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Study of Electrocardiographic and Echocardiographic Abnormalities in HIV Positive Patient with special Reference to CD4 Count.

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Abstract

Introduction: The incidence of Echocardiographic abnormalities in HIV/AIDS patients is increased in recent years in India. Early screening and prompt treatment are important to prevent significant morbidity from cardiac involvement and to promote long term health in PLHIV. Hence the present study was undertaken to determine various Electrocardiographic and Echocardiographic abnormalities and their correlation to CD4 counts.**Method:**This was a cross-sectional studyon100 patients from April 2019 to June 2020 in our department those who were fulfilling the criteria. The study population was investigated for routine blood tests, X-Ray chest PA view, ECG, CD4 count and 2D Transthoracic Echocardiography.**Results:** The cases comprised of 36 females (36%) and 64 males (64%). Mean CD4 count was 313.7 ± 237.62 /μl. Most patients belonged to WHO clinical Stage II (41.0%) and III (29.0%). The ECG findings were seen in 51% cases and sinus tachycardia (27%) found to be most common. Echocardiographic abnormalities were seen in 67% of cases. Left ventricular diastolic (35%) dysfunction and reduced ejection fraction (25%) were the commonest findings. Echocardiographic abnormalities increased with CD4 counts less than 200/μland with advancement in stage of disease as per WHO grade and were statistically significant.**Conclusion:** Cardiovascular abnormalities in the form of electrocardiogram and ECHO findings werepresent in 51% and 67% of patients, respectively. Echocardiographic findings showed significant correlationwith CD4 count and WHO disease stage.

Keywords: HIV, Cardiac abnormality, CD4 count, ECG, Echocardiogram.

Introduction

HIV/AIDS is a multi-systemic disease, affecting virtually every organ and system of the body, and causing progressive dysfunction. It was approximated that 2.4 million people were living with HIV in India, which equates to a prevalence of 0.3%. Accumulating evidence show that the prevalence of cardiac involvement in PLHIV has been reported to range between 28 to 73%. These cardiac diseases include pericardial effusion, myocarditis, dilated cardio-myopathy, endocarditis, pulmonary hypertension, malignant neoplasms, coronary artery disease, and drug-related cardiotoxicity [1]. With the increased use of highly active antiretroviral therapy (HAART) to prolong lifespan of patients, cardiovascular disorders have increasingly become a leading cause of morbidity and mortality in people living with HIV-AIDS (PLHA)[2]. They often go unrecognized or untreated and reduced quality of life. Patients on various ART regimen may experience different rates and types of cardiovascular abnormalities based on genetic background, dietary intake, and lifestyle factors. In addition, patients in resource-limited settings are more likely to have advanced HIV disease and poor nutritional status.The ECG, which is fairly widely available in resource-poor countries, is helpful in evaluating HIV subjects for identifying subtle cardiovascular disease.Echocardiography is an important imaging modality useful for identifying and characterizing most of the cardiac manifestations in patients with HIV infection Routine CV monitoring can detect these abnormalities early enough to initiate prompt therapy or preventive measures. Such screening

prevents significant morbidity from cardiac involvement.This study seeks to determine the prevalence of cardiac abnormalities in HIV positive patients using ECG and Echocardiography and their correlation to CD4 counts.

Material and methods

It was an observational study carried out from April 2019 to June 2020 in the Department of medicine, Shyam shah medical college and Sanjay Gandhi Hospital, Rewa, MP. A total of 100 HIV Positive cases fulfilling the inclusion & exclusion criteria were chosen.

Inclusion criteria: All patients presented with HIV positive status (HIV1 /HIV2) come to OPD and IPD in SGMH Rewaand who gave a written informed consent.

Exclusion Criteria: All Patients with history of Ischemic, Rheumatic, or Congenital Heart Disease, Hypertension, Diabetes Mellitus, Chronic Alcoholism and Chronic Respiratory Illness prior to HIV diagnosis were excluded from the study.All patients underwent routine haematological and biochemical investigations and special investigations like ECG and transthoracic echo-cardiography were carried out in every patient. All patients were assessed clinically by detailed history taking, general and systemic physical examination. CD4 estimation will be done by flow cytometry.

Statistical analysis: The data were compared for statistical analysis using the Chisquare test, student t-test, and analysis of variance, as appropriate. All analyses were performed using the IBM SPSS statistics for Windows, version 23.0. The values were represented as number (%) and mean ± standard deviation. A p value <0.05 was considered statistically significant.

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Results

A total of 100 PLHA were studied. The mean age of the study population was 39.9 ± 10.6 years. (range:18-65 years). Most of the patients (51%) were in the age group of 21-40 years as shown in table no 01. Of 100 patients, 64 were male and 36 were female (male: female ratio: 1.7:1). Sexual mode (heterosexual contact) was the most common transmission route detected in 88% of all cases as shown in table no. 02. Out of 100 cases most common occupation of study cohort were farmers (26%) followed by laborer (22%) and housewife (16%).

Table 1: Age wise distribution of cases

Age group	No. of cases	Percentage
≤20	04	04.0
21-40	51	51.0
41-60	42	42.0
>60	03	03.0
Total	100	100.0

Table 2: Distribution of cases according to the Modes of Transmission

Mode of transmission	Number	Percentage
Heterosexual	88	88.0
Mother to child	08	08.0
Blood products	04	04.0
Total	100	100.0

As shown in table no.03, Majority of the patients belongs to WHO stage 2 (41%) followed by WHO stage 3 (29%), clinical stage 1 (26%) and stage 4 with only 4%.

Table 3: Distribution of cases according to WHO clinical staging of HIV

WHO Clinical Stage	No of Cases		Total	Percentage
	Male	Female		
1	15	09	26	26.0
2	22	19	41	41.0
3	21	08	29	31.0
4	3	1	04	04.0
Total	64	36	100	100.0

As shown in table no 04 The CD4 count was less than 51/ µl in 5% of cases, between 51 and 200/ µl in 36% of cases, between 201 and 500/ µl in 41% of cases, and >500/ µl in 18% of cases.The range of CD4 count was 26-1263/µl (mean, 313.7 ± 237.62/µl)

Table 4: Distribution of cases on the basis of CD 4 Count

CD4 Count	No. of cases	Percentage
≤50	5	5.0
51-200	36	36.0
201-500	41	41.0
>500	18	18.0
Total	100	100.0

As shown in table no 05, ECG was carried out in different CD4 category patients, it was found that the maximum % of abnormal ECG was found in CD4 <50 category i.e., 80.0% and least abnormal ECG findings were seen in CD4 >499 category patients i.e., 26.4%. The above findings are statistically significant p<0.05.
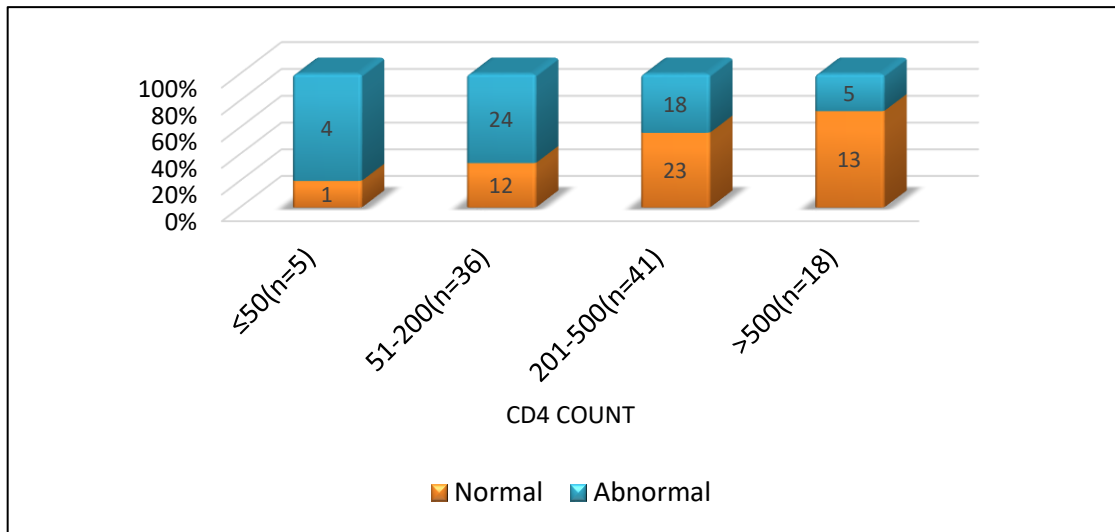
Table 5: Relation between CD4 Count with ECG changes in HIV/AIDS Patients

CD4 Count Category	No. of Patients	ECG abnormalities		
		Normal	Abnormal	
≤50	5	01(20%)	04 (80.0%)	
51-200	36	12(33.3%)	24(66.6%.)	
201-500	41	23 (56.1%)	18 (43.9%)	P value=0.019
>500	18	13(72.2%)	05 (26.4%)	
Total	100	49	51	

As table no 06 shows that Sinus Tachycardia was more prevalent in group with CD4 <200, seen in 16 patients out of 27 moreover low voltage complex, ST-T changes and LVH also shows similar findings i.e., a total of 6,6 and 7 cases when compared to group with CD4 Count >200 and that was also found to be significant statistically. (fig.01)

Table 6: Comparison of CD4 categories with different ECG findings in HIV patients

| ECG Findings	<200	>200	P value
Sinus Tachycardia(n=27)	16	11	0.004
Low Voltage QRS(n=7)	6	1	0.01
QT Prolongation(n=12)	5	7	0.91
ST-T changes(n=8)	6	2	0.041
LVH(n=10)	7	3	0.03
RAD(n=4)	3	1	0.25
LAD(n=5)	2	3	
Bundle Branch Block(n=6)	3	3	0.6

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Fig 1: Relation between CD4 Count with ECG Changes in HIV/AIDS

From table no 07 There was statistically significant association between Echocardiographic Abnormality in two Compared groups of CD4 counts and the propensity of those ECHO abnormalities increased with decrease in CD4 count. (Fig.02.)

Table 7: Comparison between 2D ECHO finding and CD4 Count

ECHO Finding	CD4 count		P value
	<200	>200	
Pulmonary HTN(n=08)	4	4	0.29
Diastolic Dysfunction(n=35)	19	16	0.04
Pericardial effusion(n=22)	14	08	0.014
Reduced EF <60%(n=25)	17	08	0.001
Wall abnormalities(n=04)	3	1	0.15
Dilated Cardiomyopathy(n=09)	08	01	0.002
LVH(n=10)	06	04	0.224
Normal(n=37)	09	28	
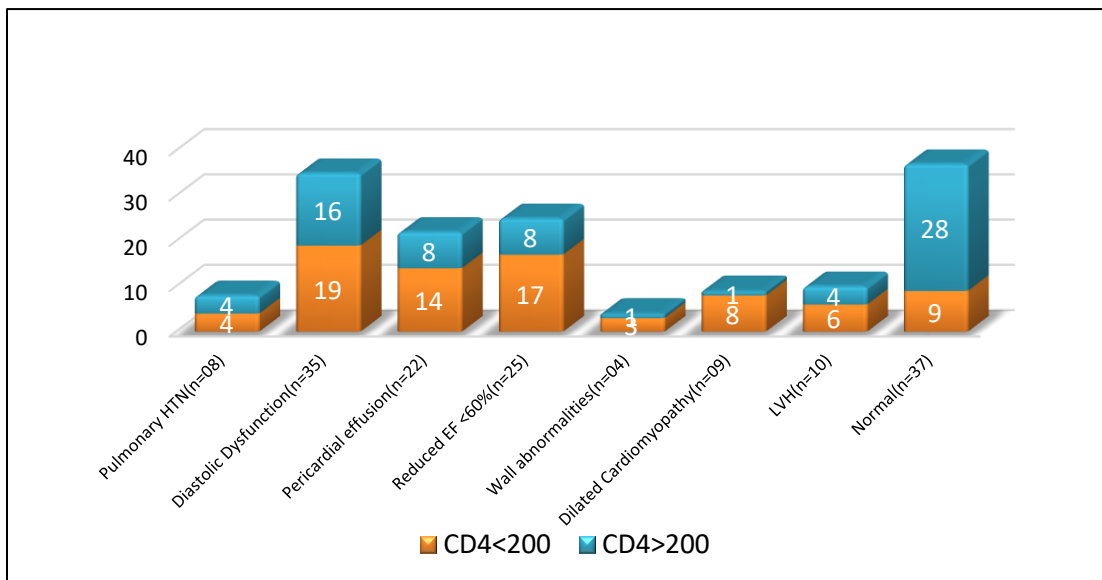
Fig 2: Showing comparison between 2D Echo finding and CD4 Count

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As shown in table no 08 Out of 35 cases having diastolic dysfunction, majority of Diastolic Dysfunction seen in patients with grade 2 i.e.,16%. majority of patient with pericardial effusion belong to WHO grade 1 and 2.

Table 8: WHO staging correlation with ECHO abnormalities

Echo finding	WHO grade				P value
	1	2	3	4	
Pulmonary HTN(n=08)	2	3	2	1	0.702
Diastolic Dysfunction(n=35)	7	16	8	4	0.016
Pericardial effusion(n=22)	8	11	2	1	0.45
Reduced EF <60%(n=25)	5	12	4	4	0.09
Wall abnormalities(n=04)	0	1	1	2	0.003
Dilated Cardiomyopathy(n=09)	2	4	3	0	0.57
LVH(n=10)	2	5	2	1	0.58
Normal(n=37)	17	11	08	0	

Discussion

In this study 100 patients with HIV infection and registered in ART Centre were included.The mean age of the patients was 39.96 ± 10.69 years. The mean age of male and female patients was 41.7 ± 11.07 and 36.72 ± 9.26 years, respectively.Maximum no. of cases belongs to age bracket 21-40 years i.e., 51% cases and in 41-60 years i.e., 42% cases.The cases comprised of 64 male and 36 female (male: female ratio: 1.7:1) The gender difference was also at par with NACO report, where 39% of the total HIV patients in India were females, 3.5% were children and the rest 57.5% were males[3].In this study Majority of the patients belongs to WHO stage 2 (41%) followed by WHO stage 3 (29%), clinical stage 1 (26%) and stage 4 with only 4%. Maximum males were in clinical stage 2 (22%). Study done by Gaikwad et al reported that the maximum number of patients studied were in clinical stage 2 (48.0%) followed by clinical stage 3 (38.0%), clinical stage 4 (8.7%) and only 5.3% of cases were in Stage 1 respectively of WHO grading[4].In the present study the range of CD4 count was 26-1263/µl (mean, 313.7 ± 237.62/µl). The CD4 count was less than 51/µl in 5% of cases, between 51 and 200/µl in 36% of cases, between 201 and 500/µl in 41% of cases, and >500/µl in 18% of cases. In this study, out of 100 cases, 51% patients had ECG abnormalities which indicates that ECG can be used as an easy and convenient tool for investigating CVD risk. Commonest abnormalities were sinus tachycardia in 27% of cases, QT prolongation in 12% cases, sign of LVH seen in 10% cases. Mishra et al. observes ECG findings in 54.5% cases out of 200 cases studied and again sinus tachycardia was most common abnormalities seen followed by low voltage complex[5]. Similarly, in a western study done by Heidenreich et al 38% patients had sinus tachycardia, 7.2% patients had low voltage complexes and 6% had ST-T changes[6].It was observed that 2D echocardiography was normal in 37 out of 100 cases (37%), while various abnormalities were observed in 67 cases (67%). Left ventricular diastolic dysfunction was the commonest findings being noticed in 35%. which is similar to the findings of several previous studies involving Indian PLHA. Other abnormal findings were pericardial effusion in 22% cases, reduced ejection fraction 25% pulmonary artery hypertension in 08% of cases, DCMP in 9% cases and LVH in 10% cases. Higher incidence of diastolic dysfunction in our study was comparable to western study by Reinsch et al which was 48%[7].Nayak et al on 91 HIV-positive cohort, diastolic dysfunction on echocardiography was reported in 37%[8]. The left ventricular diastolic dysfunction is one of the earliest evidences of myocardial involvement and may be an asymptomatic in early stages. Diastolic dysfunction was also observed to be more frequent and worsening with disease progression. It is been observed that there was statistically significant association between Echocardiographic abnormality in two compared groups of CD4 counts and the propensity of those ECHO abnormalities increased with decrease in CD4 count.Majority of Diastolic Dysfunction seen in patients with WHO clinical stage 2 i.e.,16%. which was statistically significant. Majority of patient with

pericardial effusion belong to WHO clinical stage 1 and 2. In comparison to this study Sundarrajan et al. had revealed a strong association between the disease stages and echocardiographic manifestations, indicating that cardiac abnormalities are directly proportional to the disease stage[9].In various studies the exact prevalence of cardiac involvement in patients with HIV/AIDS varies depending on screening method and population studies. In our study we observed that various echocardiographic abnormalities are not infrequent. Echocardiography as a relevant tool for diagnosis of subclinical cardiac abnormalities, with the aim of instituting management early wherever necessary.

Conclusion

This study clearly revealed that majority of study cohort have cardiovascular abnormalities which are clinically quiescent. Cardiac abnormalities were specifically correlated to CD4+ T cell counts. Based on the present study it is highly recommendable for routine screening of cardiac abnormalities in HIV patients to identify early cardiac involvement and curtail the cardiac complications by early interventions.

Limitations

A small sample size was evaluated at a single time point reduces the strength of present study. Follow-up of cardiac abnormalities in patients with previous normal echocardiography as well as the natural history of who had cardiac abnormality could not be studied. Viral load could not be estimated due to its constraints.

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