



CORRELATION OF CD4 COUNT WITH CAROTID INTIMA-MEDIA THICKNESS IN HIV PATIENTS: A CROSS-SECTIONAL STUDY IN A TERTIARY CARE SETTING IN DAVANGERE, INDIA

General Medicine

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ABSTRACT

Background: HIV infection, despite effective antiretroviral therapy (ART), is linked to chronic immune activation and heightened cardiovascular risk. Carotid intima-media thickness (CIMT) is a validated surrogate for subclinical atherosclerosis. **Objective:** To examine the relationship between CD4 count and CIMT in HIV patients, and assess the impact of ART duration on CIMT. **Methods:** A cross-sectional study was conducted at two tertiary hospitals in Davangere between May 2023 and October 2024. One hundred HIV-positive adults on stable ART were enrolled. Patients with hypertension, diabetes, cardiovascular disease, chronic kidney disease, smoking/alcohol use, hyperuricemia, or thyroid disorders were excluded. CIMT was measured by high-resolution B-mode ultrasonography. CD4 counts were determined by flow cytometry. **Results:** Mean CD4 count was significantly lower in patients with CIMT above the 75th percentile (345 cells/mm³) compared with those below this threshold (588 cells/mm³; $p < 0.001$). A moderate inverse correlation was found between CD4 count and mean CIMT ($r = -0.45$; $p < 0.001$). Longer ART duration (>6 years) was associated with higher CIMT at the 75th percentile ($p = 0.004$). **Conclusion:** Lower CD4 counts are associated with increased CIMT, reflecting greater subclinical atherosclerosis in HIV patients. Prolonged ART use (>6 years) further augments vascular thickening. Regular CIMT screening alongside CD4 monitoring may aid in early cardiovascular risk detection.

KEYWORDS

HIV, CD4 Count, Carotid Intima-media Thickness, Atherosclerosis, Antiretroviral Therapy, Cardiovascular Risk

INTRODUCTION

The advent of highly active antiretroviral therapy (HAART) has transformed HIV into a chronic manageable condition. However, HIV-related chronic inflammation and long-term ART use have been implicated in accelerated atherosclerosis and cardiovascular disease (CVD) risk [1–3]. CIMT, measured by ultrasonography, provides a non-invasive, reproducible assessment of early vascular wall changes [4,5]. Higher CIMT predicts myocardial infarction and stroke in both HIV and general populations [6]. CD4 lymphocytes, central to immune function, are progressively depleted in HIV infection [7]. Low CD4 counts have been linked with systemic inflammation, endothelial dysfunction, and increased CIMT [8,9]. While ART improves immune recovery, its metabolic side effects—dyslipidemia, insulin resistance—can promote atherosclerosis [10,11]. In India, where CVD prevalence is rising, few studies have investigated CD4–CIMT associations. This study aims to: (1) Evaluate the correlation between CD4 counts and CIMT in HIV-positive patients. (2) Analyse CIMT differences according to ART duration.

MATERIALS AND METHODS

Study Design and Setting: Cross-sectional observational study at Bapuji Hospital and Chigateri General Hospital, JJM Medical College, Davangere, May 2023–October 2024.

Participants: 100 HIV-positive adults on stable ART. Exclusion: hypertension, diabetes, CVD, CKD, smoking/alcohol use, hyperuricemia, hypothyroidism.

Data Collection: Demographics, ART duration, CD4 counts (flow cytometry), and CIMT (high-resolution B-mode ultrasonography of common carotid arteries)

CIMT Measurement: Far-wall CIMT measured ≥ 5 mm proximal to carotid bifurcation, avoiding plaques; mean of three readings per side recorded. Abnormal CIMT defined as >0.9 mm or ≥ 75 th percentile for age/sex [4].

Statistical Analysis: SPSS v25. Continuous variables: mean \pm SD; categorical: %. Associations tested using t-test, chi-square, and Pearson correlation. Significance: $p < 0.05$.

Ethics: Approved by Institutional Ethics Committee, JJM Medical College; informed consent obtained.

RESULTS

Participant Profile: Mean age 41.2 ± 8.6 years; 54% male. Most were aged 31–50 years. ART duration ranged 1–10 years (mean 4.5 years).

CD4 and CIMT: Patients above CIMT 75th percentile had mean CD4 count 345 cells/mm³; those below, 588 cells/mm³ ($p < 0.001$). Moderate inverse correlation between CD4 and CIMT ($r = -0.45$; $p < 0.001$).

ART Duration and CIMT: No significant differences for ART ≤ 6 years; ART >6 years linked to higher CIMT at 75th percentile ($p = 0.004$).

Sex Differences: At 75th percentile, females showed more elevated CIMT ($p = 0.007$); no differences at lower percentiles.

Age Trends: Older patients (>50 years) had higher CIMT; significant at 25th and 75th percentiles.

DISCUSSION

This study demonstrates a significant inverse correlation between CD4 count and CIMT, aligning with prior studies that link immune suppression to vascular thickening in HIV [8,12]. Prolonged ART (>6 years) was associated with increased CIMT, likely due to cumulative metabolic effects [10,14]. While ART is essential for survival, these results highlight the need for cardiovascular monitoring.

Female patients showed higher CIMT in advanced percentiles, potentially due to hormonal changes and metabolic responses to ART [15]. Age-related CIMT increases reflect cumulative vascular injury, compounded by HIV-specific factors [16].

Limitations: Cross-sectional design limits causal inference; single-center study; ART regimen details not stratified; other CVD markers not assessed.

CONCLUSION

Lower CD4 counts are significantly associated with increased CIMT in HIV-positive patients. ART duration beyond six years is linked to greater vascular thickening. CIMT screening alongside CD4 monitoring should be integrated into HIV care to guide early cardiovascular prevention.

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