

## A STUDY OF CARDIOVASCULAR MANIFESTATIONS OF HIV IN PLHA PATIENTS IN TERTIARY CARE HOSPITAL

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### Abstract

**Background:** Cardiovascular diseases in HIV-positive patients are being highly detected in developing countries. It is anticipated to develop even more common as HIV-infected individuals live longer. Therefore, the study aimed to determine the prevalence of cardiovascular manifestations in HIV-positive patients and assess the association with HAART, CD4 cell count, and WHO stages of the disease. **Materials and Methods:** It was an observational cross-sectional study conducted on 100 patients from the Medicine Ward and Cardiology Ward for one and a half years. We have collected demographic and clinical data, including age, sex, presence of chest pain, palpitation, breathlessness, DM, HTN, and addictive habits. Further, we performed a chest X-ray and assessed the presence of coronary artery disease, dilated cardiomyopathy, pericardial effusion, Pulmonary HT, and other cardiac manifestations. **Result:** Among all participants, 77% were males, and 23% were females. 2% were > 61. 20% of subjects experienced chest pain, 17% had breathlessness, 12% had DM, 10% had hypertension, 59% were alcoholic, and 56% were smokers. WHO clinical staging of HIV/AIDS indicated that 6% were stage 2, 53% were stage 3, and 41% were stage 4. In general, 34% of HIV patients get cardiac symptoms. The chest X-ray results for 84% of the patients were normal, showing no substantial abnormalities. Further, 54% of the patients had a CD4 count below 200, 41% had a value in the 200-350 range, and just 5% had a count beyond 350. **Conclusion:** The study concludes that cardiac involvement and cardiovascular complications were commonly seen in HIV-infected patients.

## INTRODUCTION

AIDS was first recognised in the United States in 1981 when the Centers for disease control and Prevention (CDC) informed the unexplained occurrence of Pneumocystis jirovecii pneumonia in five formerly healthy homosexual men. Injecting drug users, haemophiliacs, and blood transfusion patients, both male and female, were quickly diagnosed with the condition. The human immunodeficiency virus (HIV) was discovered to be the AIDS-causing agent in 1984 after being isolated from a lymphadenopathy patient in 1983. ELISA, or a sensitive enzyme-linked immunosorbent assay, was created in 1985.<sup>[1-3]</sup>

In India, the first case of AIDS was reported in 1986 in Chennai. AIDS impacts all bodily systems. Patients with HIV infection frequently experience cardiovascular disease, especially in the later stages of the illness. This is because HIV infection is now being treated more effectively, which has increased survival. When HIV-positive individuals have

cardiovascular abnormalities such as coronary heart disease, dilated cardiomyopathy, and pericardial effusion, they frequently go undiagnosed or untreated, which increases cardiovascular morbidity and mortality and lowers the quality of life. It has been estimated that between 28 and 73% of PLHIV have cardiac involvement and that 8 to 10% of HIV patients experience symptomatic heart failure.<sup>[4-6]</sup> Therefore, the study aimed to evaluate the prevalence of cardiovascular manifestations in HIV-positive patients and assess the association with HAART, CD4 cell count, and WHO stages of the disease.

## MATERIALS AND METHODS

This observational cross-sectional study was conducted on 100 patients from the Medicine Ward and Cardiology Ward for one and a half years. Informed consent was obtained from the patients, and ethical committee approval was obtained before the study started.

### Inclusion Criteria

HIV-positive patients above 15 who gave informed consent irrespective of the duration of their illness and ART status were included.

### Exclusion Criteria

Patients with a history of ischaemic, rheumatic, congenital heart disease, and chronic respiratory illness before HIV diagnosis were excluded.

We have collected demographic and clinical data, including age, sex, presence of chest pain, palpitation, breathlessness, DM, HTN, and addictive habits. Further, we performed a chest X-ray and assessed the presence of coronary artery disease, dilated cardiomyopathy, pericardial effusion, Pulmonary HT, and other cardiac manifestations.

### Statistical Analysis

Data were collected, entered in a Microsoft Excel sheet, and analysed using SPSS software. Frequency and percentages were used to present qualitative data, then analysed using the Chi-square or Fisher's exact test (for 2 x 2 contingency tables). Statistical significance was defined as  $p < 0.05$ .

## RESULTS

In this study, the echocardiographic manifestations of 100 HIV patients were analysed regardless of their CD4 count, stage of disease, and ART status. Among them, 77% were males, and 23% were females. In the age group, 16%, 51%, and 31% were < 40 years old, between 41-50, and between 51-60 years old, while only 2% were > 61. 20% of subjects experienced chest pain, 17% had breathlessness, 12% had DM, 10% had hypertension, 59% were alcoholic, and 56% were smokers [Table 1].

According to the WHO's clinical staging of HIV/AIDS, participants were staged. Among 6% were stage 2, 53% were stage 3, and 41% were stage 4. In general, 34% of HIV patients get cardiac symptoms.

The chest X-ray results for 84% of the patients were normal, showing no substantial abnormalities. In addition, a substantial percentage (94%) of the patients lacked any signs of coronary artery disease, dilated cardiomyopathy, pericardial effusion, pulmonary hypertension, left ventricular hypertrophy, aortic sclerosis, pulmonary

thromboembolism, or grade 1 diastolic dysfunction. These results imply that none of these specific cardiac disorders or diseases was present in the participants.

There were, however, instances where some individuals had positive results for particular illnesses. Coronary artery disease was identified in 6% of the patients and dilated cardiomyopathy in 10%. A pericardial effusion was present in 6% of the individuals as well. These results suggest that some of the sampled population had these heart disorders or diseases. 54% of the patients had a CD4 count below 200, 41% had a value in the 200-350 range, and just 5% had a count beyond 350. This shows that many responders might have immune system worries that diseases like HIV/AIDS could cause.

Regarding ART (antiretroviral therapy) drugs, 86% of the patients reported using them, indicating that a large majority of those surveyed were undergoing treatment for HIV/AIDS [Table 2].

As the condition worsens, the frequency of cardiovascular symptoms rises. When the CD4 count is less than 350 cells/mm, over 97% of manifestations take place. When individual manifestations are compared, stage 4 has a higher incidence of cardiomyopathy and pericardial effusion. In stage 3, there is a higher prevalence of left ventricular hypertrophy, pulmonary hypertension, and coronary artery disease. The difference between the WHO stages was statistically significant for dilated cardiomyopathy ( $p=0.036$ ) but not for other cardiovascular symptoms [Table 3].

54% of patients had a CD4 count < 200, 41% had a CD4 count of 200 – 350, and 5% had a CD4 count > 350. There was a significant difference in coronary artery disease and PTE between CD4 count but no significant difference in other cardiovascular manifestations [Table 4].

A significant difference between ART drugs for pulmonary hypertension but not for other cardiovascular symptoms. Comparatively, to those not taking ART drugs, a larger proportion of individuals using ART drugs showed pulmonary hypertension [Table 5].

Comparing various stages of HIV, in stage 3, the incidence is 16%, and the incidence in stage 4 is 18% [Table 6].

**Table 1: Demographic data of the study**

		Frequency	Percentage
Sex	F	23	23
	M	77	77
Age	<40	16	16
	41-50	51	51
	51-60	31	31
	>61	2	2
Chest pain	No	80	80
	Yes	20	20
Palpitation	No	99	99
	Yes	1	1
Breathlessness	No	83	83
	Yes	17	17
DM	No	88	88
	Yes	12	12

HTN	No	90	90
	Yes	10	10
Alcoholic	No	41	41
	Yes	59	59
Smoker	No	44	44
	Yes	56	56

**Table 2: Distribution of cardiac manifestations**

		Frequency	Percentage
Chest X-ray	Cardiomegaly	14	14
	Rt atrial enlargement	2	2
	Normal	84	84
Coronary artery disease	No	94	94
	Yes	6	6
Dilated cardiomyopathy	No	90	90
	Yes	10	10
Pericardial effusion	No	94	94
	Yes	6	6
Pulmonary HT	No	96	96
	Yes	4	4
LVH	No	97	97
	Yes	3	3
Aortic sclerosis	No	98	98
	Yes	2	2
PTE	No	99	99
	Yes	1	1
Grade 1 DD	No	98	98
	Yes	2	2
CD4 count	<200	54	54
	200-350	41	41
	>350	5	5
ART drugs	No	14	14
	Yes	86	86

**Table 3: Comparison of various conditions with WHO stage**

		WHO STAGE			P value
		2	3	4	
Coronary artery disease	No	6	48	40	0.683
	Yes	0	4	2	
Dilated cardiomyopathy	No	6	50	34	0.036
	Yes	0	2	8	
Pericardial effusion	No	6	51	37	0.105
	Yes	0	1	5	
Pulmonary HT	No	6	49	41	0.619
	Yes	0	3	1	
LVH	No	6	50	41	0.832
	Yes	0	2	1	
Aortic sclerosis	No	6	50	42	0.39
	Yes	0	2	0	
PTE	No	6	51	42	0.627
	Yes	0	1	0	
Grade 1 DD	No	6	51	41	0.925
	Yes	0	1	1	

**Table 4: Comparison of various conditions with CD4 count**

		CD4 Count			P value
		< 200	200-300	> 350	
Coronary artery disease	No	53	38	3	0.002
	Yes	1	3	2	
Dilated cardiomyopathy	No	47	38	5	0.494
	Yes	7	3	0	
Pericardial effusion	No	49	40	5	0.323
	Yes	5	1	0	
Pulmonary HT	No	51	40	5	0.667
	Yes	3	1	0	
LVH	No	53	39	5	0.639
	Yes	1	2	0	
Aortic sclerosis	No	54	39	5	0.23
	Yes	0	2	0	
PTE	No	54	41	4	<0.0001
	Yes	0	0	1	

Grade 1 DD	No	53	40	5	0.928
	Yes	1	1	0	

**Table 5: Comparison of various conditions with ART drugs**

		ART drugs		P value
		No	Yes	
Coronary artery disease	No	14	80	0.326
	Yes	0	6	
Dilated cardiomyopathy	No	13	77	0.757
	Yes	1	9	
Pericardial effusion	No	12	82	0.131
	Yes	2	4	
Pulmonary HT	No	11	85	<0.0001
	Yes	3	1	
LVH	No	14	84	0.579
	Yes	0	2	
Aortic sclerosis	No	14	84	0.579
	Yes	0	2	
PTE	No	14	85	0.696
	Yes	0	1	
Grade 1 DD	No	14	84	0.579
	Yes	0	2	

**Table 6: Distribution of various stages of HIV**

		No of Cases	Percentage
Stage 2	Others	6	100%
	Cardiac Disease	0	0%
Stage 3	Others	36	69%
	Cardiac Disease	16	31%
Stage 4	Others	24	57%
	Cardiac Disease	18	43%

**Table 7: Distribution of patients with CD4 count and ART (Antiretroviral Therapy) drugs**

	CD4 count			ART drugs	
	<200	200-350	>350	No	Yes
Coronary artery disease	1	3	2	0	6
Dilated cardiomyopathy	7	3	0	1	9
Pericardial effusion	5	1	0	2	4
Pulmonary HT	3	1	0	3	1
LVH	1	2	0	0	2
Aortic sclerosis	0	2	0	0	2
PTE	0	0	1	0	1
Grade 1 DD	1	1	0	0	2

Lower CD4 counts, especially those under 200, were associated with an increased risk of coronary artery disease, dilated cardiomyopathy, pericardial effusion, pulmonary hypertension, left ventricular hypertrophy (LVH), and grade 1 diastolic dysfunction (DD). The frequency of these situations decreased when CD4 counts rose to 200–350 and then over 350. Notably, there were no grade 1 DD, pericardial effusion, pulmonary hypertension, LVH, aortic sclerosis, or dilated cardiomyopathy among patients with CD4 counts greater than 350. According to these results, there may be a link between lower CD4 counts and a higher risk of cardiovascular disease.

The prevalence of coronary artery disease, dilated cardiomyopathy, pericardial effusion, and left ventricular hypertrophy (LVH) was higher in people taking ART medications than in people not taking them. The prevalence of pulmonary hypertension was greater in those not taking ART medications. Both groups had very little aortic sclerosis, pulmonary

thromboembolism (PTE), or grade 1 diastolic dysfunction (DD) [Table 7].

## DISCUSSION

In the current study, 34% of the 100 patients with HIV/AIDS infection displayed cardiac symptoms, while 84% of the patient's chest X-ray results were normal, revealing no significant abnormalities. In the current study, men made up the majority (77%), and the age group with the highest prevalence of cardiovascular symptoms was between the ages of 41 and 50. Similarly, the study by Singh et al. impacted more men than women, which found that the age range between 30 and 39 years was the most common. Considering that young males are the most vulnerable to commercial sex workers, forced migration, and unemployment.<sup>[7,8]</sup>

In our study, breathlessness (17%) and chest discomfort (20%) were the most prevalent cardiac symptoms. However, 10% of patients had hypertension, and 12% had diabetes mellitus. In a

Marwadi et al. study, breathlessness and palpitations were reported at 11% and 33%, respectively. [9] Dilated cardiomyopathy (10%), coronary artery disease (6%), and pericardial effusion (6%) were the three clinical conditions that were most frequently found in the current study.

Compared to those not taking ART drugs, those taking them had a higher incidence of coronary artery disease, dilated cardiomyopathy, pericardial effusion, and left ventricular hypertrophy (LVH). Those not taking ART drugs had a higher prevalence of pulmonary hypertension. No aortic sclerosis, pulmonary thromboembolism (PTE), or grade 1 diastolic dysfunction (DD) was present in any group. Cardiovascular symptoms result from HIV directly invading cardiac muscle, either with or without myocarditis, from increased left ventricular mass (LV) in HIV-infected patients, the toxic effects of antiretroviral therapy (ART), concurrent opportunistic infections, and nutritional inadequacies.<sup>[2]</sup>

In our study, the majority of the study population had CD4 counts < 200 (54%), followed by 200-300 (41%), and just 5%, had CD4 counts more than 350. According to the study by Sarosh Kumar KK et al., cardiac involvement occurs frequently in HIV individuals who are asymptomatic. Left ventricular diastolic dysfunction (25%), left ventricular hypertrophy (15%), dilated cardiomyopathy (15%), pericardial effusion (13.3%), and mild pulmonary artery hypertension (10%) were the cardiac symptoms that were seen. Low CD-4 counts are more typical in people with cardiac involvement. Among these diseases, the connection between the CD-4 counts and Concentric Left Ventricular Hypertrophy was statistically significant. [10] Similar results were seen in the study by Ayaskanta Singh et al., where 28.6% of cases had CD4 counts below 50/L, 32.9% had CD4 counts between 50 and 200/L, and 25.7% had CD4 counts above 350/L.<sup>[8]</sup>

As the disease advanced, the frequency of cardiovascular symptoms rose. The presence of risk factors such as systemic hypertension and diabetes further increases the risk of heart disease. It's critical to categorise CVD risk in HIV-positive patients. Clinicians can calculate the risk of heart disease in HIV patients using generic risk stratification methods, such as the Framingham Risk Score. There is a consensus that the degree of immunosuppression plays the most significant role in the emergence of cardiac abnormalities.<sup>[11]</sup> The current study likewise showed a significant correlation between the echocardiographic results and CD4 count. According to a Taiwanese study, a lower CD4 count positively correlates with systolic and diastolic dysfunctions.<sup>[12]</sup> Because pericardial effusion is linked to a low CD4 count, it is frequently regarded as a sign of end-stage disease. According to Sharma RK et al. study, patients with a CD4 count below 350/L are more likely to experience echocardiographic abnormalities.<sup>[13]</sup>

Mishra et al. examined the profile and characteristics of cardiovascular abnormalities among patients living with HIV. The study demonstrated that cardiovascular abnormalities assessed as electrocardiogram and ECHO were seen in 54.5% and 52% of patients, respectively. Results from echocardiography revealed a strong relationship between CD4 count and the WHO disease stage.<sup>[14]</sup>

#### Limitations

Less HIV patients with naïveté were included in the study; only 100 HIV individuals were assessed at one point, and it was not followed up on. Further research is required to determine the impact of medication duration with various regimens on cardiovascular symptoms. It was not determined how the cardiac problems and HAART were related, and the echocardiogram results were not adjudicated independently.

## CONCLUSION

The study concludes that cardiac involvement and cardiovascular complications were commonly seen in HIV-infected patients. As the epidemic progressed and new treatments helped to increase the long-term survival of affected individuals, cardiovascular complications were more widely diagnosed. The most common cardiovascular manifestations in HIV patients were dilated cardiomyopathy followed by pericardial effusion and coronary artery disease. Early recognition and treatment were important to prevent significant morbidity from cardiac involvement. This approach will prolong survival in AIDS patients.

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