMI or unstable angina.

Tahir ahmed et al⁸ has shown that WBC count on admission predicts short term and long term mortality of patients with ACS. In his study 133 patients with acute coronary syndromes were categorized based on WBC counts. Patients were followed for a period of one year and those with WBC count >10000 cells / mm³ had both high short term and long term mortality and concluded that WBC count is an independent predictor of adverse cardiovascular events. Mohammad Madjid,et al⁷ has quoted studies reporting WBC count as an independent risk factor for coronary heart disease(CHD) adjusting for other risk factors including smoking.

LVSD is a frequent complication and potent predictor of poor outcomes in AMI. Leucocytosis has been shown to be associated with the development of heart failure in patients with AMI ³. Mechanisms by which WBC's contribute to microvascular injury are as follows. Pressure dependent plugging of microvessels, endothelial cell injury by oxidative and proteolytic damage, decreased WBC deformability, increased leucocyte adhesiveness, hypercoagulable state with decreased epicardial patency. Leucocytes also promote infarct expansion^{7,8,10}.

Cooper et al¹¹ has shown that each increase in TLC of 10,000 / mm³ was associated with an increased risk of death with LVSD in AMI patients. Barron et al⁸, Christopher et al¹² have shown development of CHF with higher WBC count. Aggelopolus et al⁹ has shown that elevated WBC levels are independent predictors of development of LVSD after an acute coronary syndrome.

Nasir et al¹³ has found significant inverse association between WBC count and LVEF and positive correlation between WBC count and stages of left ventricular hypertrophy in end stage renal disease patients on regular hemodialysis.

Eslandarian et al³ in his case control study, categorized the patients into a test group with LVEF<45% and a control group with LVEF>45% and observed leucocytosis (>11000cells/mm³) in 47.8% of patients with LVEF<45%.In our study we categorized the patients based on LVEF as normal, mild,moderate and severe and measured WBC counts in each group. We observed high leucocyte count in patients with severe(55%) and moderate (38%) LVEF.

In our study significant association was noted between raised WBC count and LVSD after AMI (P<0.005) and our results were comparable with that reported in other studies.

VII. Conclusion

The results from this study show that elevated initial leukocyte count has statistically significant association with severe LV dysfunction in patients with AMI. Since WBC count is an inexpensive tool it can be done for risk stratification. In future, studies to be conducted to evaluate whether the pharmacological treatment targeted towards leucocytes are valuable in preventing micro vascular injury.

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