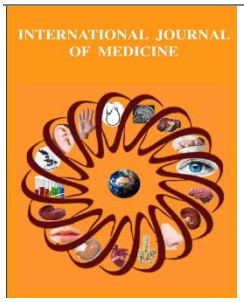

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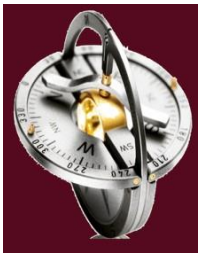

Original Research

A Study of Lipid Abnormalities in Human Immunodeficiency Virus Infected Individuals

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Abstract

Introduction HIV is a lentivirus (a subgroup of retrovirus) that causes AIDS, a condition in humans which causes a progressive failure of the immune system that leads to life threatening opportunistic infection and cancers. Without treatment the average survival time after infection with HIV is estimated to be 9 – 11 years. Dyslipidemias, or disorders of lipoprotein and lipid metabolism, are metabolic abnormalities that cause a chronic rise in cholesterol and triglyceride (TG) levels in the blood. Raised total cholesterol (TC), high low-density lipoprotein cholesterol (LDL-C), low high-density lipoprotein cholesterol (HDL-C), and increased TG are all involved. ***Methods And Materials***: 90 HIV diagnosed patients in K C General hospital were selected and the study was conducted during the year 2022-2024 which includes 45 patients started on HAART at least for 18 months and 45 HAART naïve patients, i.e, patients who are newly diagnosed but not yet started on HAART. ***Results***: Marital status data shows that most individuals are unmarried in both groups, with no significant difference (p=0.839), suggesting marital status may not play a role in HIV exposure or management. ***Conclusion***: Our study showed a high prevalence of dyslipidemia in HIV patients undergoing HAART therapy. Elevated levels of total cholesterol, triglycerides, and LDL, along with reduced HDL, contribute to the characterization of dyslipidemia. Significant differences in lipid parameters between baseline and follow-up periods (6 and 12 months) were evident, indicating the impact of HAART therapy on lipid metabolism.

Keywords: *HIV/AIDS, Dyslipidemia, Antiretroviral Therapy (ART/HAART), Cardiovascular Risk, Metabolic Complications*.

Introduction

HIV is a lentivirus (a subgroup of retrovirus) that causes AIDS, a condition in humans which causes a progressive failure of the immune system that leads to life threatening opportunistic infection and cancers. Without treatment the average survival time after infection with HIV is estimated to be 9 – 11 years.

Dyslipidemias, or disorders of lipoprotein and lipid metabolism, are metabolic abnormalities that cause a chronic rise in cholesterol and triglyceride (TG) levels in the blood. Raised total cholesterol (TC), high low-density lipoprotein cholesterol (LDL-C), low high-density lipoprotein cholesterol (HDL-C), and increased TG are all involved.[1-3]

Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) is a chronic infection associated with dyslipidemia and insulin resistance.[4] Highly Active Antiretroviral Therapy (HAART) is the mainstay of treatment for people living with HIV/AIDS (PLWHA).[5] The goal of HAART is to suppress viral replication so that the patient's immune system can recover and protect against the development of AIDS and death.[6] Treatment of HIV/AIDS with HAART is complex because of its interaction with lipid-lowering medications in PLWHA.[7]

In HIV patients, dyslipidemia is a common comorbidity and can occur due to multiple factors. These factors include the virus itself, antiretroviral therapy medications, lifestyle factors, and genetic predisposition. Certain antiretroviral medications used in the treatment of HIV, particularly protease inhibitors and certain nucleoside reverse transcriptase inhibitors, have been shown to increase lipid levels in some patients. This predisposition to dyslipidemia in HIV patients can lead to complications such as atherosclerosis and cardiovascular disease.[8]

Dyslipidemia occur in up to 70%-80% of HIV-infected subjects who are receiving combined ART and is mainly associated with specific antiretroviral agents of the nucleoside reverse transcriptase inhibitors (NRTIs), nonnucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitor (PI) classes.[9,10] Dyslipidemia associated with combination ART use is characterized by increased levels of serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-c) and triglycerides (TG) and a decreased high-density lipoprotein-cholesterol (HDL-c) level.[11,12] Furthermore, the prevalence of dyslipidemia in HIV patients has been associated with other metabolic abnormalities, such as insulin resistance and diabetes.

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In patients receiving combination ART, changes in lipid profiles have been also shown to be an independent risk factor for adverse outcomes, including cardiovascular-related events, reduced life expectancy and increased use of medical resources, which can greatly increase healthcare costs of the disease and reduce quality of life of patients with HIV.[13,14]

Methods And Materials

In- patients and out-patients of Department of Medicine, K.C general Hospital, Malleshwaram.

STUDY DESIGN: An observational study.

PATIENT SELECTION: 90 HIV diagnosed patients in K C General hospital were selected and the study was conducted during the year 2022-2024 which includes 45 patients started on HAART at least for 18 months and 45 HAART naïve patients, i.e, patients who are newly diagnosed but not yet started on HAART.

STUDY DURATION: The study duration was for 18 months, from 15th august 2022 to 14th Feburary 2024

INCLUSION CRITERIA:

- HIV patients who visited the ART centre in KC General Hospital, Malleshwaram during the study period who give consent for the study.
- Age group of both sexes 18 to 60 years.
- Patients with good adherence to HAART.

EXCLUSION CRITERA:

- Patients with Diabetes Mellitus, known renal, liver disorders , thyroid and Autoimmune Diseases.
- Patients on long term steroid therapy
- Obese patients with (BMI >30)
- Known case of dyslipidaemia who is on medication of lipid abnormalities and with long standing cholestasis.
- Patients on drugs like Beta Blockers, Diuretics, Cyclosporine, estrogen, Growth hormone, Retinoids, etc.
- Patients who are pregnant and breastfeeding.

Methods:

HIV infected or incidentally detected individuals admitted in the wards and OPD of Internal Medicine department and ART Centre at K C General Hospital was be chosen for the study. Patients who fulfilled the inclusion and the exclusion criteria was subjected to a detailed history and clinical evaluation, after getting an informed consent from them.

Results

Table 1. Distribution Of Study Population According To Age

AGE	HIV NAIVE		P VALUE
	YES	NO	
MEAN ± SD	39.6 ± 8.622	43.93 ± 9.411	0.025

Figure 1. Bar Diagram Showing Distribution Of Study Population According To Age

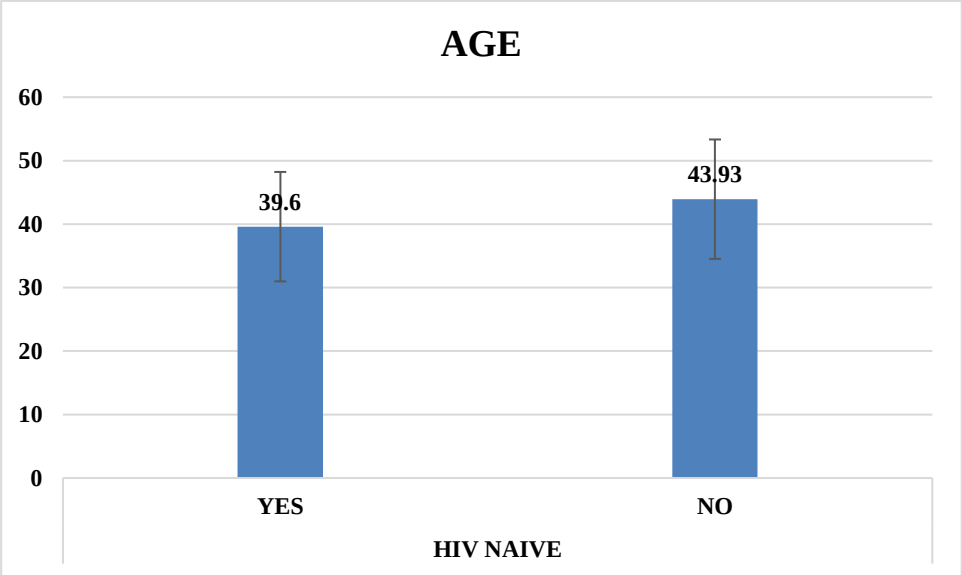
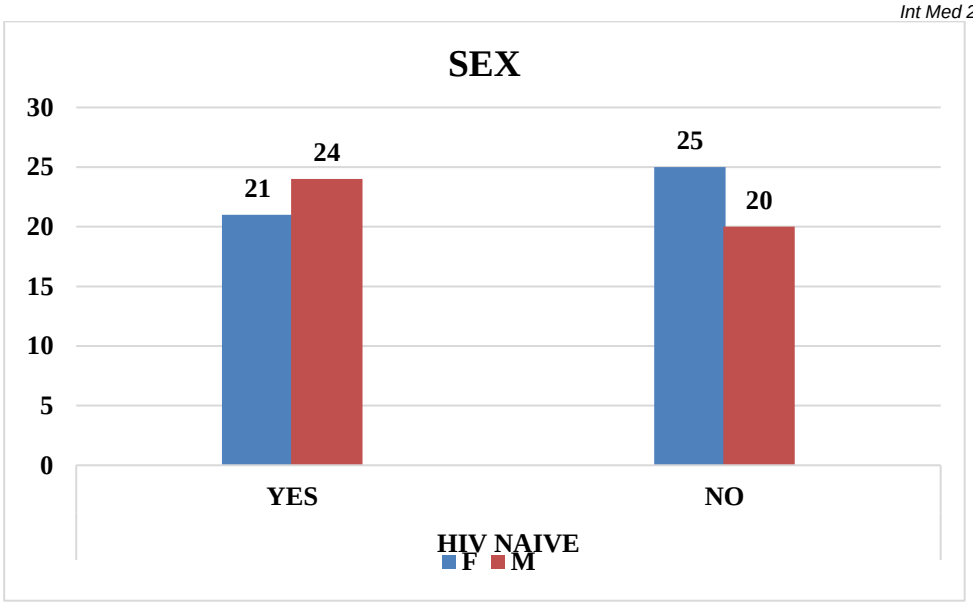


Table 2. Distribution Of Study Population According To Sex

SEX		HIV NAIVE		Total	P VALUE
		YES	NO		
F	Count	21	25	46	0.399
	%	46.7%	55.6%	51.1%	
M	Count	24	20	44	
	%	53.3%	44.4%	48.9%	
Total	Count	45	45	90	
	%	100%	100%	100%	

Figure 2. Bar Diagram Showing Distribution Of Study Population According To Sex

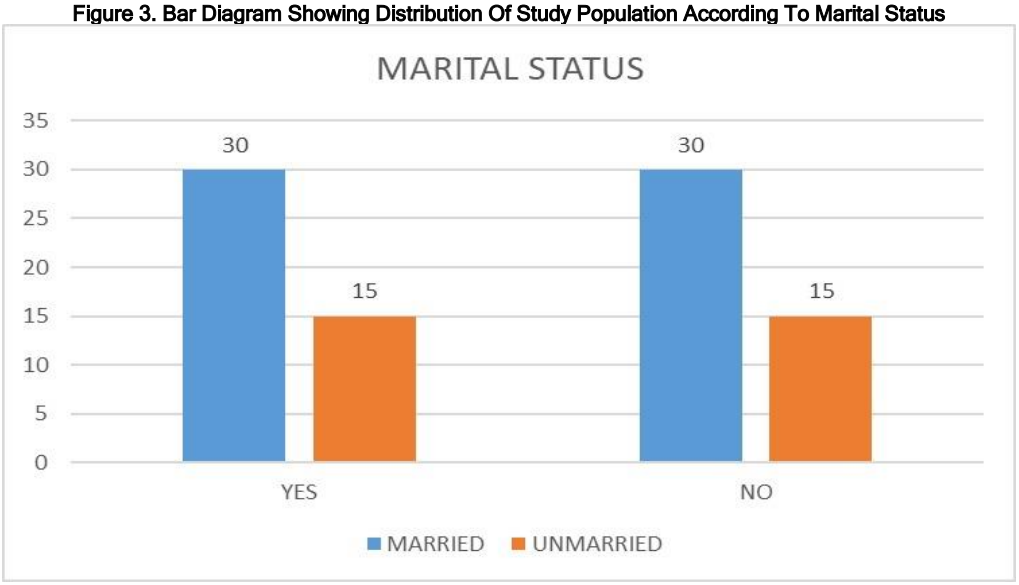


In terms of gender distribution, there is no significant difference between the groups; both feature a nearly even split between males and females, indicating gender does not influence HIV naive status in this cohort (p=0.399).

Table 3. Distribution Of Study Population According To Marital Status

MARITAL STATUS		HIV NAIVE		Total	P VALUE
		YES	NO		
YES	Count	30	30	**60**	0.839
	%	66.6%	66.6%	**66.6%**	
NO	Count	15	15	**30**	
	%	33.3%	33.3%	**33.3%**	
Total	Count	**45**	**45**	**90**	
	%	**100%**	**100%**	**100%**	

Figure 3. Bar Diagram Showing Distribution Of Study Population According To Marital Status

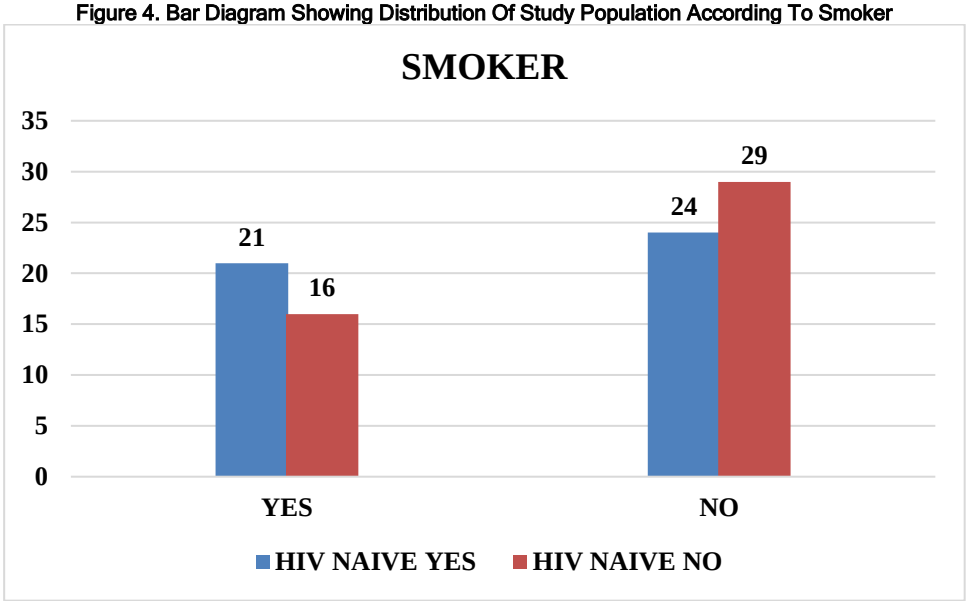


Marital status data shows that most individuals are unmarried in both groups, with no significant difference (p=0.839), suggesting marital status may not play a role in HIV exposure or management.

Table 4. Distribution Of Study Population According To Smoker

SMOKER		HIV NAIVE		Total	P VALUE
		YES	NO		
YES	Count	21	16	**37**	0.284
	%	46.7%	35.6%	**41.1%**	
NO	Count	24	29	**53**	
	%	53.3%	64.4%	**58.9%**	
Total	Count	**45**	**45**	**90**	
	%	**100%**	**100%**	**100%**	

Figure 4. Bar Diagram Showing Distribution Of Study Population According To Smoker

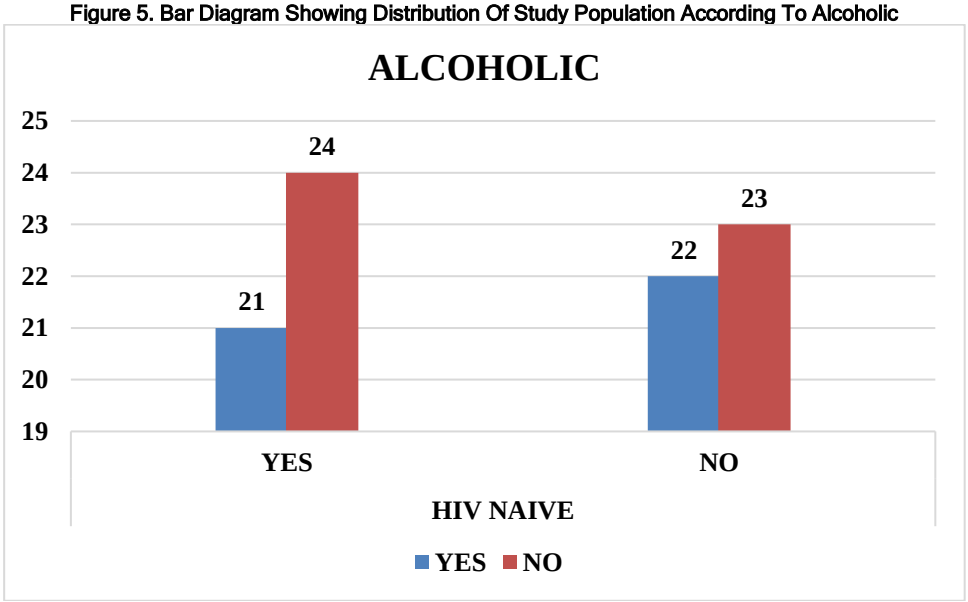


Smoking habits do not differ significantly between groups, with roughly half of each group being smokers (p=0.284)

Table 5. Distribution Of Study Population According To Alcoholic

ALCOHOLIC		HIV NAIVE		Total	P VALUE
		YES	NO		
YES	Count	21	22	43	0.833
	%	46.7%	48.9%	47.8%	
NO	Count	24	23	47	
	%	53.3%	51.1%	52.2%	
Total	Count	45	45	90	
	%	100%	100%	100%	

Figure 5. Bar Diagram Showing Distribution Of Study Population According To Alcoholic



Discussion

This observational study was conducted to study the lipid abnormalities in human immunodeficiency virus infected individuals on Highly active antiretroviral therapy (HAART) in our hospital. A total of 90 HIV diagnosed patients were studied in our research, which included 45 patients on HAART at least for 18 months and 45 HAART naïve patients, i.e., patients who are newly diagnosed but not yet started on HAART.

Given the high prevalence of age-related metabolic diseases and the complex etiology of these comorbidities in inflammation and immune activation, dyslipidemia in PLHIV continues to be a challenge today, with HIV viremia and antiretroviral therapy representing two sides of the same coin.

Lipid abnormalities are common in HIV-positive individuals and are significant for a number of reasons. Clinically speaking, HIV raises the risk of cardiovascular (CV) events by the same amount as more conventional risk factors like diabetes or high blood pressure. Antiretroviral therapy (ART) has also decreased mortality and made HIV infection a chronic illness; however, ART–especially the earlier medications, including the early protease inhibitors (PIs)–is linked to lipodystrophy and lipid abnormalities. HIV has evolved into a chronic illness with patients living longer and into ages where co-morbidities like cardiovascular disease (CVD) are common since the discovery and development of antiretroviral therapy (ART). The identification and treatment of CVD risk factors, especially dyslipidemia, have grown to be critical components of HIV infection treatment plans.

In an investigation that compared HIV-positive individuals with uninfected controls who were matched for age, gender, and body mass index, the HIV patients showed increased levels of triglycerides, C-reactive protein (CRP), and interleukin (IL)-6, but decreased levels of HDL-C and LDL-C.[113] Even when viral replication is inhibited by antiretroviral therapy (ART), HIV infection is frequently associated with prolonged inflammation and immunological activation, which further complicates alterations in lipid profiles in HIV positive individuals. Combination antiretroviral therapy (ART) significantly extends the projected life expectancy of HIV-positive individuals, but it also raises their risk of cardiovascular disease.

The available HAART drug combinations in our hospital were Tenofovir disoproxil fumerate (TDF) + Lamuvidine(3TC) + Doltugravir (DTG); Zidovudine (ZDV) + Lamivudine(3TC) + Doltugravir (DTG); Abacavir (ABC) + Lamuvidine(3TC) + Doltugravir (DTG); and Atazanavir (ATV) + Retonavir (RTV)+ Doltugravir (DTG).

In our study, age differences were notable, with the HIV-naive group averaging younger at 39.6±8.622 years compared to 43.93±9.411 years for non-naives, which was statistically significant (p=0.025). Comparatively, in the Indumati V et al study.113 the average age of the ART group was 36±8.99 years, while the ART-naïve group was 35.75±9.05 years. Also, Singh et al.111 observed a mean age of the controls as 39.23±4.5 years, while the patients' mean age was 36.43±9.62 years in their research. In another study by Aseefa et al.124 the authors found a mean age of 43.5±11.27 years in their study.

Abnormalities in lipid metabolism linked to HAART have been documented, mostly in individuals receiving PIs and d-4T therapy regimens, but also NVP and EFV treatment regimens. The participants' overall cardiovascular risk was not evaluated in our study. However, the substantial lipid disturbance is known to be linked to an increased risk of cardiovascular disorders, which implies that HAART may potentially be detrimental to the cardiovascular system.

Conclusion

Our study showed a high prevalence of dyslipidemia in HIV patients undergoing HAART therapy. Elevated levels of total cholesterol, triglycerides, and LDL, along with reduced HDL, contribute to the characterization of dyslipidemia. Significant differences in lipid parameters between baseline and follow-up periods (6 and 12 months) were evident, indicating the impact of HAART therapy on lipid metabolism.

Our study aimed to analyze lipid abnormalities in adult HIV patients on HAART therapy, determine the prevalence of dyslipidemia, and compare the lipid profiles of patients on HAART for at least 12 months with HAART-naïve patients. The findings revealed that HAART therapy is associated with significant lipid abnormalities, including increased levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG), and decreased high-density lipoprotein cholesterol (HDL-C). The prevalence of dyslipidemia was notably higher in HIV patients on HAART therapy compared to HAART-naïve patients, highlighting the impact of antiretroviral therapy on lipid metabolism.

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