

Original Research Article


Study of profile of cardiac dysfunction in HIV infected children

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Abstract

Background: There are very few published studies of heart disease in HIV infected children. The incidence of cardiovascular disease reported among HIV infected children ranges from 72% to 90%. Cardiac disease was primary cause of death in 25% of HIV Positive patients. Studies carried out in Indian subcontinent have demonstrated the presence of systolic and diastolic dysfunction on 2D Echo in HIV infected patients.

Objectives: To determine the prevalence, and describe the type of heart disease among children with HIV attending an ART centre in Gandhi hospital and centre of excellence Niloufer hospital in collaboration Department of Cardiology, Gandhi Hospital.

Materials and methods: 100 HIV infected children in age group of 1-18 years attending an ART centre in Gandhi hospital and centre of excellence Niloufer hospital from December 2011 to August 2013 were evaluated clinically, and investigated by chest X-ray, electrocardiography and 2D-echo.

Results: Heart abnormalities were detected in 48 children (43 by 2D-echo, 4 by ECG, 1 by chest X-ray). The abnormalities included left ventricular systolic dysfunction (16%), left ventricular dilation (8%), left ventricular hypertrophy (11%), Pulmonary artery hypertension (11%), tricuspid regurgitation (14%) pulmonary regurgitation (4%), mitral regurgitation (4%), sinus tachycardia (4%), cardiomegaly on chest X-ray 1 of total 100 children taken for study.

Conclusions: Heart abnormalities were common especially in HIV infected children. Clinical examination, chest radiograph and ECG may pick up manifest cardiac disease. Sub-clinical manifestations such as left ventricular dilatation hypertrophy and decrease systolic dysfunction can be detected only by echo cardiography. Annual echography and ECG examination is recommended to evaluate the progression of cardiac disease and treat the same before it become irreversible in HIV infected children.

Key words

Cardiac dysfunction, HIV, Children.

Introduction

India has an estimated 220,000 children infected by HIV/AIDS. It is estimated that 55,000 to 60,000 children are born every year to mothers who are HIV Positive. Approximately 2.1 million children under 15 were living with HIV (2007). An estimated 290,000 children under 15 died of AIDS-related causes (2007) [1, 2].

The currently available anti-retroviral (ARV) drugs and treatment of opportunistic infections have converted HIV infection into a chronic illness. All body systems, including the cardiovascular system, may be affected by HIV disease. There are still very few HIV infected children accessing anti-retroviral therapy at the moment in developing countries because of financial constraints. Since ARV drugs do not eliminate the HIV from the body, their use may simply postpone the development of heart disease, yet some of these drugs like zidovudine are cardiotoxic themselves and have been associated with heart disease [3].

As pulmonary diseases in HIV disease are more effectively prevented and treated, the proportional morbidity and mortality of heart diseases among children with HIV/ AIDS increases [4]. Most of the published studies about heart disease in HIV/AIDS have been done in adults. The few published studies of heart disease among HIV infected children have used small sample sizes (of less than 50) or were highly selective (including only children with symptomatic HIV disease or those who were very sick).

In many clinical situations, HIV infected children are not routinely evaluated by echocardiography. Previous studies have shown that heart diseases in HIV/AIDS patients are usually subclinical but may be severe. When the signs and symptoms of cardiac dysfunction are present, they are non-specific and often attributed to non-cardiac

pathologies especially pulmonary disease.

The cardiac complications attributed to HIV infection vary, ranging from subclinical electrocardiographic (ECG) changes, to life-threatening cardiomyopathy, and sudden death. Autopsy studies have documented pathologic cardiac findings in some children with HIV infection. The virus itself has been detected in myocardial cells as well as pericardial fluid in HIV-infected children. Furthermore, 2 studies have suggested that cardiac disease may be an important prognostic indicator of the severity and the rate of progression of the overall HIV disease itself [4, 5].

Aim and objectives

- To determine the incidence of cardiac abnormalities in children with HIV infection.
- To evaluate the spectrum of cardiac abnormalities in children with HIV infection

Materials and methods

Inclusion criteria

Around 100 children in age 1 to 18 years with HIV infection who comes for follow up at ART center in Gandhi hospital and centre of excellence, niloufur hospital from December 2011 to August 2013 were included in the study.

Exclusion criteria

Children with congenital heart diseases.

Cardiac studies

A cardiologist using echo machine did M-mode and 2- dimensional echocardiography following the criteria of the American Society of Echocardiography. The transducer frequency was 3.5 or 5 MHz depending on the need. The subcostal view was got with the patient lying supine and was used mainly to assess anatomic relations and presence of congenital

abnormalities. Parasternal and apical views were obtained with the patient in the left lateral or supine position depending on what gave the best view. Long parasternal views with M-mode were used for measuring the heart chamber dimensions in diastole and systole. Left ventricular fractional shortening (LVFS) was automatically computed by the machine and is the quickest and, for clinical purposes, usually sufficient to assess left ventricular function.

Doppler and color flow studies were done to study valve and orifice pressure gradient and directionality of blood flow. Continuous Doppler recordings were obtained, with the sample volume located between the tips of the valve.

Mode of diagnosis on echo

Left ventricular systolic dysfunction was defined as left ventricular fractional shortening <28%.

LV measurements were converted to z scores based of normal values of M mode echocardiographic measurements of more than 2000 healthy infants and children in central Europe. Z scores >2 are taken in consideration while defining ventricular dilation and hypertrophy [10].

Electrocardiography (ECG)

The 12-lead standard ECG was done. Chest radiographs was also done to specify the presence or absence of cardiomegaly.

Table – 1: Demographic data.

Sex	TOTAL		Heart abnormality	
	ART	(n) PreART	ART	PreART
male	31	25	15	10
female	24	20	11	7

Discussion

Worldwide, the extent of, and factors associated with cardiac abnormalities in pediatric HIV are yet to be fully known. Few studies of cardiac abnormalities in HIV infected children have been published and most of these studies have been based on echo and ECG findings.

Ethical consideration

Permission to carry out the study was obtained from Ethics Committee of Gandhi medical college. Informed consent was obtained from the caretakers of the children who participated in the study.

Results

Demographics

100 HIV infected children of whom 55 males and 45 females (**Table – 1**).

Prevalence of heart disease

Of the 100 children studied, heart abnormalities were detected by echo in 43 children, by ECG in 4 children and chest X-ray one child (**Graph – 1**).

Types of heart abnormalities detected

Of 100 HIV children studied 16 had left ventricular systolic dysfunction, 11 had left ventricular hypertrophy, 8 had left ventricular dilation, 14 had tricuspid regurgitation, 5 had pulmonary regurgitation, 4 had mitral regurgitation, 11 had pulmonary artery hypertension (**Graph – 2 to 7**).

Electrocardiographic findings

Sinus tachycardia was the most frequent ECG abnormality detected and was found in 4 children.

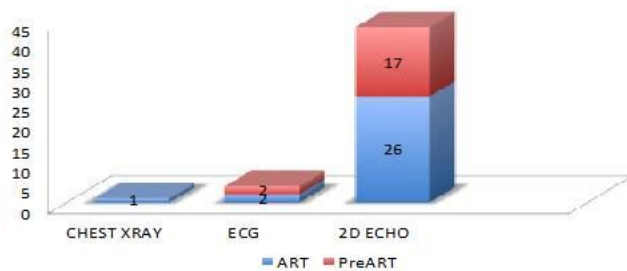
Prevalence and type of heart abnormalities detected

The prevalence of heart abnormalities detected by echo alone among HIV positive children in this study was 48%. This prevalence falls within the range of 18% to 78% reported by previous studies. And the abnormalities detected were

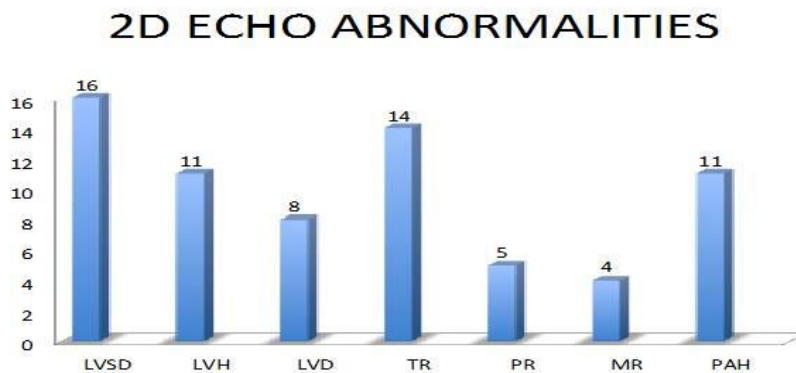
significantly more prevalent in children on ART (26%) compared to those with PreART (17%) by 2D echo.

children (ART 12%, PreART 4%) a prevalence that is within the range of 5% to 65% found in previous study. Decreased left ventricular systolic function is seen when the ventricular hypertrophy fails to keep with progressive left ventricular dilatation.

Graph – 1: Prevalence of heart disease.

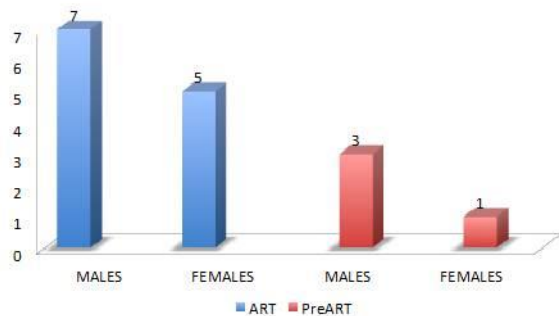


Graph – 2: 2D echo abnormalities.

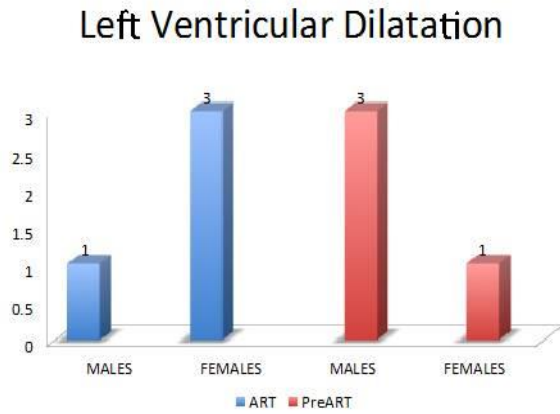


Graph – 3: Left ventricular systolic dysfunction.

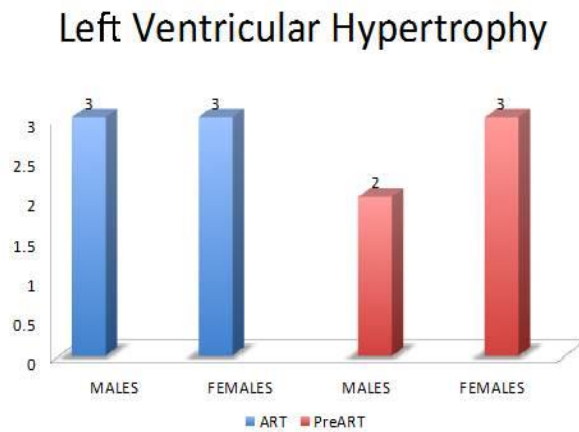
Left Ventricular Systolic Dysfunction



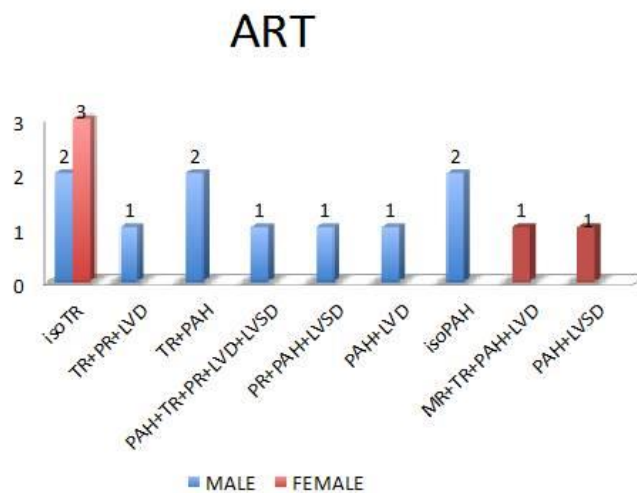
Graph – 4: Left ventricular dilatation.



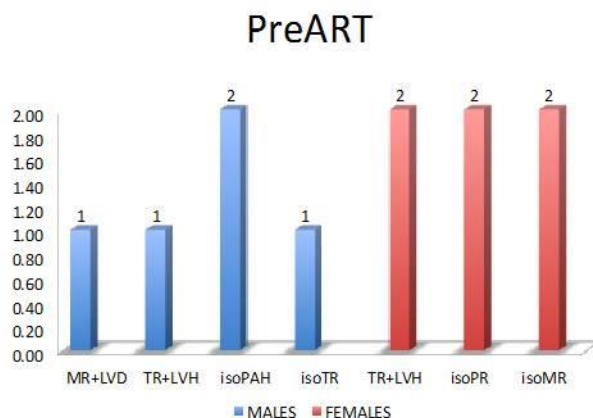
Graph – 5: Left ventricular hypertrophy.



Graph – 6: ART.



Graph – 7: PreART.



Left ventricular dilatation is 8% (ART 4%, PreART 4%), Left ventricular hypertrophy is 11% (ART 6%, PreART 5%) both of which are below the range of previous study. Direct cytotoxic effect of HIV virus on cardiac cells has been proposed to be the cause of progressive dilatation of left ventricle in HIV infected children [6]. Tricuspid regurgitation was found in 14%, pulmonary regurgitation in 5%, mitral regurgitation in 4%.

Pulmonary hypertension is seen 11% (9% in ART, 2% in PreART). The pathogenesis of primary pulmonary hypertension in HIV infection is multifactorial and poorly understood. Clinical symptoms and outcomes of patients with right ventricular dysfunction are related to the degree of pulmonary hypertension, varying from a mild asymptomatic condition to severe cardiac impairment with cor pulmonale and death. Activation of alfa-1 receptors and genetic factors (increased frequency of HLA-DR6 and DR52) have also been hypothesized in the pathogenesis of HIV- associated pulmonary hypertension. The effect of antiretroviral therapy on pulmonary hypertension is not known; however, a recent report from the Swiss Cohort Study, showed that pulmonary artery pressure increased in untreated patients but decreased in patients treated with ART [7].

Sinus tachycardia found in 4% which was less

than other studies. The autonomic imbalance and neuropathy, which are present in early HIV infection and progress with worsening HIV disease, are possible explanations for the sinus tachycardia. Other ECG abnormalities were rare and asymptomatic. No children had pericardial effusion and right ventricular abnormalities in my study which was found in other studies.

A recent report [8] of HIV-infected adolescents and young adults receiving long-term HAART found that, while traditional echocardiographic measures of cardiac function were normal, measures of cardiac strain and strain rate were significantly impaired. Sims, et al. [9] suggest that these echocardiographic measures could be prognostic of long-term myocardial dysfunction in this population. Examining the associations between individual ART agents and combinations of ART might identify optimal ART regimens, both in terms of optimizing HIV outcomes and protecting long-term cardiac health and represents a future research opportunity using this data set. Finally, an analysis of renal function data from these 2 HIV-infected pediatric cohorts, relative to the cardiac findings from both the P²C²-HIV and AMP-HIV cohorts, could be a potentially interesting next research step in better characterizing the potential contributing factors to cardiac outcomes in pediatric HIV-infected populations.

Conclusions

Over 48% of children in this study had cardiac abnormality. Most frequent abnormalities are left ventricular systolic dysfunction 16%, left ventricular dilatation 8%, left ventricular hypertrophy 11%, TR 14% and pulmonary artery hypertension in 11%.

Recommendations

Based on these findings, it can be recommended that clinicians need to maintain a high degree of suspicion for heart disease in HIV-infected children. Clinical examination and chest radiograph and ECG may pick up manifest cardiac disease. Sub-clinical manifestations such as left ventricular dilatation hypertrophy and decrease systolic dysfunction can be detected only by echo cardiography. Annual echocardiography examination is recommended to evaluate the progression of cardiac disease and treat the same before it becomes irreversible in HIV infected children.

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B. Kalyan Kumar, Ravi Kumar, J. Venkateshwar Rao. Study of profile of cardiac dysfunction in HIV infected children. IAIM, 2017; 4(10): 165-172.

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