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ORIGINAL RESEARCH

Study of Cardiac Abnormalities in HIV Patients and their Correlation with Cd4 Count

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ABSTRACT

Background: HIV impacts all body systems. Cardiovascular illness is a prominent non-HIV-related cause of death in HIV patients. Traditional risk factors, HIV-related inflammation, and antiretroviral medication metabolic effects contribute to cardiovascular disease in HIV patients. HIV infection is a cardiovascular risk factor. Recent investigations show a link between HIV and cardiac events.

Methods: 100 HIV-positive patients >12 years old at Government Medical College - Hospital, Suryapet, Telangana, India. All study participants had CD4 counts, ECGs, and echocardiograms. HIV patients were divided into four stages based on their CD4 cell count: >500, 200-500, 50-200, and 50.

Results: In advanced HIV illness, cardiovascular problems tend to increase in frequency. To conduct the study, 100 HIV patients (both newly diagnosed and those already on ART) at the ART clinic at Government Medical College -Hospital, Suryapet, Telangana, India were randomly assigned to one of four groups according on their CD4 level and WHO stage. In the study, over half (49%) of participants were between the ages of 21 and 40, and nearly as many (43%) were between the ages of 41 and 50. About 85% of the study population was on ART, and 15% were recent diagnoses. The gender ratio of the participants in the study was quite close to 50-50. The people in the study were subjected to electrocardiograms and echocardiograms.

Conclusion: Cardiovascular problems are more frequent and predictable effects of advanced HIV infection. A study was conducted to highlight the various circulatory issues brought on by HIV infection. Higher rates of morbidity and mortality are associated with a number of these anomalies.

Keywords: Cardiac abnormalities, HIV, patients, correlation, CD4 count.

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INTRODUCTION

A retrovirus called the human immunodeficiency virus affects every system in the body. One of the main causes of non-HIV related death in HIV patients is cardiovascular disease. Traditional risk factors, chronic HIV-related inflammation, and the metabolic side effects of antiretroviral therapy are all risk factors for cardiovascular disease in HIV patients. Cardiovascular diseases are at increased risk due to HIV infection alone. According to recent studies, HIV patients or HIV patients taking HAART have higher rates of coronary events. Protease inhibitors, a key element of HAART, cause harmful metabolic consequences as

insulin resistance and dyslipidemia.[1-3] The risk of cardiovascular problems rises as a result of increased production of many cytokines that are toxic to myocytes as a result of HIV infection. The pathogenesis of these complications also involves HIV infection-induced vasculitis and endothelial dysfunction.[4] Therefore, the causes of cardiac disease associated with HIV may be multiple and include HIV infection of the myocardium itself, any of the recognised causes of cardiac disease in other patient populations, infectious or neoplastic complications, or their treatments.[5,6]

The most frequent complications are diastolic dysfunction, left ventricular systolic dysfunction, pericardial effusion, dilated cardiomyopathy, and coronary artery disease, although many cardiovascular complications have been described, such as pulmonary hypertension, systemic hypertension, infective endocarditis, and accelerated atherosclerosis in HIV patients.[7-9] Within six to twelve months of diagnosis, HIV patients with rapidly developing congestive heart failure pass away.[10-13]

The CD4 count decreases as the disease worsen, increasing the risk of cardiovascular problems and eventual death. In order to identify complications early and manage them, all HIV patients with low CD4 counts should undergo an echocardiographic screening.[14-16] The purpose of this study was to determine the prevalence of cardiac complications in HIV patients and how CD4 count relates to them. The study's goals were to determine the relationship between cardiac abnormalities in HIV patients and CD 4 count as well as to assess CD 4 count as a prognostic indicator of disease progression in HIV patients.[17-19]

MATERIALS AND METHODS

100 HIV positive patients >12years of age coming to ART centre, Government Medical College - Hospital, Suryapet, Telangana, India. This study was conducted among 100 HIV positive patients coming to ART centre, Government Medical College - Hospital, Suryapet, Telangana, India. CD4 count, ECG and Echocardiogrram were done in all the participants of the study. Cases were classified as HIV patients into four groups depending upon the CD4 cell count >500 (stage1), CD4 cell count 200-500 (stage 2), and 50-200(stage 3) and <50 stage 4.

Inclusion criteria:

- Age >12 yrs
- Newly diagnosed HIV patients
- Patients on ART therapy

Exclusion criteria:

Patients with

- Valvular heart disease.
- Coronary artery disease.
- Congenital heart disease
- Rheumatic heart disease
- Thyroid disorders
- Pregnant women

Data Collection:

For those who tested positive for HIV, a thorough clinical examination and complete medical history were performed. The CD4 cell count was determined using the blood samples of research group participants. In the study group, ECG and echocardiograms were performed.

Laboratory Investigations:

From the study group's blood samples, CD4 counts were determined using flow cytometry. Here, monoclonal antibodies targeting the CD3 and CD4 cell surface antigens were conjugated to the cells. Then a LASER laser was used to intersect these cells as they passed through a flow chamber. Data gained from the analysis of the flourescent signals obtained from the LASER beam intersecting the cells helped distinguish between the various cell subpopulations depending on their cluster differentiation. In the study group, a 12-lead ECG and echocardiogram were performed.

Data analysis

Microsoft Excel (Windows 7; Version 2007) was used to enter the data, and the Statistical Package for Social Sciences (SPSS) for Windows programme was used to conduct the analyses (version 22.0; SPSS Inc, Chicago). For categorical data, frequencies and percentages were calculated, while descriptive statistics like mean and standard deviation (SD) for continuous variables were computed. Chi-Square test for categorical variables was used to investigate associations between variables. Using an unpaired t test, the mean comparison of quantitative variables was examined. Pie charts and bar charts were utilised to visually show the data that had been evaluated. The significance threshold was set at 0.05.

Study Protocol

- All cases were classified into 3 categories based on CD4 cell count
- 12 lead ECG and Echocardiogram were done in study group.

Design of study: Prospective analytical study

Period of study: 11 months (November 2021 to September 2022)

RESULTS

Table 1: **Distribution of Study Subjects according to the Age Group (N=100)**

Age (in Years)	**No.**	**Percent**
≤ 20	8	8.0
21-30	17	17.0
31-40	32	32.0
41-50	16	16.0
>50	27	27.0
Total	100	100
Mean (SD)	39.72 (12.69)	
Range	17-61	

Comments: About 49% of study population was in the age group of 21 40 Years and 43% of study population were in the age group of 41->50years.

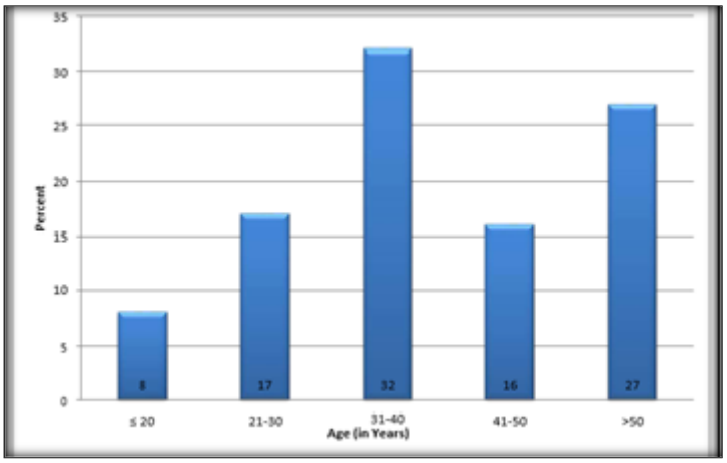

Figure 1: Distribution of Age

Comment: Most of the study population was in the age group of 21 to 50.

Table 2: Distribution of Study Subjects according to the Gender (N=100)

Gender	No.	Percent
Male	53	53.0
Female	47	47.0
Total	100	100

Comment: Males and Females were almost equal in the study population.

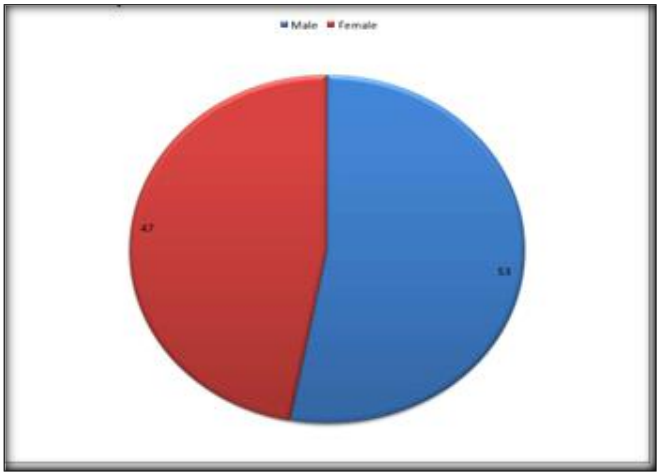

Figure 2: Distribution of Gender

Table 3: Distribution of the study population according to ART status (n=100)

Art Status	Frequency	Percent
On Art	85	85
Newly Diagnosed	15	15
Total	100	100

Comment: Most of the study population was on ART.

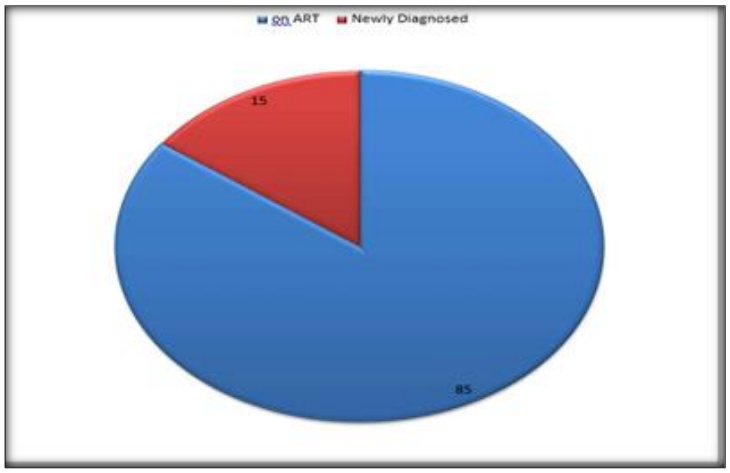

Figure 3: Distribution of Art Status

Comment: Most of the study population was on ART.

Table 4: Distribution of Study Subjects according to the CD4 Count (N=100)

CD4 Count	No.	Percent
>500	35	35.0
200-500	16	16.0
50-200	28	28.0
<50	21	21.0
TOTAL	100	100
Mean (SD)	393.89 (400.89)	
Range	12-1812	

Comments: About 51% of the study population was in stage 1 & 2 and 49% of study population in stage 3 & 4.

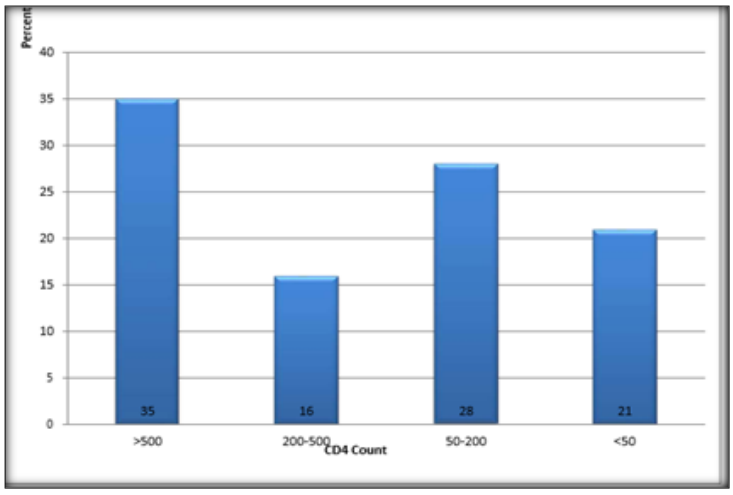

Figure 4: Distribution of CD4 Count

Comments: About 51% of the study population was in stage 1 & 2 and 49% of study population in stage 3 & 4

Table 5: Prevalence of ECG abnormalities in the study population (n=100)

ECG Abnormalities	Frequency	Percentage
Present	25	25
Absent	75	75
Total	100	100

Table 6: ECG abnormalities in the study population

ECG Abnormalities	Frequency	Percentage
Poor progression of R wave	9	9%
Low voltage QRS	7	7%
RBBB	5	5%
LBBB	4	4%
Total	25	25

Comments: ECG abnormalities were present in 25% of the study population and most common findings were poor progression of R wave.

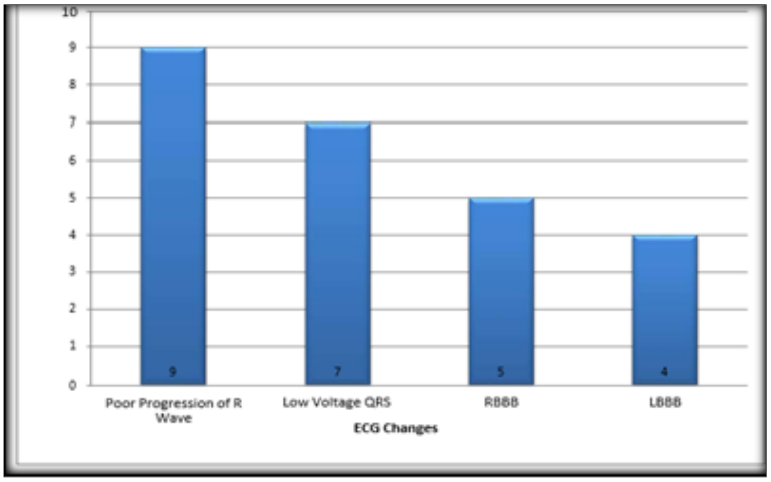

Figure 5: Distribution of ECG Changes

Comments: ECG abnormalities were present in 25% of the study population and most common findings were poor progression of R wave.

Table 6: Distribution of Study Subjects according to the CVS Manifestations (N=100)

CVS Manifestations	No.	Percent
ECG Changes	25	25.0
ECHO Findings		
Pericardial Effusion	10	10.0
Systolic Dysfunction	7	7.0
Diastolic Dysfunction	11	11.0
DCM	3	3.0
RWMA	2	2.0
Infective Endocarditis	1	1.0
Pulmonary Hypertension	3	3.0

Comments: ECG changes were seen in 25% of the study population and ECHO findings were present in 37% of the study population and most common findings were Diastolic Dysfunction 11%.

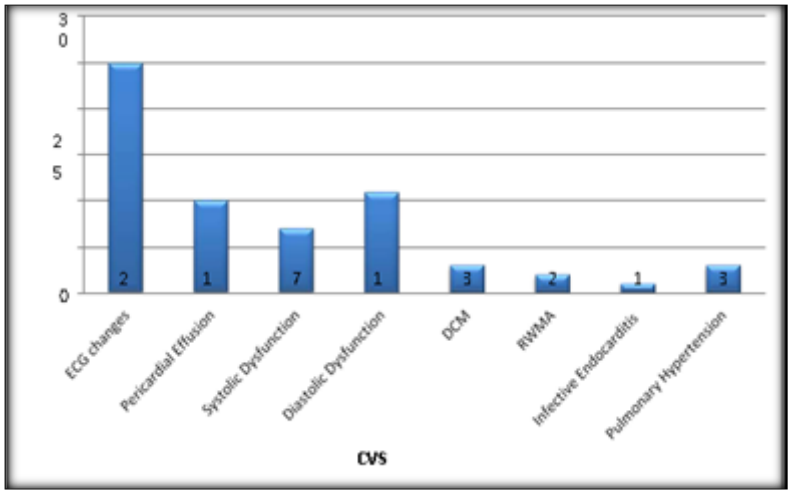

Figure 6: Distribution of CVS

Comments: ECG changes were seen in 25% of the study population .ECHO findings were present in 37% of the study population and most common findings were Diastolic Dysfunction 11%.

Table 7: Cardiovascular Manifestations in HIV with respect to Age (N=100)

CVS Manifestations	**No.**	**Age (Years)**					**P Value**
		≤ 20	**21-30**	**31-40**	**41-50**	**>50**	
ECG Changes	25	1 (12.5)	6 (35.3)	6 (18.8)	3 (18.8)	9 (33.3)	0.459
ECHO findings							
Pericardial Effusion	10	1 (12.5)		4 (12.5)	2 (12.5)	3 (11.1)	0.678
Systolic Dysfunction	7			3 (9.4)		4 (14.8)	0.207
Diastolic Dysfunction	11	2 (25.0)	1 (5.9)	4 (12.5)	2 (12.5)	2 (7.4)	0.641
DCM	3		1 (5.9)		1 (6.3)	1 (3.7)	0.672
RWMA	2			1 (3.1)	1 (6.3)		0.602
Infective Endocarditis	1					1 (3.7)	0.604
Pulmonary Hypertension	3		1 (5.9)			2 (7.4)	0.403

Comment: ECG changes were seen more in study population of age >50 (9%).ECHO findings were seen more in study population of age >50.

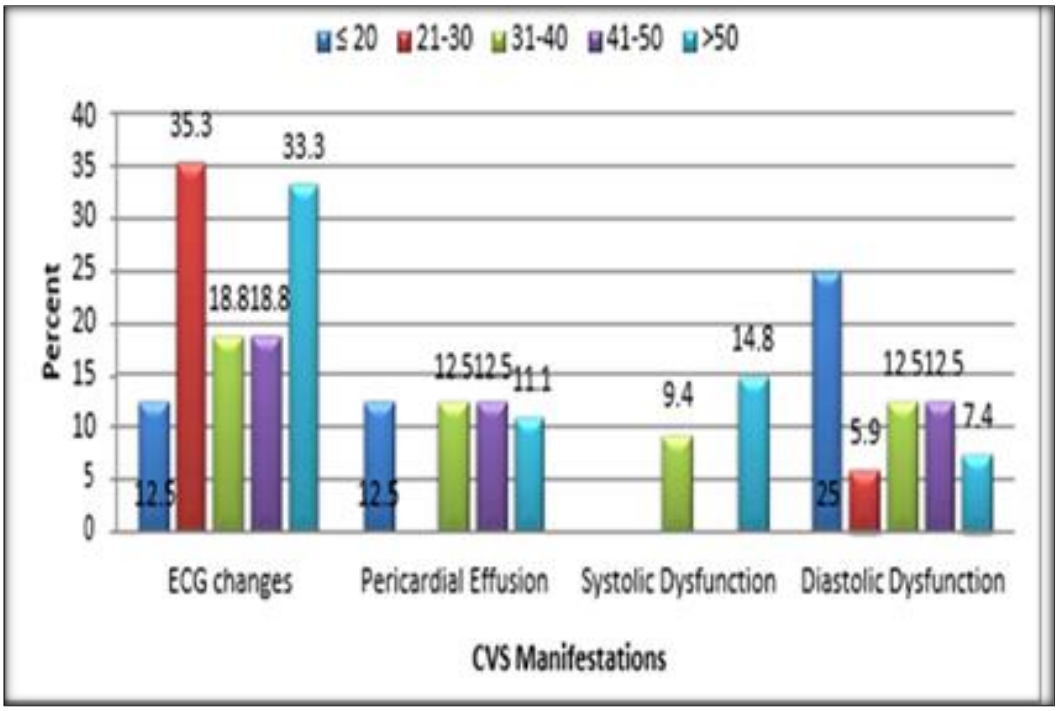

Figure 7.1: Age and CVS Manifestations

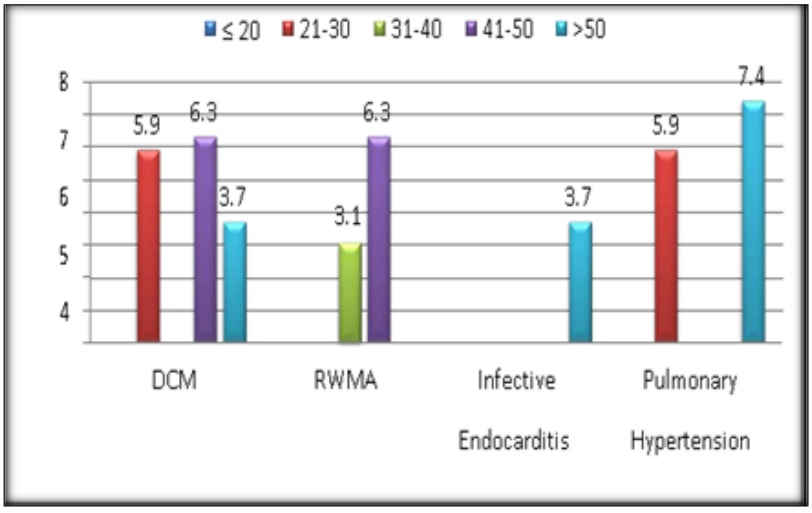

Figure 7.2: Age and CVS Manifestations

Comments: ECG changes were seen more in study population of age >50 (9%).ECHO findings were seen more in study population of age >50.

Table 8: Cardiovascular Manifestations in HIV with respect to Gender (N=100)

CVS Manifestations	No.	Gender		P Value
		Male	Female	
ECG Changes	25	11 (20.8)	14 (29.8)	0.298
ECHO Findings				
Pericardial Effusion	10	4 (7.5)	6 (12.8)	0.385
Systolic Dysfunction	7	3 (5.7)	4 (8.5)	0.577
Diastolic Dysfunction	11	7 (13.2)	4 (8.5)	0.454
DCM	3	2 (3.8)	1 (2.1)	0.630

RWMA	2	2 (3.8)		0.179
Infective Endocarditis	1		1 (2.1)	0.286
Pulmonary Hypertension	3	2 (3.8)	1 (2.1)	0.630

Comments: ECG changes were seen more in female population 14% than male population 11%.

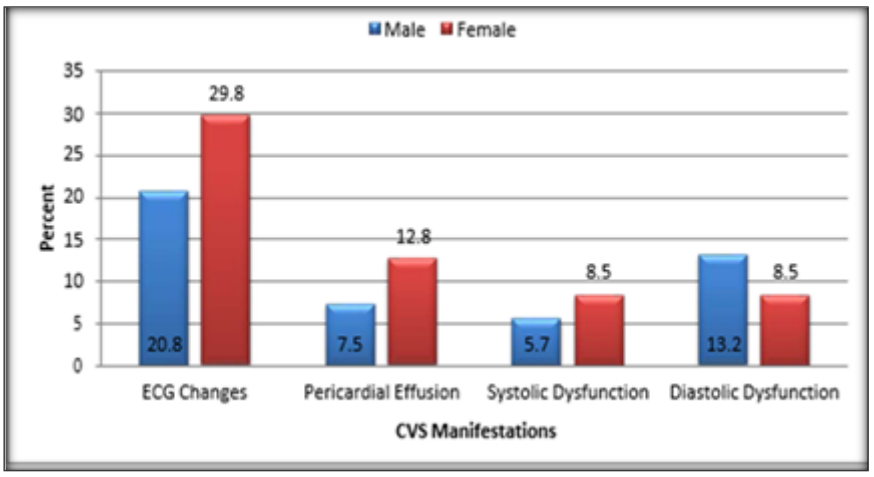

Figure 8.1: Gender and CVS Manifestations

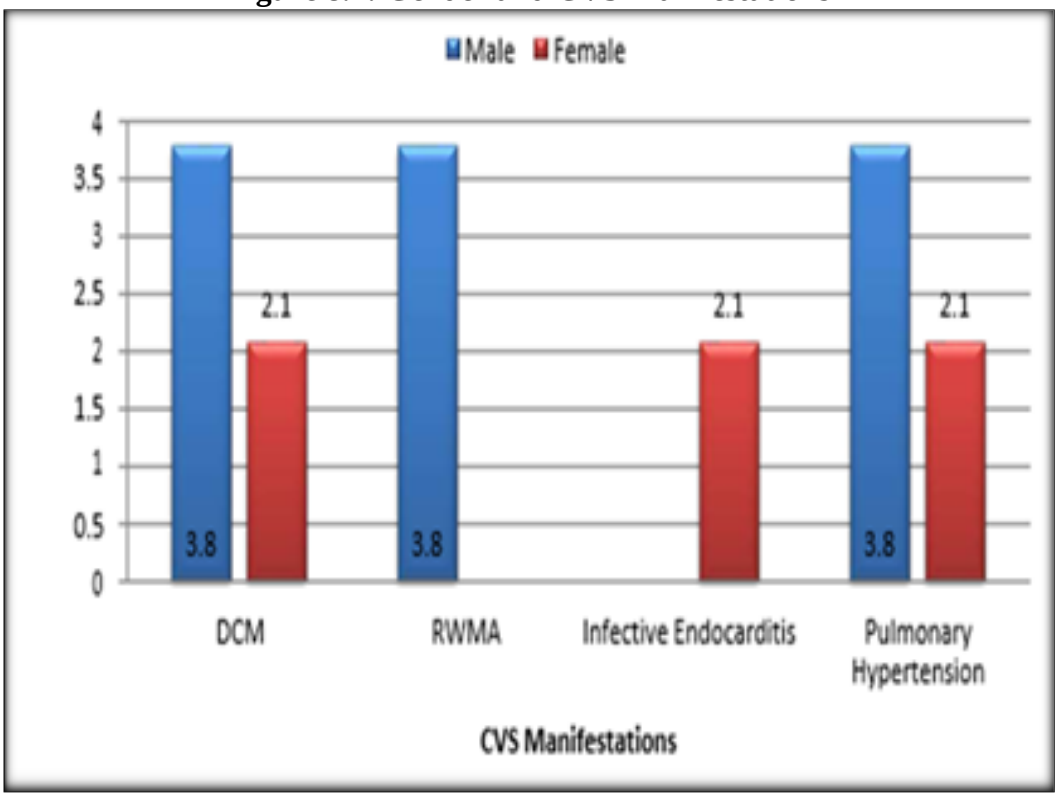

Figure 8.2: Gender and CVS Manifestations

Comments: ECG changes were seen more in female population 14% than male population 11%.

Table 9: Cardiovascular Manifestations in HIV with respect to CD4 Count (N=100)

CVS Manifestations	No.	CD4 Count				P Value
		≤ 50	51-200	201-500	>500	
ECHO Changes	25	4 (19.0)	6 (21.4)	7 (43.8)	8 (22.9)	0.299
Pericardial Effusion	10		7 (25.0)	2 (6.3)	1 (5.7)	0.016*
Systolic Dysfunction	7	5 (23.8)			2 (5.7)	0.006*
Diastolic Dysfunction	11	5 (23.8)		5 (31.3)	1 (2.9)	0.001*
DCM	3		1 (3.6)	2 (12.5)		0.081
RWMA	2		1 (3.6)		1 (2.9)	0.744
Infective Endocarditis	1		1 (3.6)			0.458
Pulmonary Hypertension	3		1 (3.6)	1 (6.3)	1 (2.9)	0.738

Comments:

- Pericardial Effusion was present in 10% of the population. P value is 0.016 significant.
- Diastolic dysfunction was present in around 11% of study population. P value is 0.001 significant.
- Systolic dysfunction was present in around 7% of study population. P value is 0.012 significant

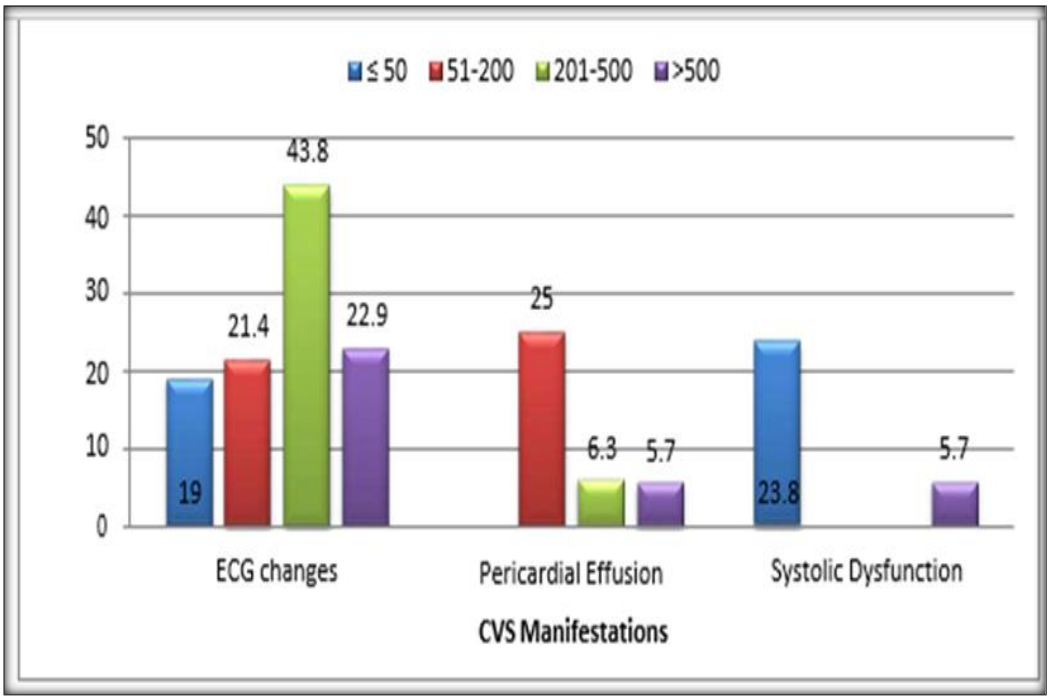

Figure 9.1: CD4 and CVS Manifestations

Comments:

- Pericardial Effusion was present in 10% of the population. P value is 0.016 significant.
- Systolic dysfunction was present in around 7% of study population. P value is <0.012 significant.

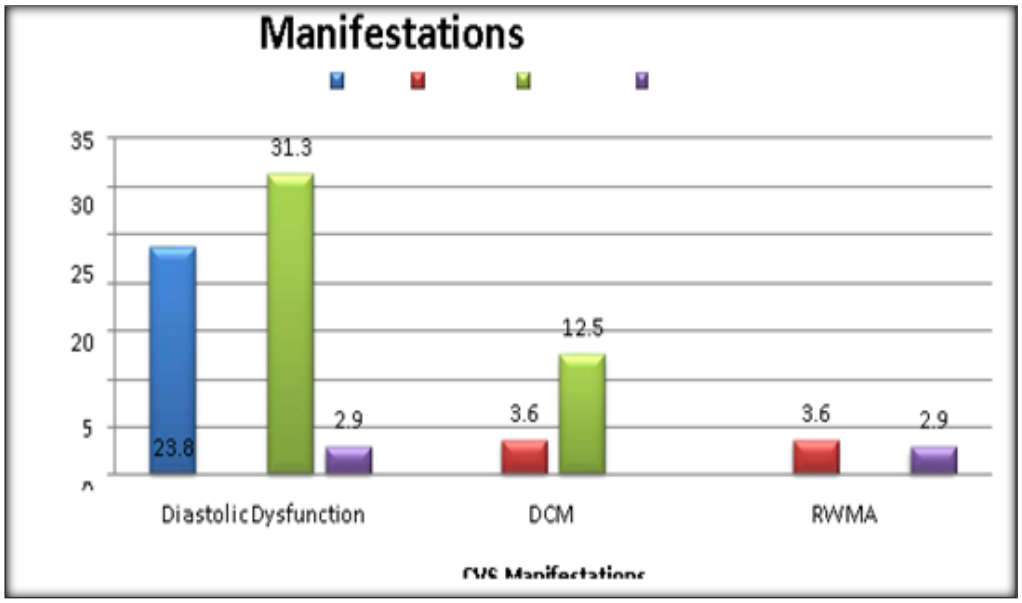

Figure 9.2: CD4 Count and CVS Manifestations

Comments: Diastolic dysfunction was present in around 11% of study population. P value is 0.001 significant.

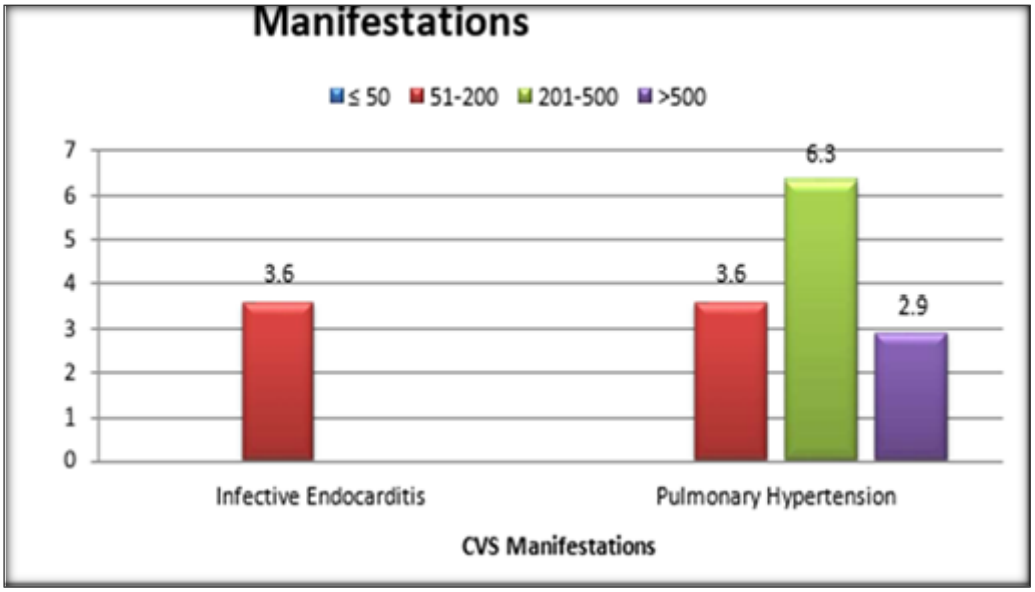

Figure 9.3: CD4 Count and CVS Manifestations

Comments: no significant P value.

DISCUSSION

With late stages of the disease, cardiovascular problems are more prevalent in HIV infection. 100 HIV patients, including those who had recently been diagnosed and those using ART, who were separated into 4 groups based on CD4 count and WHO staging participated in this study. About 49% of the study's participants were between the ages of 21 and 40, and 43% were between the ages of 41 and 50. 15% of the study group had just received a diagnosis, and about 85% of the population was on ART. The study group's gender distribution was also essentially equal. In the study population, ECG and echocardiography were done.[17-19]

Most of the HIV-positive patients in our investigation showed clinically inactive echocardiac abnormalities. This shows that monitoring for subclinical heart problems using echocardiography is crucial. HIV patients most frequently had diastolic dysfunction, according to observations. The bulk of the patients were in stages 2 and 4 and experienced exertional dyspnea and it was observed in 11% of patients with a p value of 0.001. Diastolic dysfunction results from aberrant ventricular filling brought on by the ventricle's noncompliance.[20,21]

10% of patients had pericardial effusion, with a p value of 0.016, and the majority of those instances were in stages 2 and 3 (CD4 count 500), with a range of symptoms ranging from moderate effusion without symptoms to severe pericardial effusion. The most frequent cardiac condition linked to a reduced survival time is pericardial effusion. In HIV infection, pericardial effusion can be caused by TB, secondary infections, cancer, and other generalised effusive processes. The diagnostic procedure is echocardiography, and patients with symptoms require pericardiocentesis. With a p value of 0.06, 7% of individuals had systolic dysfunction. The majorities of patients was in stage 4, had modest LV systolic insufficiency, and were asymptomatic. Very few people had no symptoms. Systolic dysfunction is a significant contributor to morbidity and mortality, and 6% of patients with advanced disease experience symptomatic heart failure. Myocarditis, dilated cardiomyopathy, and coronary artery disease are among the causes.[22-24]

Dilated cardiomyopathy (DCM), regional wall motion abnormality (RWMA), infective endocarditis (IE), and pulmonary hypertension (PHT) were additional cardiac abnormalities observed in the study group but were not statistically significant.[25] According to the findings of this study, HIV patients with low CD4 counts and late-stage disease experience all cardiac problems. Cardiovascular problems rise as CD 4 counts drop. Therefore, echocardiographic testing is required for HIV patients with CD4 counts below 500/microlitre. This study had some limitations, despite the fact that the drop in CD4 count corresponds well with the cardiac anomalies. Since these cardiac symptoms may also be caused by complicating variables such smoking, alcoholism, drug abuse, diabetes mellitus, hypertension, and dyslipidemia. Effective antiretroviral therapy can slow the course of cardiac issues in HIV infection, despite the fact that the precise pathophysiology of circulatory abnormalities in HIV is complex and poorly understood.

CONCLUSION

In advanced phases of HIV infection, cardiovascular abnormalities are more frequent and predictable consequences. There was a study done. to draw attention to the different circulatory problems caused by HIV infection. Numerous of these anomalies are linked to higher rates of morbidity and mortality. Systolic and diastolic dysfunction, pericardial effusion, and HIV patients with low CD4 counts all frequently have these cardiac problems. As a result, these variables can also be utilised to forecast how an illness would develop. For this reason, cardiac problems should be examined in all HIV patients with low CD4 counts (200/microlitre). Increased clinical outcomes and survival rates in HIV patients are related to early detection and treatment of these sequelae.

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