



Cardiac Manifestations in HIV

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ABSTRACT

Objective: To evaluate the incidence of cardiac manifestations in patients with human immunodeficiency virus (HIV) infection. **Methods:** In this prospective study, 100 HIV-infected patients were examined irrespective of their duration of illness and treatment status. Cardiac manifestations were evaluated using chest X-ray, electrocardiography, and echocardiography.

Results: The overall incidence of cardiac manifestations among the HIV patients was 22%, with trend towards male predominance. Further, the incidence tended to increase as the HIV disease progresses. Dilated cardiomyopathy, pericardial effusion, coronary artery disease, pulmonary hypertension, and left ventricular hypertrophy were the major cardiac manifestation observed in the study. Cardiac risk factors such as hypertension, diabetes, dyslipidemia, smoking, and alcoholism were more common among HIV-infected patients with cardiac diseases than those without cardiac diseases.

Conclusion: Cardiac complications are common in HIV-infected patients. The incidence increases as the HIV disease progresses. Presence of risk factors further increases the incidence of cardiac manifestations in HIV-infected patients.

KEYWORDS

Cardiac disease, Human immunodeficiency virus, Incidence, Risk factor

INTRODUCTION

Acquired immunodeficiency syndrome is a serious health concern worldwide as the infection with human immunodeficiency virus (HIV) is increasing.^{1,2} It is characterized by an acquired, profound, irreversible immunosuppression that predisposes the patient to multiple opportunistic infections, malignant neoplasms, and progressive dysfunction of multiple organs including cardiac manifestations. The report of cardiac involvement in HIV-infected patients was first described in 1983. Since then, evidences of cardiovascular manifestations as the consequence of in HIV have been widely reported and well-established.¹ The significant advances in the knowledge about HIV and its treatment have altered the course of HIV disease, with improved survival in HIV patients.^{3,4} Because of increased longevity, long-term effects of late-stage infection such as HIV-related cardiovascular disease are emerging as leading health issues in this population. The common cardiac manifestations in such patients include pericardial effusion, myocarditis, dilated cardiomyopathy, accelerated atherosclerosis, endocarditis, pulmonary hypertension, malignancy, and drug-related cardio-toxicity.^{1,3} Focused assessment and understanding of

co-morbid cardiovascular disease prevalence and presentation is required for early recognition and prompt treatment in such patients living with HIV infection.⁴ With this background, the present study was conducted.

METHODS

Study design and patient population

We conducted a prospective study to identify the incidence of cardiac diseases in patients with various stages of AIDS. In this study, all HIV-infected in-patients and out-patients, who presented at the Osmania General Hospital, Hyderabad, India between January-2012 and January-2013 were considered for enrollment. Patients who tested positive HIV antibody tests were included in the study, while patients with evidence of heart disease previous to the diagnosis of HIV infection were excluded. Accordingly, 100 HIV-infected patients were enrolled, irrespective of their duration of their illness and ART status. Patients were classified according to the World Health Organization (WHO) Clinical Staging System for HIV/AIDS.⁵ A signed informed consent was obtained from each enrolled patient.

Data collection

All enrolled patients underwent a thorough clinical evaluation including physical examination and past medical history of hypertension, diabetes, dyslipidemia, smoking, and alcoholism. Routine lab investigations were performed, which included liver function test (LFT), renal function test (RFT), complete blood picture (CBP), fasting blood sugar, total cholesterol, and CD4 count. In addition, the incidence of cardiac manifestations was analyzed using chest X-ray, electrocardiogram, and two-dimensional echocardiography.

Data analysis

The baseline demographics, clinical profile, and cardiac manifestations were expressed as frequency and percentages. Incidences of cardiac manifestations were stratified according to gender and HIV/AIDS clinical stages. In addition, the role of traditional cardiac risk factors and CD₄ count in the occurrence of cardiac manifestations was investigated.

RESULTS

Demographic details

The demographic details of enrolled patients are given in **Table 1**. Of 100 HIV-infected patients examined in the study, 82% were males and 18% were females. Based on the WHO Clinical Staging System for HIV/AIDS, the number of patients belonged to stage 2, stage 3, and stage 4 were 6, 50, and 44 respectively.

Table 1: Demographic details of enrolled patients, Comparison between patients with and without cardiac manifestations

	HIV-infected patients (n=100)	Patients with cardiac manifestations (n=22)	Patients without cardiac manifestations (n=78)
Gender-based stratification			
Males, n (%)	82 (82%)	19 (86.4%)	63 (80.8%)
Females, n (%)	18 (18%)	3 (13.6%)	15 (19.2%)
Clinical stage of HIV-based stratification			
Stage 1, n (%)	0 (0%)	0 (0%)	0 (0%)
Stage 2, n (%)	6 (6%)	1 (4.5%)	5 (6.4%)
Stage 3, n (%)	50 (50%)	9 (40.9%)	41 (52.6%)
Stage 4, n (%)	44 (44%)	12 (54.6%)	32 (41.0%)

Incidence of cardiac manifestations

The overall incidence of cardiac manifestations was 22% among the HIV patients. Gender based stratification revealed that cardiac manifestations were present in 19 (86.4%) males and 3 (13.6%) females (**Table 1**). This indicates that the incidence was higher among males as compared to females. Similarly, a stratification based on HIV/AIDS stage revealed that 0 (0%), 1 (4.5%), 9 (40.9%), and 12 (54.6%) patients with stage 1, stage 2, stage 3, and stage 4 of HIV/AIDS exhibited cardiac manifestations respectively (**Table 1**). This indicates that the incidence of cardiac manifestations increased with the severity of disease.

The proportion of individual cardiac manifestations observed in HIV-infected patients is represented in **Figure 1**. Dilated cardiomyopathy (22.7%) was the most common manifestation, followed by pericardial effusion (18.2%). Other notable manifestations included coronary artery disease (13.6%), pulmonary hypertension (13.6%), left ventricular hypertrophy (9.1%), diastolic dysfunction (4.5%), mitral valve prolapse (4.5%), valvular heart disease (4.5%), pulmonary thromboembolism (4.5%), and mediastinal mass (4.5%).

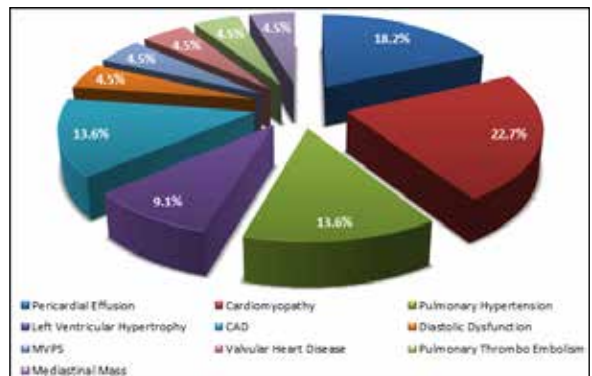


Figure 1: Proportion of various cardiac diseases in HIV-infected patients

When individual manifestations were compared according to the HIV/AIDS stage, incidence of dilated cardiomyopathy and pericardial effusion was found to be higher in stage 4, whereas the incidence of pulmonary hypertension, coronary artery disease, left ventricular hypertrophy and diastolic dysfunction was found to be higher in stage 3 (**Table 2**).

Table 2: Individual cardiac manifestations compared according to the HIV/AIDS stage

Cardiac manifestations	HIV-infected patients with cardiac manifestations			
	Overall (n=22)	Stage 2 (n=1)	Stage 3 (n=9)	Stage 4 (n=12)
Mitral valve prolapse	1 (4.54%)	1 (100%)	-	-
Pericardial effusion	4 (18.18%)	-	1 (1.1%)	3 (2.5%)
Cardiomyopathy	5 (22.72%)	-	-	5 (4.2%)
Pulmonary hypertension	3 (13.63%)	-	2 (2.2%)	1 (0.8%)
Left ventricular hypertrophy and diastolic dysfunction	3 (13.63%)	-	2 (2.2%)	1 (0.8%)
Coronary artery disease	3 (13.63%)	-	2 (2.2%)	1 (0.8%)
Valvular heart disease	1 (4.54%)	-	1 (1.1%)	-
Pulmonary thromboembolism	1 (4.54%)	-	-	1 (0.8%)
Mediastinal mass	1 (4.54%)	-	1 (1.1%)	-

Role of cardiac risk factors

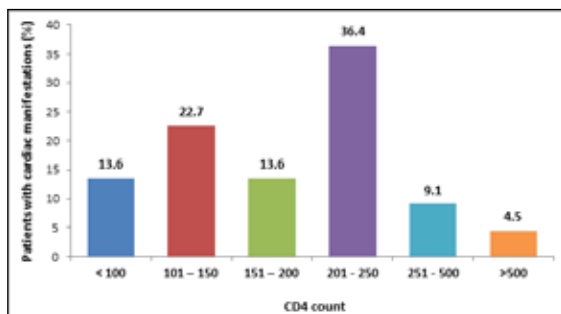
Analysis of risk factors for cardiac disease in 100 HIV-infected patients revealed that hypertension, diabetes, and dyslipidemia were present in 7, 5, and 7 patients respectively. All female patients denied smoking and alcohol history. Of 82 males, alcoholism was noted in 59 (71.9%) patients and smoking was noted in 61 (74.4%) patients. The influence of cardiac risk factors on cardiac manifestations in HIV-infected patients is given in **Table 3**. Similarly, HIV-infected patients with cardiac diseases displayed higher incidence of hypertension (22.7% vs. 2.6%), diabetes (18.2% vs. 1.3%), and dyslipidemia (22.7% vs. 2.6%) as compared to that in HIV-infected patients without cardiac diseases. It was also observed that the incidences of cardiac diseases were higher in HIV patients with smoking (72.7% vs. 57.7%) or alcohol habits (68.2% vs. 56.4%). Overall, these findings indicate that presence of cardiac risk factors increases the incidence of cardiac diseases in HIV-infected patients.

Table 3: Influence of risk factors on cardiac manifestations in HIV-infected patients

Cardiac risk factors	Overall patients (n=100)	Patients with cardiac manifestations (n=22)	Patients without cardiac manifestations (n=78)
Hypertension	7 (7%)	5 (22.7%)	2 (2.6%)
Diabetes	5 (5%)	4 (18.2%)	1 (1.3%)
Dyslipidemia	7 (7%)	5 (22.7%)	2 (2.6%)
Alcoholism	59 (59%)	15 (68.2%)	44 (56.4%)
Smoking	61 (61%)	16 (72.7%)	45 (57.7%)

Role of CD₄ count

The influence of CD₄ count on incidence of cardiac manifestations among HIV-infected patients is illustrated in **Figure 2**. It was observed that almost 86.4% of cardiac manifestations occurred in HIV-infected patients with CD₄ count below 250.

**Figure 2: Influence of CD₄ count on cardiac manifestations in HIV-infected patients**

DISCUSSION

Cardiovascular complications are common in HIV-infected patients. Previous reports have indicated that the prevalence of cardiac manifestations in HIV-infected individuals ranges between 28% and 73%.¹ However, there are very few clinical studies in this regard.⁶ With this background, we aimed to evaluate the incidence of cardiac manifestations in patients with HIV infection. The overall incidence of cardiac manifestations among HIV-infected patients in the present study was found to be 22%. Of note, we observed a trend towards male predominance in the incidence of cardiac manifestations in HIV-infected individuals. This observation is in line with reports indicating a significant male predominance for cardiovascular complications.⁷ We also observed that the incidence of cardiac manifestations tended to increase with advances in HIV/AIDS stage. This observation is also in line with a general notion that cardiac morbidity and mortality are more common in advanced stages of HIV infection.⁶ However, cardiac disease can occur at any stage of HIV infection.

The spectrum of cardiovascular disease in HIV-infected patients is broad. Previous studies have indicated that major cardiovascular manifestations among these patients include pericardial effusion, myocarditis, dilated cardiomyopathy, endocarditis, coronary artery disease, pulmonary hypertension, vascular aneurysm, and cardiac tumors.⁸ In similar lines, the cardiac manifestations observed in our investigation were dilated cardiomyopathy (22.7%), pericardial effusion (18.2%), coronary artery disease (13.6%), pulmonary hypertension (13.6%), left ventricular hypertrophy (9.1%), diastolic dysfunction (4.5%), mitral valve prolapse (4.5%), valvular heart disease (4.5%), pulmonary thromboembolism (4.5%), and mediastinal tumor (4.5%). In lines with our study, Singh et al. had earlier investigated cardiac abnormalities in 70 patients with HIV infection and found that reduced ejection fraction (48.7%), pericardial effusion (17.4%), pulmonary artery hypertension (11.4%), dilated cardiomyopathy (8.5%), diastolic dysfunction (8.5%), and regional wall motion abnormality (1.4%) were major cardiac manifestations.⁹

Earlier, it has been demonstrated that traditional cardiovascular risk factors are widely present in patients with HIV infection. While factors such as dyslipidemia, diabetes mellitus, metabolic syndrome, and hypertension may be related to HIV infection or to HIV therapies, other factors such as smoking and alcoholism are independent of HIV infection.¹⁰ In the present study, we observed that majority of these cardiac risk factors including hypertension, diabetes, dyslipidemia, smoking, and alcoholism were more common among HIV-infected patients with cardiac diseases than those without cardiac diseases. These findings indicate that appropriate management of traditional cardiac risk factors may be required for improved prognosis in HIV-infected patients. In several studies, low CD₄ count is also identified as a significant predictor of cardiovascular events.^{9,11} In the present study, we observed that almost 86.4% of cardiac complications occurred in HIV-infected patients with CD₄ count < 250.

Cardiovascular manifestations in HIV represents a diagnostic and therapeutic challenge for cardiologists, specialists in infective diseases, and radiologists.⁸ Further, the number of HIV-infected individuals with cardiac complications may increase in coming years as long-term survival with chronic viral infection, co-infections, drug therapy, and immunosuppression affects the heart significantly. Therefore, understanding the manifestation and prognosis of HIV-related cardiac illness is vital for appropriate monitoring, early intervention, and therapy.¹² With increasing interest by researchers in regard, the role of HIV in cardiovascular disease is beginning to be recognized in recent years. Further, the impact of anti-retroviral therapy in cardiovascular manifestations is being investigated. In addition, the identification of molecular mechanisms of HIV-related heart disease may provide the basis for rational therapeutic strategies and improved care.¹⁰ Future studies are warranted in this regard. Since cardiac complications are often indeterminate in the initial stages, periodic screening of HIV-infected patients by electrocardiogram and echocardiogram is recommended.⁶ Additional strategies to prevent cardiovascular events in HIV-infected patients should focus on reduction of traditional cardiac risk factors, as well as HIV and ART-specific risk factors.

CONCLUSION

Findings of the present study indicate that cardiac complications are common in HIV-infected patients. The incidence of cardiac disease increases as the HIV disease progresses. Presence of risk factors further increases the incidence of cardiac manifestations in HIV-infected patients. Further clinico-pathological studies are required to identify the role of HIV infection in the pathogenesis of cardiovascular events in HIV-infected patients.

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