Section: Medicine

Original Research Article

PREDICTORS ASSOCIATED WITH POOR OUTCOMES IN PATIENTS OF ACUTE MYOCARDITIS

Received : 15/03/2024
Received in revised form : 16/05/2024
Accepted : 30/05/2024

Keywords:
Acute Myocarditis, Clinical Parameter, Cardiac Enzymes, Echocardiography.

Corresponding Author:
Dr. Ayasa Parveen,
Email: ayasha.salim7@gmail.com

DOI: 10.47009/jamp.2024.6.3.118

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (3); 582-586

Ayasa Parveen[1], Mohammad Sheeraz[2]

[1]Assistant Professor, Department of Medicine, IIMSR, Lucknow, Dashauli, Uttar Pradesh, India
Assistant Professor, Department of Pediatrics, IIMSR, Lucknow, Dashauli, Uttar Pradesh, India.

Abstract

Background: Myocarditis is a potentially life threatening inflammatory disorder of the myocardium. Presentation in acute myocarditis in adult varies from mild flu like Illness to a fatal fulminent form. Early identification of the severity of illness by clinical parameters and investigation is helpful in prioritization of intensive care especially in developing countries with limited resources. The aim is to know the factors at admission that can be associated with poor outcomes in patients of acute myocarditis. **Materials and Methods:** The present study was conducted in the IIMS&R Lucknow. This was an observational study which enrolled adults who presented with the fever of acute onset (less than 15 days in duration), and were diagnosed as suspected myocarditis on the basis of clinical features, Troponin I and echocardiography. Adult patients with known cardiac lesions, congenital or acquired, presenting with heart failure were excluded. Their clinical features, cardiac biomarkers and echocardiography findings were compared between survivors and non-survivors. Statistical analysis is data was collected and analyzed using SPSS version 16. Fisher's exact test (used where expected frequency was less than 5), was used for categorical variables and Student's T- test was used for continuous variables depending on whether they are normally distributed or not. P value of less than 0.05 was considered significant. **Result:** All patients were diagnosed as suspected myocarditis according to expanded criteria. 21 Patients died while 69 patients survived. So total of 90 patients of suspected myocarditis were observed for this study. There was no statistically significant difference in survivors and non survivors in terms of clinical parameters like tachycardia, tachypnea and hypotension at the time of admission. It was also observed that 100%of patients who died had raised troponin levels ($p<0.05$), while 81.1% patients who survived had raised troponin level at the time of admission and this increament was statistically significant ($p=0.0336$). Similarly 95.2% of patients who died had raised CPK-MB levels at the time of admission.($p<0.05$) than in comparison to the patients who survived which was also statistically significant ($p=0.0346$). SGOT was raised in 90.4% of patients who died but its increment was not statistically significant. LV ejection fraction (<50%) was decreased more in non survivor group (100%) as compared to survivor group (81.1%) which was statistically significant ($p=0.0336$). Rest all parameters of echocardiography like cardiac dilation, Regional wall motion abnormality,and Regional cardiac hypertrophy were abnormal equally in both the groups and was not statistically significant. In our study, Cardiac marker TROP I ($p=0.0336$), CPKMB ($p=0.0346$) and ejection fraction ($p=0.0336$) independently were the predictors of poor outcomes in our study group. **Conclusion:** In this observational study of Risk factors affecting poor outcomes in patients of myocarditis in adult of age group 15-45 year was increased level of cardiac markers, troponin I and CPK-MB and on echocardiography, ejection fraction (<50%) was most common predictor of mortality at admission.

INTRODUCTION

Myocarditis is an inflammatory process of the myocardium that can have an assortment of different etiologies such as infection, systemic disease and/or exposure to medications and toxins.[1] It has been defined by the World Health Organization/ International Society and Federation of Cardiology as an inflammatory disease of the heart muscle diagnosed by established histological, immunologic, and immunohistological criteria.[2]

Inview of its clinical presentation and treatment in both adults,[3-8] and children,[9-13] have been the subject of a number of recent reviews. It is caused primarily by numerous infectious agents, but it may also accompany autoimmune disease, hypersensitivity reactions, and toxins.

There are a variety of clinical presentations ranging from mild dyspnea and chest pain that can be self-limiting to cardiogenic shock and death.[14] Although there can be several causes, viral infection remains the leading cause of both acute and chronic myocarditis.[14,15] Common viral infections associated with infection of the myocardium are the adenoviruses and Coxackievirus B, although other viruses have been associated with myocarditis such as Human Immunodeficiency Virus (HIV), Cytomegalovirus (CMV), Epstein-Barr Virus (EBV) and herpes virus, HSV.[14-16]

Myocarditis is a potentially life-threatening inflammatory disorder of the myocardium. About half of the cases of dilated cardiomyopathy in children are due to myocarditis.[17] the mortality rates for infants and children with myocarditis may be as high as 75% and 25%, respectively,[18] and adult 27-39%. early initiation of therapy is potentially beneficial and prompt diagnosis is imperative.[19]

Presentation in acute myocarditis in adult varies from mild flu like Illness to a fatal fulminent form. In many instances, the clinical course in acute myocarditis is monophasic with spontaneous recovery after several days of congestive heart failure.[20] On the other hand, some patients rapidly progress into cardiogenic shock before or after hospitalization.[20] Ventricular arrhythmias, cardiogenic shock or cardiac arrest, are serious complications, during acute phase appearing unexpectedly.[21] Some patients may progress into subacute or chronic forms, with death as the final outcome.[21]

Furthermore, the predictors of the mortality in acute myocarditis have not yet been established in adults. In the present study, we examined hemodynamic variables, cardiac biomarkers and echocardiographic findings at admission in patients with suspected myocarditis and their impact on mortality.

MATERIALS AND METHODS

The present study was conducted in the IIMS&R Lucknow This was an observational study which enrolled adults who presented with the fever of acute onset (less than 15 days in duration), and were diagnosed as suspected myocarditis on the basis of clinical features, Troponin I and echocardiography.[22] Adult patients with known cardiac lesions, congenital or acquired, presenting with heart failure were excluded. On admission, patients were subjected to detailed history and clinical examination.

Complete blood count, erythrocyte sedimentation rate, C-reactive protein was done in all patients. Chest X-ray, cardiac enzymes: Troponin I, BNP (brain natriuretic peptide) and CPK-MB (creatinine phosphokinase) (The Alere Triage® Cardio3 Panel) were done at admission. Detailed echocardiographic examination including M-mode, 2-dimensional, and colour doppler echocardiography with colour-coding character was done in all patients. Echocardiograms were performed in the supine position and left lateral position with the right shoulder slightly raised, using modern digital echocardiographic equipment (Toshiba SSA 380 Power-Vision, Tokyo, Japan). We followed recommendations for standardising measurements made from M mode echocardiograms.[23,24] Centile charts (3rd, 10th, 25th, 50th, 75th, 90th, and 97th centiles) were constructed for each measurement in relation to body surface area.[25]

Study Type: In previously treated patients, an observational study was planned to evaluate the predictors of mortality in patients suffering from acute / fulminant myocarditis of age group 15yr-45yr.

Study Design: A cross-sectional study was planned to evaluate the study.

Study Population: Case material for this study was the patients admitted to Department of Internal Medicine IIMS&R Lucknow as a case of acute myocarditis.

Sample Size: A sample of 90 patients were taken in which 61 patients survived and 21 patients expired. Patients who expired were compared with those who survived in terms of clinical features, cardiac markers and echocardiography findings.

Inclusion Criteria

- Recent history of viral prodrome in adults aged 15- 45 year, with fever of less than 2 weeks duration
- Development of acute and severe heart failure following this illness – Difficulty in breathing, edema, hepatomegaly, tachycardia, gallop rhythm, muffled heart sound.
- Myocardial dysfunction characterized by raised Troponin- I level(>0.05IU/dl) and/or acute myocarditis according to echocardiography –

Acute myocarditis- Markedly decreased LV EF<50%, Dilated LV, Normal septal thickness.

Exclusion Criteria

- Pre-existing cardiac illness (congenital or acquired).
- Condition known to be associated with acute congestive heart failure other than viral illness.

GROUP-A (survived): In previously treated patients from 15-45years groups fulfilling clinical diagnostic criteria of acute/fulminant myocarditis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

who had survived during course of illness during hospitalisation It was observed that there were 69 patients in this group.

GROUP-B (death): In previously treated patients from 15-45years groups fulfilling clinical diagnostic criteria for acute/fulminant myocarditis who died during course of illness during hospitalization .It was observed that there were 21 patients in this group

Data collection and work-up of study children: The previously treated patients which were admitted to department with confirm diagnosis of acute myocarditis fulfilling the inclusive criteria were included in study samples using consecutive sampling. Details of thepatients which were recorded on a daily basis in the form of history, clinical examination,routine investigation, chest X ray, ECG and echocardiography were taken in structured proforma.

Statistical analysis: Data was collected and analyzed using SPSS version 16. Fisher's exact test (used where expected frequency was less than 5), was used for categorical variables and Student's T- test was used for continuous variables depending on whether they are normally distributed or not. P value of less than 0.05 was considered significant.

Sample Collection: Cases with suspected myocarditis were studied for their clinical features, recovery patterns and other biochemical and imaging parameters.

- Blood investigation- CBC, random blood sugar, general blood picture, renal function test (serum urea, serum creatinine), liver function test (SGPT, SGOT), and ABG was done by standard methodology.
- Chest x-ray (cardiomegaly, pulmonary congestion)
- ECG (for myocarditis)
- 2D echo;

Echocardiography was done in department of radiology everytime by the same radiologistand he was not aware of clinical data of the two groups. TOSHIBA NEMIO SSA-550A machine equipped with a 12.0-MHz transducer was used for this purpose. M mode tracings were recorded through the both anterior and posterior left ventricular wall thickness, the left ventricular end diastolic diameter, and left ventricular end systolic diameter for atleast 3 consecutive cardiac cycles at a paper speed of 50 mm/s. From these measurements, left ventricular fractional shortening was calculated.

- CPK-MB and/or Trop-I enzyme marker.

2K41 ARCHITECT STAT Troponin-I Reagent kit

2K41 ARCHITECT STAT Troponin-I assay is a two step immunoassay to determine the presence of cTnI in human serum and plasma using CMIA (chemiluminescent microparticle immunoassay) technology with flexible assay protocols referred to as Chemiflex.

RESULTS

Present study on Predictor associated with poor outcomes in acute myocarditis (cross sectional study-an observational study) was carried out at the Department of Medicine, Integral Institute of Medical Science & Reserch, Lucknow, of age group 15-45 years.

Previously treated patients for acute/fulminant myocarditis were selected for study.

All patients were diagnosed as suspected myocarditis according to expanded criteria. 21 Patients died while 69 patients survived. So total of 90 patients of suspected myocarditis were observed for this study.

Difference In Clinical Parameter between Survivors and Non-survivors

There was no statistically significant difference in survivors and non survivors in terms of clinical parameters like tachycardia, tachypnea and hypotension at the time of admission. [Table and Figure 1].

Cardiac Markers in Survivor and Non-survivor Group

It was also observed that 100%of patients who died had raised troponin levels ($p<0.05$), while 81.1% patients who survived had raised troponin level at the time of admission and this increament was statistically significant ($p=0.0336$).

Similarly 95.2% of patients who died had raised CPK-MB levels at the time of admission. ($p<0.05$) than in comparison to the patients who survived which was also statistically significant ($p=0.0346$).

SGOT was raised in 90.4% of patients who died but its increment was not statistically significant

Echocardiography in Survivor and Non-survivor Group

LV ejection fraction (<50%) was decreased more in non-survivor group (100%) as compared to survivor group (81.1%) which was statistically significant ($p=0.0336$) [Table/Fig-4d,5]. Rest all parameters of echocardiography like cardiac dilation, Regional wall motion abnormality, and Regional cardiac hypertrophy were abnormal equally in both the groups and was not statistically significant. [Table/Fig-1].

In our study, Cardiac marker TROP I ($p=0.0336$), CPKMB ($p=0.0346$) and ejection fraction ($p=0.0336$) independently were the predictors of poor outcomes in our study group [Table/Fig-1].

ISSN (O): 2687-5365; ISSN (P): 2753-6556

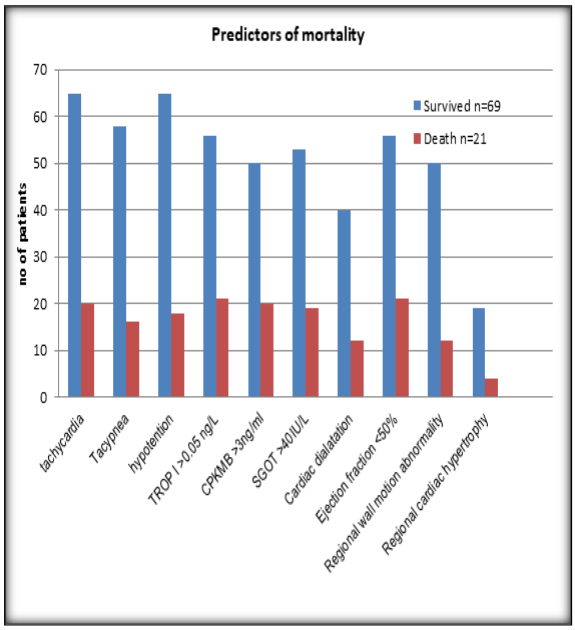

Figure 1

Table 1

	Survived n=69(%)	Death n=21(%)	P value
Clinical parmeters			
tachycardia	65(94.2)	20(95.2)	1.0000
Tacypnea	58(84.0)	16(76.1)	0.5148
hypotention	65(94.2)	18(85.7)	0.3472
Cardiac markers			
TROP I >0.05 IU	56 (81.1)	21(100)	0.0336
CPKMB >3ng/ml	50 (72.4)	20 (95.2)	0.0346
SGOT >40IU/L	53 (76.8)	19 (90.4)	0.2231
Echocardiography			
Cardiac dialatation	40(57.9)	12(57.1)	1.0000
Ejection fraction <50%	56(81.1)	21(100)	0.0336
Regional wall motion abnormality	50(72.4)	12(57.1)	0.1919
Regional cardiac hypertrophy	19(27.5)	4(19.0)	0.5721

DISCUSSION

Clinical presentation: There was no statistically significant difference in the clinical presentation and examination of the two groups at admission. [Table 1]

Cardiac enzymes: Increased level of cardiac markers, troponin I and CPK-MB at admission were associated with increased mortality in patients of acute myocarditis [Table 1]. Biomarkers have become an increasingly important clinical tool for assessing cardiovascular disease and progression to heart failure. Biomarkers are used in early detection of sub-clinical disease, diagnosis, risk stratification, monitoring disease state, and to determine therapies.[26] Many biomarkers are also risk factors directly involved in the pathogenesis of disease.

On echocardiography, ejection fraction (<50%) was most common predictor of mortality [Table 1]. Earlier Schultz et al,[27] had reported that the prognosis for patients with acute myocarditis varies but depends on ejection fraction (EF), clinical presentation and pulmonary artery pressure. In a series of biopsy-proven lymphocytic myocarditis cases, Magnaniet al. used a multivariate predictive model and identified presentation with syncope, bundle branch block, or an EF <40% as significant predictors of increased risk of death or transplantation.

There were certain limitations in our study. As our primary objective was to know the predictors associated with poor outcomes in myocarditis patients, we had not done endomyocardial biopsy which is the gold standard test for ethical reasons. Another concern is that we had not done follow-up of our patients to deduce the long-term outcome of our patients who survived.

CONCLUSION

The main interest of this study was to evaluate the risk factors associated with poor outcomes in patients of acute myocarditis based on clinical parameters, cardiac biomarkers, CPKMB, troponin I and Echocardiography. In this observational study of factors affecting poor outcomes in patients of myocarditis in adult of age between 15-45 year was increased level of cardiac markers, troponin I and CPK-MB and on echocardiography, ejection fraction (<50%) was most common predictor of mortality [Table1].

ISSN (O): 2687-5365; ISSN (P): 2753-6556

These data on the use of y-globulin in acute/fulminant myocarditis should be viewed as preliminary in view of several limitations in our study. Our patient selection and exclusion criteria attempted to maximize the percentage of patients with acute/fulminant myocarditis in the study sample, but discrimination of acute/fulminant myocarditis from the acute presentation of a cardiomyopathy was necessarily inexact. Also it was difficult to differentiate between acute and fulminant myocarditis because they had mixed features of both of these conditions, it was differentiated by clinical and echocardiographic findings. Acute and convalescent viral titers were not systematically obtained in this observational study, and endomyocardial biopsies that might have yielded additional supportive evidence of acute/fulminant myocarditis were not performed for ethical reasons. Finally, we did not have follow-up data for the patients with persistent LV dysfunction and how many developed complications, such as dilated cardiomyopathy.

In summary, In this observational study of Risk factors affecting poor outcomes in patients of myocarditis in adult of age group 15-45 year was increased level of cardiac markers, troponin I and CPK-MB and on echocardiography, ejection fraction (<50%) was most common predictor of mortality at admission.

REFERENCES

1. Bowles NE, Vallejo J (2003) Viral causes of cardiac inflammation. Curr Opin Cardiol 18: 182-188.
2. Richardson P, McKenna W, Bristow M, Maisch B, Mautner B, O'Connell J, Olsen E, Thiene G, Goodwin J, Gyarfas I, Martin I, Nordet P. Report of the 1995 World Health Organization/International Society and Federation of Cardiology Task Force on the Definition and Classification of Cardiomyopathies. Circulation. 1996;93:841–842.
3. Magnani JW, Dec GW. Myocarditis: current trends in diagnosis and treatment. Circulation. 2006;113:876–890.
4. Cooper LT Jr. Myocarditis. N Engl J Med. 2009;360:1526–1538.
5. Schultheiss HP, Kühl U, Cooper LT. The management of myocarditis. Eur Heart J. 2011;32:2616–2625.
6. Kindermann I, Barth C, Mahfoud F, Ukena C, Lenski M, Yilmaz A, Klingel K, Kandolf R, Sechtem U, Cooper LT, Böhm M. Update on myocarditis. J Am Coll Cardiol. 2012;59:779–792.
7. Sagar S, Liu PP, Cooper LT Jr. Myocarditis. Lancet. 2012;379:738–747.
8. Elamm C, Fairweather D, Cooper LT. Pathogenesis and diagnosis of myocarditis. Heart. 2012;98:835–840.
9. Acute viral myocarditis in children: guidelines. Bohn D, ed. Pediatr Crit Care Med. 2006;(suppl 6):S1–S24.
10. Kühl U, Schultheiss H-P. Myocarditis in children. Heart Fail Clin. 2010;6:483–496.
11. Levine MC, Klugman D, Teach SJ. Update on myocarditis in children. Curr Opin Pediatr. 2010;22:278–283.
12. Foerster SR, Canter CE. Contemporary etiology, outcomes, and therapy in pediatric myocarditis. Prog Pediatr Cardiol. 2011;31:123–128.
13. May LJ, Patton DJ, Fruitman DS. The evolving approach to paediatric myocarditis: a review of the current literature. Cardiol Young. 2011;21:241–251.
14. Goland S, Czer LS, Siegel RJ, Tabak S, Jordan S, et al. (2008) Intravenous immunoglobulin treatment for acute fulminant inflammatory cardiomyopathy: series of six patients and review of literature. Can J Cardiol 24: 571-574.
15. Gupta S, Markham DW, Drazner MH, Mammen PP (2008) Fulminant myocarditis. Nat Clin Pract Cardiovasc Med 5: 693-706.
16. Cooper LT (2009) Myocarditis. N Engl J Med 360: 1526-1538.
17. Towbin JA, Lowe AM, Colan SD, Sleeper LA, Orav EJ, Clunie S, et al. Incidence, [1]causes, and outcomes of dilated cardiomyopathy in children. JAMA. 2006; 296(15):1867–76.
18. Dancea AB. Myocarditis in infants and children: a review for the paediatrician. [3]J Paediatr Child Health. 2001;343:1388–98.
19. Drucker NA, Colan SD, Lewis AB, Beiser AS, Wessel DL, Takahashi M, et al. [4]Globulin treatment of acute myocarditis in the paediatric population. Circulation. 1994;89:252–57
20. Woodruff JF. Viral myocarditis: a review. [5]Am J Pathol. 1980;101:425–84.
21. Lieberman EB, Hutchins GM, Herskowitz A, Rose NR, Baughman KL. [6]Clinicopathologic description of myocarditis. J Am Coll Cardiol. 1991;18:1617–26.
22. Liu PP, Schultheiss HP. Myocarditis. In:. Braunwald's heart disease: a textbook of [7]cardiovascular medicine. (Volume 2). Libby P, Braunwald E (Ed.), W. B. Saunders, Philadelphia, 2008;1784-1785
23. Roeland J, Gibson DG. Recommendations for standardization of measurements [8]from M-mode echocardiograms. Eur Heart J. 1980;1:375–78.
24. Sahn DJ, DeMaria A, Kisslo J, Weyman. A. Recommendations regarding [9]quantitation in M-mode echocardiography: results of a survey of echocardiographic measurements. Circulation. 1978;58:1072–83.
25. Kampmann C, Wiethoff CM, Wenzel A, Stolz G, Betancor M, Wippermann C-F, [10]et al. Normal values of M mode echocardiographic measurements of more than 2000 healthy infants and children in central Europe. Heart. 2000;83(6):667–72.
26. Hochholzer W, Morrow DA, GiuglianoRP. Novel biomarkers in cardiovascular disease: update 2010. American Heart Journal 2010;160:583-594.
27. Schultz JC, Hillard AA, Cooper LT Jret al. Diagnosis and treatment of viralmyocarditis. MayoCli.2009;84:1001-1009.

ISSN (O): 2687-5365; ISSN (P): 2753-6556