



STUDY OF CARDIOVASCULAR RISKS AND CAROTID INTIMAL THICKNESS (CIMT) AND THE EFFECT OF ANTIRETROVIRAL THERAPY IN THE CARDIOVASCULAR PROFILE AMONG HIV PATIENTS

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ABSTRACT

Antiretroviral therapy (ART) for HIV infection has led to a considerable reduction in mortality and morbidity associated with the disease such that presently HIV is considered as a 'manageable' chronic disease. ART medications increase cardiovascular risk. Patients with HIV are at increased risk for premature cardiovascular disease. Our study aimed to evaluate the exaggerated cardiovascular risk in HIV patients on long term ART. We studied 100 HIV patients and 50 normal subjects in a tertiary multi-specialty hospital in south India which is also an Antiretroviral therapy center. We sought to compare the Carotid intimal media thickness (CIMT) by ultrasound scanning of carotids, Fasting lipid profile and fasting blood sugar of all the patients in the study. The CIMT and Framingham cardiac risk score was significantly higher in HIV patients on ART compared to patients not on ART. This publication highlights the importance of evaluating cardiovascular risk before initiating ART as well as during follow up and make necessary changes in the treatment regimen to improve the quality of life of patients with HIV.

KEYWORDS

Antiretroviral therapy, cardiovascular risk, carotid intimal thickness, Framingham cardiac risk score

INTRODUCTION:

Effective highly active antiretroviral therapy (HAART) for Human Immunodeficiency Virus (HIV) infection has led to marked improvement in life-expectancy for patients with HIV.

Despite reductions in the incidence of AIDS with effective treatment, patients continue to experience considerable morbidity and mortality from non-AIDS illness such as premature cardiovascular disease, liver failure and renal failure.

Mounting data suggests that HIV infection and exposure to anti retro viral medications lead to early development of risk factors associated with cardiovascular disease. Therefore, the cardiovascular risk assessment should be performed on a regular basis in HIV patients.

In the general population, the Framingham risk score, which is a scoring system used to estimate the 10 year cardiovascular risk of an individual is widely accepted as a reference tool.

Assessment of carotid intimal thickness and Framingham risk score would help predict the risk of cardiovascular events amongst the patients and addressing these factors will improve the outcome of these patients.

MATERIALS AND METHODS

A clinical study was conducted in a multispecialty ART hospital in South India over a period of 2 years to assess the various metabolic parameters in HIV patients on ART and to compare these parameters with HIV patients not on ART, and also to correlate CIMT with cardiovascular risk.

A Total Of 150 Patients Were Studied Of Which Included:

- 50 HIV positive patients not on ART (Group I)
- 50 HIV positive patients who are on ART (Group II)
- Control group: 50 age and sex matched non-HIV individuals

All Were Subjected To:

Investigations Which Included:

- 1) Carotid Intimal Media Thickness (CIMT) assessed by B-scan ultrasound.
- 2) Fasting Lipid profile (FLP)
- 3) Fasting Blood Sugar (FBS)

RESULTS

Carotid Intimal Media Thickness (CIMT)

The C-IMT of HIV patients on ART (0.74 ± 0.16) were significantly higher than HIV patients not on ART (0.69 ± 0.13) and the normal subjects ($0.68 \pm .09$)

HIV patients on ART had 0.06mm greater C-IMT than HIV patients not on ART and normal subjects.

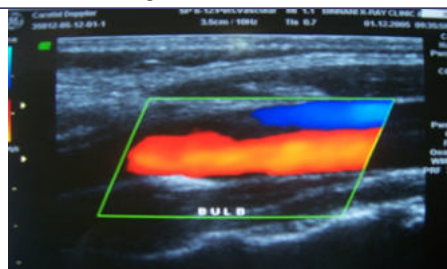


Image 1: Normal Carotid Bulb Color Flow

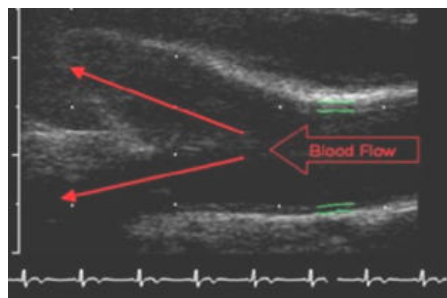


Image 2: Intima-media thickness of common carotid artery is the distance between the green lines

Table 1. Arterial thickness of HIV patients and controls :

		N	Mean	Std. Deviation	F	p
CIMT	Controls	50	.6832	.09128	2.704	0.07
	HIV no ART	50	.6948	.13031		
	HIV & ART	50	.7420	.16881		

CIMT

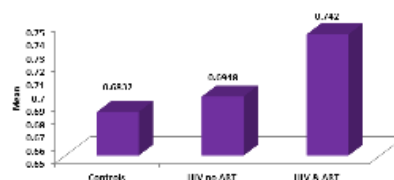


Figure 1

Framinghams Score

Table 2. Framinghams score of HIV patients and controls

		N	Mean	Std Deviation	F	p
FR	Controls	50	2.9200	1.8388	11.518	<0.001

SCR	HIV no ART	50	4.5200	2.6360		vhs
	HIV & ART	50	5.5800	3.6088		

The Framingham score of HIV patients on ART (5.58±3.60) was significantly higher than HIV patients not on ART (4.52±2.63) and normal subjects (2.92±1.83)

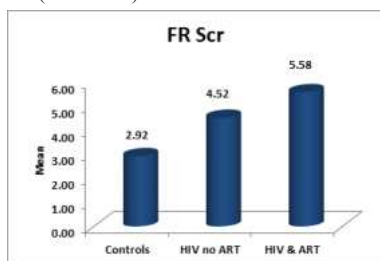


Figure 2. Framingham score of HIV patients and controls

FBS

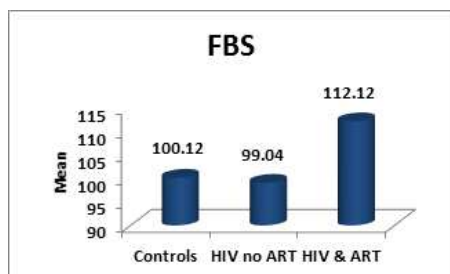


Figure 3. FBS of HIV patients and controls

The FBS of HIV patients on ART was 112.12±14.10 which was significantly higher ($p<0.001$) than HIV subjects not ART (99.40±11.62) and normal subjects (100.12±12.30)

Total Cholesterol

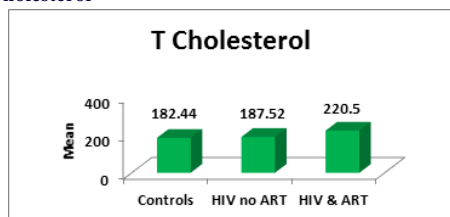


Figure 4 Total cholesterol of HIV patients and controls

The total cholesterol of HIV patients on ART (220.50±22.89) were significantly higher ($p<0.001$) than HIV patients not on ART (187.52±17.16) and normal subjects (182.44±11.00).

HDL

The HDL of HIV patients on ART (44.72±16.97) was significantly lower ($p<0.001$) than normal subject (61.02±7.73) but there was no much difference from HIV patients not on ART (45.46±10.71)

LDL

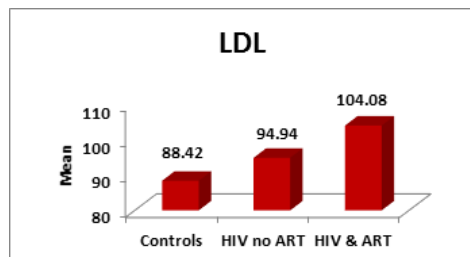


Figure 5. LDL of HIV patients and controls

The LDL of HIV patients on ART (104.08±11.28) was significantly higher than HIV patients not on ART (94.94±12.74) and normal subjects (88.42±9.72)

DISCUSSION

Although the routine use of HAART has prolonged the life expectancy of individuals infected with HIV¹, the accelerated onset of cardiovascular disease has emerged as a concerning complication of chronic HIV infection and long-term use of HAART². Moreover, there is increasing evidence supporting the initiation of HAART in asymptomatic patients with HIV infection and a CD4+ T-cell count >500 cells/mm³. It is, therefore, more relevant to stratify patients for cardiovascular disease risk as ART is being initiated or treatment regimens are being adjusted⁴.

Studies have shown that Framingham risk scores are increased in patients infected with HIV when compared with the general population and that increased Framingham risk scores are associated with increased smoking prevalence, lipodystrophy, CD4+ T-cell counts and serum CRP levels in this population⁵⁻⁸. In a study examining Framingham risk score, as well as three other cardiovascular algorithms (PROCAM, Progetto Cuore and SCORE) in patients infected with HIV, the Framingham risk score provided the highest estimate of cardiovascular risk⁷.

In our study, 100 HIV patients and a control of 50 normal subjects were evaluated. The sample size was further divided into 2 groups: 50 HIV patients not on ART and 50 HIV patients who were on ART for more than 1yr.

We found that HIV patients who were on ART for more than 1yr had statistically significant ($p<0.001$) increase in Total Cholesterol (220.50±22.89) and LDL (104.08±11.28) as compared to the HIV patients not on ART (187.52±17.16, 94.94±12.74) and normal subjects (182.44±11.00, 88.42±9.72). The results were similar to the study conducted by Bruno Caramelli et al where they observed average increments of 31% for Total Cholesterol and 146% for Triglycerides¹⁰.

Another study conducted by Manuthu EM, Joshi MD et al on 134 HIV patients observed high total cholesterol occurred in 39.2% of HAART and 10.0% HAART naive patients, whereas high LDL cholesterol occurred in 40.8% and in 11.2% respectively. HDL levels were low in 14.6% and 51.3% among HAART and HAART naive patients, respectively, while high triglycerides occurred in 25.6% and 22.5% respectively¹¹.

In our study, HIV patients on ART had a significant increase ($p<0.001$) of the Framingham Cardiac Risk Score compared to HIV patients not on ART and normal subjects. 86% HIV patients had <10% risk and 7 HIV patients on ART had a risk >10%. The results were similar to study conducted by Antonella d'Arminio Monforte et al where they studied 6,762 patients and observed 6,431 (94%) had ≤10% FRS, 1% >20%¹².

In our study there was increase in the C-IMT ($p=0.07$) among HIV patients who were on ART compared to HIV patients not on ART and normal subjects. HIV patients on ART had 0.06mm greater C-IMT than HIV patients not on ART and normal subjects. The results were similar to study conducted by G V L De Socio et al where they studied 140 subjects and observed 55% of patients at intermediate risk (6–20%) had subclinical carotid lesions¹³.

Carlos Jerico et al observed that among 132 enrolled patients, 93 (70.5%) were on ART and 39 (29.5%) had never been on antiretroviral therapy. In accordance with cardiovascular risk stratification, subclinical carotid atherosclerosis was found in 26.6% (17 of 64 patients) of the very low-risk group (10-year coronary risk <5%), 35.3% (12 of 34 patients) of the low-risk group (10-year coronary risk between 5% and 9%) and 76.5% (26 of 34 patients) of the moderate/high-risk group (10-year coronary risk ≥10%)¹⁴.

Our study provides support that increased 10-year CHD risk as determined by Framingham risk scores in patients infected with HIV is associated with increased surrogate markers of atherosclerosis. We also found that the addition of HIV-related variables does not affect the predictive performance of the Framingham risk equation.

Our findings are relevant to patients infected with HIV on HAART, as they support the use of a well-accepted bedside predictive instrument in this population.

A Few Limitations In Our Study :

- The sample size was small

- We could not do a follow up on patients to assess changes in the cardiac biochemical profile.
- The addition of hsCRP in our study would have helped to give a better analysis of the cardiovascular risk on HIV patients on ART.

CONCLUSION:

- The C-IMT in HIV patients on ART was higher than HIV patients not on ART and much higher than normal subjects.
- The Framingham Risk Score for 10 yr Cardiac risk is significantly higher in HIV patients on ART compared to the HIV patients not on ART and normal subjects
- The FBS in HIV patients on ART were significantly higher than normal subjects
- The Total Cholesterol and LDL were much higher in HIV patients on ART
- The HDL in HIV patients on ART were lesser compared to the controls

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