IJBC 2015; 7(5): 223-226

Iranian Journal of Blood & Cancer

Journal Home Page: www.ijbc.ir

ORIGINAL ARTICLE

The Prognostic Value of White Blood Cells Count in Patients with Myocardial Infarction

Ali Shahriari Ahmadi[1], Abdollah Amirfarhangi[1], Abbas Gheisoori[1]*, Mohsen Arabi[1], Alireza Mahmoudian[1], Mehrdad Payandeh[2], Masoud Sadeghi[3]

[1]Department of Hematology-Oncology, Rasoul-e-Akram Hospital, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Hematology-Oncology, Kermanshah University of Medical Sciences, Kermanshah, Iran
[3]Medical Biology Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

ARTICLE INFO

Article History:
Received: 27.06.2015
Accepted: 1.09.2015

Keywords:
Leukocytosis
Mortality Rate
Myocardial infarction
WBC Count
Prognostic factor

**Corresponding author:*
Abbas Gheisoori,
Department of Hematology-Oncology,
Rasoul-e-Akram Hospital,
Tehran University of Medical Sciences,
Tehran, Iran
Tel: +98 9188413243
Email: gheisoori85245@yahoo.com

ABSTRACT

Background: Ischemic heart disease and acute myocardial infarction is one of the most dramatic manifestations in one of the most investigated fields in the past few decades. In this study, the prognostic value of white blood cells count in patients with myocardial infarction (MI) was investigated in a six months follow-up.
Methods: In this cohort study, 106 patients with MI were investigated. White blood cell counts were assessed 48 hours after MI and the location of MI was determined using ECG. Mortality rate was determined and their correlation with leukocytosis was analyzed up to 6 months of follow-up. Binary logistic regression analysis was applied between factors such as mortality rate, location of the myocardial infarction, sex, hemoglobin and WBC count.
Results: Mean age of the patients was 62.5±13.3 years. 76.4% were men. 26% of patients had leukocytosis. Leukocytosis was significantly correlated with mortality in a six-month follow-up period (P<0.001). Fifteen (14.2%) patients died during the first three months of follow-up, of which 13 (86.7%) had leukocytosis. It was also shown that mean age of the patients and anemia in deceased group were significantly more than the survived group.
Conclusion: High WBC count in the first 48-h after MI can be regarded as a poor prognostic factor and it has an independent role in determining prognosis of patients with MI for the next six months.

Please cite this article as: Shahriari Ahmadi A, Amirfarhangi A, Gheisoori A, Arabi M, Mahmoudian AR, Payandeh M, Sadeghi M. The Prognostic Value of White Blood Cells Count in Patients with Myocardial Infarction. IJBC 2015; 7(5): 223-226.

Introduction

Coronary artery disease is the major cause of death in most modern societies across the globe. In addition, the disease leads to high morbidity, disability and loss of productivity. The clinical symptoms of coronary heart disease contain a spectrum of silent ischemia to chronic stable angina, unstable angina, acute myocardial infarction, ischemic cardiomyopathy, sudden cardiac death, arrhythmias and cardiogenic shock. Currently, 900,000 people are diagnosed with acute myocardial infarction (AMI) in the United States each year, of those about 225,000 die due to arrhythmia or heart failure.[1-5]

Systemic inflammation is triggered by myocardial infarction which is associated with the release of hematopoietic precursor cells from bone marrow into blood stream.[6,7] Understanding the cellular changes during AMI could be practically prognostic.[8] Likewise, it has been shown that immunologic changes following AMI have prognostic value for severity of AMI; however, are independent of risk factors and number of arteries involved.[9] It has been show that there is a significant correlation between the ischemic severity and the magnitude of cellular changes[10] as a consequence of acute phase response.[11]

Based on previous reports on importance of the cellular changes following AMI, this study was aimed to investigate prognostic value of the changes in hemoglobin and leukocytes in patients with myocardial during a six-month period in Iranian patients.

Patients and Methods

In a cohort study, 106 patients admitted in CCU ward of Rasul-Akram Hospital, Tehran, Iran were enrolled onto this study. Diagnostic criteria of AMI were typical or atypical chest pain that were confirmed by changes in pattern of ECG and increased levels of blood or cardiac enzymes. Patients with a history of blood disorders, including chronic anemia, leukemia and lymphoma were excluded. Complete blood count for each patient was performed within 48 hours after admission and monthly during a 6-month follow-up period after discharge. Several parameters including age, sex, mortality rate, location of myocardial infarction, and changes in leukocyte and hemoglobin levels were studied.

Data were analyzed using SPSS version 18 statistical software. The frequency for qualitative variables and mean and standard deviation for quantitative variables were calculated. Chi-square and Fisher's exact tests were used for hypothesis analysis. Binary logistic regression model was used to identify the prognosis factors during the 6-month period. The confidence limit was 95% and P<0.05 was statistically significant.

Results

In the current study, demographic and paraclinical data of 106 patients with AMI were investigated. 81 (76.4%) out of 106 patients were male. Mean age of the patients was 62.5±13.3 years (ranged from 40 to 89 years). Patients were divided into two age groups of ≤60 years (54 patients or 50.9%) and >60 years (52 patients or 49.1%). Table 1 shows the demographical parameters.

Average WBC

Mean WBC count of patients was 8616±2971/µl (ranged between 4800-22,000/µl). It was found that 28 patients (26.4%) had a WBC count above 10,000/µl, an indication of leukocytosis. Mean hemoglobin level of patients was 13.2±1.7 g/dl (range: 8.6-16.9 g/dl). Mean number of platelets were 205000±61000 /µl, which ranged from 99,000 to 408000.

Frequency of Death

13 out of fifteen patients who died during a period of six-month follow-up had leukocytosis (86.7%). A statistically significant correlation was found between mortality rate and leukocytosis (table 1). It was shown that mean age of the patients and incidence of anemia in deceased group was significantly more than survived group (P<0.001 and P=0.01, respectively). Mortality rate was higher in men and anterior wall MI was found to be more prevalent than inferior wall MI (table 1).

Binary logistic regression analysis was used to determine the factors that affect mortality rate. It was shown that leukocytosis was an independent prognostic factor in patients with MI (P<0.001, exp (B)=23.03) (table 2).

Discussion

Ischemic heart disease and acute myocardial infarction (AMI) are among the most dramatic manifestations of cardiac diseases in the past few decades.[12]

Bae et al. concluded that combination of WBC, hemoglobin and platelet distribution width (PDW) are useful markers in early risk stratification in patients with AMI.[13]

A total of 404 patients who had undergone primary percutaneous coronary intervention (PPCI) showed that neutrophil/lymphocyte ratio was found to be associated independently with early infarct-related artery patency before PPCI in patients who have undergone PCI for ST-

Table 1: Demographical characteristics of the patients with MI

Characteristics	Total (n=106)	Deceased (n=15)	Survived (n=91)	P value
Age (year)	62.5±13.3	79.3±7.5	59.8±11.2	<0.001
Gender (male)	81 (76.4)	9 (60)	72 (79.1)	0.1
Gender (female)	25 (23.6)	6 (40)	19 (20.9)	
Anterior wall MI	64 (60.4)	8 (53.03)	56 (61.5)	0.5
Inferior wall MI	42 (39.6)	7 (46.7)	35 (38.5)	
WBC<10,000 /µl	78 (73.6)	2 (13.3)	76 (83.5)	<0.001
WBC>10,000 /µl	28 (24.4)	13 (86.7)	15 (16.5)	
Hb<13g/dl	41	10 (66.7)	31 (34.1)	0.01
Hb>13g/dl	65	5 (33.3)	60 (65.9)	

Table 2: Main determinants of short-term mortality in a multivariable binary logistic regression model

Characteristics	P value	Odds ratio	95% confidence Interval
Age [<60y vs ≥60y]	0.99	2.1	0.21-6.12
Gender [male vs female]	0.98	1.002	0.19-5.2
Leukocytosis [WBC<10000 vs WBC>10000]	<0.001	23.03	4.06-13.5
Anemia [Hb<13 vs Hb>13]	0.01	2.9	0.61-13.8
Location of MI [Anterior vs Inferior]	0.27	0.4	0.08-2.04

elevation myocardial infarction (STEMI). Therefore, these simple parameters can provide useful information on the related risk evaluation in these patients.[14]

Núñez et al. studied records of 1118 consecutive patients who were admitted with a diagnosis of AMI. WBC count was measured 24 hours following admission and All-cause mortality was recorded during a median follow-up period of 10+/-2 months. They concluded that WBC count on admission was an independent predictor of long-term mortality in AMI patients.[15]

Leukocytosis is reported to be associated with adverse hospital outcome in patients presenting with AMI. The association of this prognostic factor with hospital mortality and heart failure in patients with other acute coronary syndromes is unclear.[16] Furman et al. examined the association between admission leukocyte count and hospital mortality and heart failure in 8269 patients presenting with acute coronary syndrome and concluded initial leukocyte count is an independent predictor of hospital death and the development of heart failure.[16]

In another study on 585 patients with acute non-STEMI, blood leukocyte count was measured immediately after admission in the emergency department. Again leukocytosis on admission was an independent predictor of cardiovascular events in patients with acute non-STEMI.[17]

In a study investigating 152 patients suffering from ischemic heart disease (IHD) for up to 5-year follow-up, 1.8 times more mortality rate was observed in patients with leukocytosis (WBC>9000 /µl).[18] Another study also indicated a 10.4% higher mortality rate in patients with leukocytosis (WBC>15000/µl) within the first month of MI.[19]

To remove the effects of confounding factors such as sex and location of infarction, we did a logistic regression analysis. It was found that leukocytosis was an independent factor of mortality rate in the first 6 months following AMI. The death frequency was 20.4 times more common in patients with leukocytosis than deceased patients without leukocytosis. A previous study also demonstrated leukocytosis as an independent factor of mortality rate during a 10-year follow up investigation with a risk of 2.79, suggesting that a long term follow-up care of the patients with leukocytosis might reduce the mortality rate.[20] In current study, the association between mean WBC count and prognosis of the myocardial infarction was investigated during the first 48 hours and up to six months after onset of MI. The results showed that mortality rate was significantly associated with leukocytosis up to six-month follow-up period ($P<0.001$).

Conclusion

The findings of the current study showed that leukocytosis in patients with MI was significantly associated with higher rates of mortalities in short term follow up. Therefore, better care measurements and if necessary, performing invasive procedures, including PCI or coronary artery bypass grafting (CABG), can reduce mortality in these patients. Longer studies are required to provide precise information towards better understanding of the prognostic variables in patients with AMI.

Conflict of Interest: None declared.

References

1. Gardini E, Caravita L, Ottani F, Ferrini D, Galvani M. Coronary care units: who to admit and how long. G Ital Cardiol (Rome). 2007;8(5 Suppl 1):5S-11S.
2. Jones I, Flather M, Johnson M, Barrow S, Thompson D. A description of the characteristics of patients with non-ST elevation acute coronary syndromes admitted to different settings in the 1990s. Intensive Crit Care Nurs. 2008;24(5):286-94.
3. Saitto C, Ancona C, Fusco D, Arcà M, Perucci CA. Outcome of patients with cardiac diseases admitted to coronary care units: a report from Lazio, Italy. Med Care. 2004;42(2):147-54.
4. Jairath N. Strategies for motivating CCU patients. Dimens Crit Care Nurs. 1994;13(6):326-33.
5. Andreoli TE, Carpenter CJ, Griggs Benjamin IJ. Cecil Essentials of Medicine. 7th edition. W.B. Saunders. 2007.
6. Biasucci LM, Liuzzo G, Angiolillo DJ, Sperti G, Maseri A. Inflammation and acute coronary syndromes. Herz. 2000;25(2):108-12.
7. Wojakowski W, Tendera M. Mobilization of bone marrow-derived progenitor cells in acute coronary syndromes. Folia Histochem Cytobiol. 2005;43(4):229-32.
8. Rho YH, Chung CP, Oeser A, Solus J, Raggi P, Gebretsadik T, et al. Novel Cardiovascular Risk Factors in Premature Coronary Atherosclerosis Associated with Systemic Lupus Erythematosus. J Rheumatol. 2008; 35(9): 1789-94.
9. Al-Ahmad RS, Mahafzah AM, Al-Mousa EN. Immunological changes in acute myocardial infarction. Saudi Med J. 2004;25(7):923-8.
10. Dimitrijevic M, Vasiljevic Z, Vuckovic-Dekic L, Spasic S. The involvement of immune reactions in cardiac damage during acute myocardial infarction: role of cell-mediated immune response. Panminerva Med. 1997;39(2):85-94.
11. Baumann H, Gauldie J. The acute phase response. Immunol Today. 1994;15(2):74-80.
12. Djurdjevic PM, Arsenijevic NN, Baskic DD, Djukic AL, Popovic S, Samardzic G. Systemic response of peripheral blood leukocytes and their phagocytic activity during acute myocardial infarction. Exp Clin Cardiol. 2001;6(3):159-66.
13. Bae MH, Lee JH, Yang DH, Park HS, Cho Y, Chae SC. White blood cell, hemoglobin and platelet distribution width as short-term prognostic markers in patients with acute myocardial infarction. J Korean Med Sci. 2014;29(4):519-26.
14. Kurtul A, Murat SN, Yarlioglues M, Duran M, Karadeniz M, Ergun G, et al. The relationship between neutrophil/lymphocyte ratio and infarct-related artery patency before mechanical reperfusion in patients with ST-elevation myocardial infarction. Coron Artery Dis. 2014;25(2):159-66.

15. Núñez J, Fácila L, Llàcer A, Sanchís J, Bodí V, Bertomeu V, et al. [Prognostic value of white blood cell count in acute myocardial infarction: long-term mortality]. Rev Esp Cardiol. 2005;58(6):631-9.
16. Furman MI, Gore JM, Anderson FA, Budaj A, Goodman SG, Avezum A, et al. Elevated leukocyte count and adverse hospital events in patients with acute coronary syndromes: findings from the Global Registry of Acute Coronary Events (GRACE). Am Heart J. 2004 Jan;147(1):42-8.
17. Dharma S, Hapsari R, Siswanto BB, van der Laarse A, Jukema JW. Blood Leukocyte Count on Admission Predicts Cardiovascular Events in Patients with Acute Non-ST Elevation Myocardial Infarction. Int J Angiol. 2015;24(2):127-32.
18. Amaro A, Gonzalez-Juanatey JR, Iglesias C, Martinez-Sande L, Trillo R, Garcia-Acuna J. Leukocyte count as a predictor of the severity ischaemic heart disease as evaluated by coronary angiography. Rev Port Cardiol 1993;12:913-7.
19. Barron HV, Harr SD, Radford MJ, Wang Y, Krumholz HM. The association between white blood cell count and acute myocardial infarction mortality in patients > or =65 years of age: findings from the cooperative cardiovascular project. J Am Coll Cardiol. 2001;38(6):1654-61.
20. Yarnell JW, Patterson CC, Sweetnam PM, Lowe GD. Haemostatic/inflammatory markers predict 10-year risk of IHD at least as well as lipids: the Caerphilly collaborative studies. Eur Heart J. 2004;25(12):1049-56.