International Journal of Research in Medical Sciences
Rajan N et al. Int J Res Med Sci. 2026 Aug;14(8):3472-3476
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20262638

Original Research Article

Cardiovascular manifestations in HIV-infected patients: a cross-sectional study from a tertiary care hospital

Nayana Rajan*, Anita Paritekar

General Medicine, Rajarshee Chhatrapati Shahu Maharaj Government Medical College and CPR Hospital, Kolhapur, Maharashtra, India

Received: 06 May 2026
Revised: 06 July 2026
Accepted: 18 July 2026

***Correspondence:**
Dr. Nayana Rajan,
E-mail: dr.nayanarajan305@gmail.com

ABSTRACT

Background: Human Immunodeficiency Virus (HIV) infection is associated with various cardiovascular manifestations, many of which remain asymptomatic and contribute significantly to morbidity. The present study was conducted to evaluate the prevalence and spectrum of cardiovascular manifestations among HIV-infected patients and to assess their association with CD4 counts and antiretroviral therapy adherence.
Methods: This hospital-based cross-sectional study included 100 HIV-positive patients admitted to a tertiary care hospital between October 2019 and April 2021. Detailed clinical evaluation along with laboratory investigations including CD4 count, electrocardiography, chest radiography and two-dimensional echocardiography were performed in all patients. Coronary angiography was performed in selected patients when clinically indicated.
Results: Cardiovascular abnormalities were observed in 48% of patients, of which 64.5% were asymptomatic. Diastolic dysfunction was the most common echocardiographic abnormality (36%), followed by systolic dysfunction (23%), dilated cardiomyopathy (11%) and pericardial effusion (9%). Lower CD4 counts and anemia were significantly associated with cardiovascular involvement.
Conclusions: Cardiovascular manifestations are common in HIV-infected patients and often remain clinically silent. Routine cardiac evaluation, particularly echocardiography, may help in early detection of cardiac involvement in these patients.

Keywords: Cardiovascular manifestations, CD4 count, Cardiomyopathy, Echocardiography, HIV

INTRODUCTION

HIV infection continues to pose a significant public health challenge despite remarkable advances in diagnosis and treatment. The widespread availability of combination antiretroviral therapy (ART) has substantially improved survival, transforming HIV infection into a chronic manageable disease.

Consequently, non-AIDS-related conditions have emerged as important causes of morbidity and mortality among people living with HIV, with cardiovascular disease becoming increasingly recognized as a major contributor to adverse clinical outcomes.[1,2] Cardiovascular involvement in HIV infection is multifactorial and may result from direct viral injury to the myocardium, persistent immune activation, chronic inflammation, opportunistic infections, nutritional deficiencies, adverse metabolic effects of antiretroviral therapy and conventional cardiovascular risk factors.[3]

These mechanisms can lead to a broad spectrum of cardiac abnormalities, including left ventricular systolic and diastolic dysfunction, dilated cardiomyopathy, pericardial effusion, pulmonary hypertension, valvular heart disease and coronary artery disease.[5,6] Many of these

abnormalities remain clinically silent during the early stages of the disease and may only become apparent after significant cardiac damage has occurred.[4]

Several studies have reported that the prevalence of cardiovascular manifestations is higher among patients with advanced HIV infection, particularly those with lower CD4 cell counts.[7,10] However, the reported frequency and pattern of cardiac involvement differ across various populations because of differences in disease severity, access to antiretroviral therapy, demographic characteristics and diagnostic approaches.[4,8] Although a number of international studies have evaluated cardiovascular manifestations in HIV infection, data from Indian tertiary care hospitals remain relatively limited.

Early detection of cardiovascular abnormalities is essential because timely intervention may reduce disease progression and improve long-term outcomes. Echocardiography is a simple, non-invasive and readily available imaging modality that plays an important role in identifying subclinical cardiac abnormalities before the onset of symptoms.[3,4] The present study was therefore undertaken to determine the prevalence and spectrum of cardiovascular manifestations among HIV-infected patients admitted to a tertiary care hospital and to evaluate their association with CD4 count and antiretroviral therapy adherence.

METHODS

This hospital-based cross-sectional study was conducted in the Department of General Medicine at Rajarshee Chhatrapati Shahu Maharaj Government Medical College and CPR Hospital, Kolhapur, Maharashtra, India, over a period of 18 months from October 2019 to April 2021. A total of 100 HIV-positive patients aged more than 15 years admitted to the medicine wards during the study period were included in the study. Patients diagnosed according to National AIDS Control Organisation (NACO) guidelines and willing to provide informed consent for participation and cardiac evaluation were included. Patients with congenital heart disease, pre-existing ischemic heart disease, rheumatic valvular heart disease, hypertension diagnosed prior to HIV infection, diabetes mellitus and chronic kidney disease were excluded from the study.

Detailed clinical history including ART status and physical examination findings was recorded using a pretested case record proforma. Routine laboratory investigations including complete blood count, blood glucose and CD4 count were performed in all patients. Cardiovascular evaluation included chest radiography, electrocardiography (ECG) and two-dimensional echocardiography. Coronary angiography was performed in selected patients when clinically indicated following cardiology consultation.

Data were analyzed using statistical package for the social sciences (SPSS) software version 21. Qualitative variables were analyzed using Chi-square test and a p value of less than 0.05 was considered statistically significant. The study was approved by the Institutional Ethics Committee of Rajarshee Chhatrapati Shahu Maharaj Government Medical College and CPR Hospital, Kolhapur and written informed consent was obtained from all participants prior to enrolment in the study.

RESULTS

A total of 100 HIV-positive patients were included in the study, with male predominance (60%). The majority of patients had CD4 counts between 201–350 cells/mm³. Opportunistic infections, fever, acute gastroenteritis and anemia were common indications for admission (Table 1). Cardiovascular manifestations were observed in 48% of patients, among whom 64.5% were asymptomatic. ECG abnormalities were present in 26% of patients, while cardiomegaly was detected in 18% on chest radiography.

Diastolic dysfunction was the most common echocardiographic abnormality, followed by systolic dysfunction, dilated cardiomyopathy and pericardial effusion (Table 2). Lower CD4 counts showed statistically significant association with overall cardiovascular manifestations, dilated cardiomyopathy and diastolic dysfunction (Table 3). Anemia was also significantly associated with cardiovascular involvement. Coronary angiography was performed in selected patients when clinically indicated. Among the 13 patients who underwent coronary angiography, 7 patients had coronary artery disease while 6 had normal coronary arteries. No statistically significant association was observed between coronary artery disease and lower CD4 counts.

Table 1: Demographic and clinical profile of study participants.

Variables	Number (%)
Male	60 (60)
Female	39 (39)
Transgender	1 (1)
Opportunistic infections	20 (20)
Fever	17 (17)
Acute gastroenteritis	16 (16)
Anemia	14 (14)

Table 2: Echocardiographic findings among HIV-infected patients.

Echocardiographic findings	Number (%)
Diastolic dysfunction	36 (36)
Systolic dysfunction	23 (23)
Dilated cardiomyopathy	11 (11)
Pericardial effusion	9 (9)
Regional wall hypokinesia	7 (7)
Pulmonary hypertension	3 (3)
Mitral regurgitation	1 (1)

Table 3: Association of cardiovascular manifestations with CD4 count.

Cardiovascular manifestations	Association with lower CD4 count	P value
Overall cardiovascular disease	Significant	<0.05
Diastolic dysfunction	Significant	<0.05
Dilated cardiomyopathy	Significant	<0.05
Pericardial effusion	Not significant	>0.05
Coronary artery disease	Not significant	>0.05

Table 4: Coronary angiography findings in selected patients.

Coronary angiography findings	Number (%)
Normal coronaries	6 (46.15)
Coronary artery disease	7 (53.85)

DISCUSSION

The present study demonstrated that cardiovascular manifestations are common among HIV-infected patients, with nearly half (48%) of the study population showing evidence of cardiac involvement. A notable observation was that most affected patients were asymptomatic, emphasizing that clinically silent cardiovascular disease is frequent in HIV infection. This finding highlights the importance of routine cardiovascular evaluation, particularly in patients with advanced immunosuppression, as reliance on symptoms alone may delay diagnosis. Similar observations have been reported in previous studies, who also noted that asymptomatic cardiac involvement was more common than symptomatic disease in HIV-infected individuals.[4,8]

Diastolic dysfunction was the most frequent echocardiographic abnormality in the present study, followed by systolic dysfunction, dilated cardiomyopathy and pericardial effusion. Diastolic dysfunction has consistently been recognized as an early manifestation of HIV-associated myocardial involvement and may occur before overt systolic impairment becomes evident. Persistent immune activation, chronic systemic inflammation, endothelial dysfunction and direct viral effects on the myocardium have been proposed as mechanisms contributing to impaired myocardial relaxation.[3] Similar echocardiographic patterns have been described in studies by Mondy et al, Twagirumukiza et al and Barbaro et al, supporting the observation that diastolic dysfunction remains one of the most prevalent cardiac abnormalities in the era of antiretroviral therapy.[4,6,8] Lower CD4 cell counts showed a significant association with overall cardiovascular manifestations, dilated cardiomyopathy and diastolic dysfunction. Patients with greater immunosuppression were more likely to have echocardiographic abnormalities, suggesting that declining immune status contributes to myocardial involvement. This observation is consistent with previous studies demonstrating an increased prevalence of cardiac disease among patients with advanced HIV infection. Barbaro reported that HIV-associated dilated cardiomyopathy was more common in advanced stages of the disease, while Kaplan et al demonstrated an association between lower CD4 cell counts and increased cardiovascular risk.[9,10] The findings of the present study further support the role of immune dysfunction in the pathogenesis of HIV-associated cardiovascular disease.

Pericardial effusion was identified in 9% of patients, although no statistically significant association was observed between pericardial effusion and CD4 count. Earlier studies conducted before the widespread availability of combination antiretroviral therapy reported substantially higher rates of pericardial involvement, particularly in patients with advanced AIDS.[7] The comparatively lower prevalence observed in the present study may reflect earlier diagnosis of HIV infection, improved access to antiretroviral therapy and better management of opportunistic infections.[2,3] Electrocardiographic abnormalities were observed in approximately one-fourth of the study population, whereas

cardiomegaly was detected in 18% of patients on chest radiography. Ischemic changes on electrocardiography were relatively infrequent, possibly because patients with known hypertension, diabetes mellitus and pre-existing ischemic heart disease were excluded from the study. Furthermore, the majority of patients were relatively young, reducing the burden of conventional cardiovascular risk factors. Similar electrocardiographic abnormalities have also been described in previous studies evaluating cardiovascular manifestations in HIV infection.[4,8]

Coronary angiography was performed only in selected patients with clinical indications, among whom coronary artery disease was detected in slightly more than half. However, no statistically significant association was observed between coronary artery disease and CD4 count. Although HIV infection has been associated with accelerated atherosclerosis through chronic inflammation, endothelial dysfunction, immune activation, metabolic abnormalities and conventional cardiovascular risk factors, the relatively small number of patients undergoing coronary angiography in the present study limited the ability to demonstrate a significant relationship.

Previous studies have reported an increased risk of myocardial infarction among patients receiving combination antiretroviral therapy, particularly protease inhibitor-based regimens.[2,3,11] None of the patients in the present study were receiving protease inhibitor-based therapy, which may partly explain the comparatively lower burden of coronary artery disease observed.

Anemia showed a significant association with cardiovascular manifestations in the present study. Reduced hemoglobin concentration may increase myocardial workload through chronic tissue hypoxia and compensatory increases in cardiac output, thereby contributing to the development or progression of myocardial dysfunction. Similar associations between anemia and adverse cardiovascular outcomes have been reported previously.[12]

The present study has several strengths. All enrolled patients underwent comprehensive cardiovascular evaluation using electrocardiography and two-dimensional echocardiography, enabling detection of both symptomatic and asymptomatic cardiac abnormalities. Furthermore, the relationship between cardiovascular manifestations and CD4 cell count was evaluated, providing clinically relevant information regarding the influence of immunological status on cardiac involvement.

However, the study has certain limitations. It was conducted at a single tertiary care centre with a relatively small sample size, which may limit the generalizability of the findings. Coronary angiography was performed only in selected patients based on clinical indications rather than universally, limiting assessment of the true prevalence of coronary artery disease. In addition, the cross-sectional design precludes establishing causal relationships between HIV infection, immunosuppression and cardiovascular abnormalities. Larger multicentre prospective studies with long-term follow-up are required to better define the natural history and predictors of cardiovascular disease in people living with HIV.

Overall, the findings of the present study reinforce the growing evidence that cardiovascular involvement remains an important yet frequently under-recognized complication of HIV infection despite advances in antiretroviral therapy. Early recognition through systematic cardiovascular assessment may facilitate timely management and improve long-term outcomes in this population.

CONCLUSION

Cardiovascular manifestations are common among people living with HIV and frequently remain clinically silent. Lower CD4 cell counts were significantly associated with cardiovascular involvement, highlighting the influence of immunological status on cardiac disease. Routine cardiovascular evaluation, particularly with echocardiography, may facilitate early detection of subclinical cardiac abnormalities and enable timely intervention. Larger prospective multicentre studies are warranted to further define the long-term cardiovascular outcomes in HIV-infected patients.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Triant VA. HIV infection and coronary heart disease. J Infect Dis. 2012;205(3):355-63.
2. Freiberg MS, So-Armah K. HIV and cardiovascular disease. Circulation. 2016;133(21):2167-79.
3. Hsue PY, Waters DD. HIV infection and coronary heart disease: mechanisms and management. Nat Rev Cardiol. 2019;16(12):745-59.
4. Mondy KE, Gottdiener J, Overton ET, Henry K, Bush T, Conley L, et al. High prevalence of echocardiographic abnormalities among HIV-infected persons in the era of highly active antiretroviral therapy. Clin Infect Dis. 2011;52(3):378-86.
5. Currie PF, Jacob AJ, Foreman AR, Elton RA, Brettle RP, Boon NA. Heart muscle disease related to HIV infection: prognostic implications. BMJ. 1994;309(6969):1605-7.
6. Barbaro G, Di Lorenzo G, Grisorio B, Barbarini G. Cardiac involvement in the acquired immunodeficiency syndrome. AIDS. 1998;12(18):2499-508.
7. Heidenreich PA, Eisenberg MJ, Kee LL, Somelofski CA, Hollander H, Schiller NB, et al. Pericardial

effusion in AIDS. Incidence and survival. Circulation. 1995;92(11):3229-34.
8. Twagirumukiza M, Nkeramihigo E, Seminega B, Gasakure E, Boccara F, Barbaro G. Prevalence of echocardiographic abnormalities in HIV-infected African patients. Trop Doct. 2007;37(4):218-22.
9. Barbaro G. Dilated cardiomyopathy in HIV infection. N Engl J Med. 1998;339(16):1093-9.
10. Kaplan RC, Kingsley LA, Gange SJ, Benning L, Jacobson LP, Lazar J, et al. Low CD4+ T-cell count as a major atherosclerosis risk factor in HIV-infected women and men. AIDS. 2008;22(13):1615-24.
11. Friis-Moller N, Sabin CA, Weber R, d'Arminio Monforte A, El-Sadr WM, Reiss P, et al. Combination antiretroviral therapy and the risk of myocardial infarction. N Engl J Med. 2003;349(21):1993-2003.
12. Anand IS. Anemia and chronic heart failure: implications and treatment options. J Am Coll Cardiol. 2008;52(7):501-11.

Cite this article as: Rajan N, Paritekar A. Cardiovascular manifestations in HIV-infected patients: a cross-sectional study from a tertiary care hospital. Int J Res Med Sci 2026;14:3472-6.