



HIV-Positive Inflammatory Activity Monitoring Correlated to Peripheral Insulin Resistance - Hire Study

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Abstract

HIV-positive patients have an increased risk of hyperglycemia factors associated with inflammatory activity and antiretrovirals treatment, and this can directly impact in survival and life quality. This study proposed to evaluate impact and risk factors for insulin resistance in HIV patients. Total of 218 patients were included and we detected increase in glucose levels after HAART initiation (18.5% vs. 36.7%, $p=0.0025$). High fasting glucose levels were pointed as risk factor for symptomatic clinic during follow-up (RR=1.35; IC 95% 1,01-1,80; $p=0.002$), and higher monocyte/lymphocyte ratio was associated with hospitalization after treatment start ($p=0.033$).

Keywords: HIV; Glucose; Monocyte/lymphocyte ratio; Hospitalization

Introduction

Peripheral Insulin resistance has been associated to abnormal body fat distribution, changes in lipid and carbohydrate metabolism, persistence of inflammatory system activation, and antiretroviral therapy [1-3]. Alterations in HIV patient's glycemic profile, as diabetes, activate inflammatory system, especially with higher viral load and prolonged symptomatic periods [4-6]. Antiretroviral therapy is associated with a significant increase in blood glucose levels by different pathways: increases peripheral insulin resistance modifying cellular insulin signaling or lipid metabolism, increases homocysteine levels, blocking glucose interfering with GLUT-4 transporter (protease inhibitors), or mitochondrial toxicity (nucleoside reverse transcriptase) [7-13]. Higher total cholesterol/HDL (Castelli Index 1) causes mitochondrial oxidative stress [14,15].

A study evidenced increases of 2.2 times in hospitalization rates in diabetic HIV patients, between 1994 and 2004 [16]. Brazil study evidenced an annual increase of 4.1% in diabetes prevalence of HIV infected patients [17]. Recently, Shikuma demonstrated a correlation between increased monocytes cells and peripheral insulin resistance in HIV patients [18,19]. It was observed decreases in T-CD₄ cells associated with increased monocytes [20]. Studies are evidencing a possible role of monocytes in chronic inflammatory pathophysiology [21].

Study is a multicenter retrospective cohort, including patients over 18 years, with previous diagnosis of HIV infection and followed up at Hospital Geral de Fortaleza (HGF) and Clínica Escola de Saúde (CES) at Unichristus Center University. The Epi Info software 3.5.1 was used for statistical analysis.

Results and Discussion

Total of 218 patients were included and 161 (73.9%) male. Mean age was 37.6 ± 11.4 years. Time of follow-up median was 21 months. Arterial Hypertension prevalence before HIV diagnosis was 10.6% (N=23), diabetes mellitus 2.8% (N=6) and dyslipidemia 4.1% (N=9). Final follow-up evidenced 18 patients (8.3%) symptomatic (diarrhea 44.4% and syphilis 38.9%). During monitoring period, were detected 30 patients (13.8%) requiring hospitalization, and 1.8% admitted more than once. Causes of hospitalization were neurotoxoplasmosis (11

admissions - 36.6%), bacterial pneumonia, pulmonary tuberculosis and multifocal leukoencephalopathy, each with 3 admissions (10%). Tenofovir associated to Efavirenz and Lamivudine was started in 62.9%.

Before ARV therapy, 18.6% patients had blood glucose above 100 mg/dL. After ARV, prevalence increased to 36.7% (12 months), 44.3% (26 months) and 45.9% (33 months), ($p=0.0025$).

Higher glucose levels above 100 mg/dL before antiretroviral therapy was considered a risk factor for symptoms related to HIV at final follow-up (RR=1.35, 95% CI: 1.01 to 1.80, $p=0.002$). There was a positive correlation between lower monocytes/lymphocytes ratio and no admission related to HIV ($p=0.01$). ART Therapy is essential for infected patients survival, but it contributes as risk factors for diabetes and cardiovascular diseases [22-26]. Monocytes/lymphocyte ratio could be used as inflammatory activation biomarker for monitoring, and signaling as risk for hospitalization (Table 1).

Monocytes/lymphocytes ratio was controlled in hyperglycemic group after start ARV, evidencing immunology control of inflammation related to blood glucose. Most patients had a suppressed viral load in final follow-up (97.3%), witch could not be implicated in hospital admission. Elevated monocytes levels in HIV patients are associated with pro-inflammatory mediators production and immune alterations [27,28]. It described an immune system deregulation evidenced by reduced CD₄₊ T cells associated with increased number of monocytes. However, this was not observed in present study, since monocytes increased during follow-up as T-CD₄ cells. We also detected unchanged T-CD₈ cells account, suggesting others possible uncontrolled inflammatory components involved in our population, which must be studied in future.

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	Normoglycemic (<100 mg/dL)	Hyperglycemic (≥100 mg/dL)	P
Mean age (years)	34.5	43.2	0.003
Mean CD4+ b-ART	422	318	0.286
Mean CD4+ a-ART (1 st test)	518	489	0.830
Mean CD4+ a-ART (2 nd test)	596	548	0.213
Mean CD4+ a-ART (3 rd test)	548	510	0.532
Mean CD4+ a-ART (4 th test)	571	583	0.975
Castelli index b-ART	4.48	4.78	0.377
Castelli index a-ART (1 st test)	4.58	5.27	0.013
Castelli index a-ART (2 nd test)	4.86	5.60	0.129
Castelli index a-ART (3 rd test)	5.12	5.58	0.448
Mean monocytes b-ART	398	395.7	0.701
Mean monocytes a-ART (1 st test)	453.2	376.5	0.057
Mean monocytes a-ART (2 nd test)	484.8	418	0.041
Mean monocytes a-ART (3 rd test)	432.6	506.7	0.217
Mean monocytes a-ART (4 th test)	491.1	408.2	0.624
Mean CD4/CD8 b-ART	0.43	0.27	0.024
Mean CD4/CD8 a-ART (1 st test)	0.54	0.45	0.410
Mean CD4/CD8 a-ART (2 nd test)	0.66	0.55	0.253
Mean CD4/CD8 a-ART (3 rd test)	0.64	0.59	0.245
Mean CD4/CD8 a-ART (4 th test)	0.69	0.61	0.282

Note: *b-ARV: before ARV, a-ARV: after ARV; There was significant correlation between CD4/CD8 ratio and blood glucose before ARV use. Normal blood glucose levels after ART are associated with lower Castelli Index (4.58 vs. 5.27, $p=0.013$). Elevated blood glucose was more prevalent in older persons before ARV ($p=0.003$).

Table 1: Correlation blood glucose, lipid profile and immunology/virology data from HIV patients during follow-up.

References

- Freitas P, Carvalho D, Santos AC, Mesquita J, Matos MJ, et al. (2012) Lipodystrophy defined by Fat Mass Ratio in HIV-infected patients is associated with a high prevalence of glucose disturbances and insulin resistance. *BMC Infectious Disease* 12: 1-10.
- Galescu O, Bhangoo A, Ten S (2013) Insulin resistance, lipodystrophy and cardiometabolic syndrome in HIV/AIDS. *Reviews in Endocrine & Metabolic Disorders* 14: 133-140.
- Kagaruki GB, Kimaro GD, Mweya CN, Kilale AM, Mrisho RM, et al. (2015) Prevalence and Risk Factors of Metabolic Syndrome among Individuals Living with HIV and Receiving Antiretroviral Treatment in Tanzania. *British Journal of Medicine and Medical Research* 5: 1317-1327.
- Brown TT, Tassiopoulos K, Bosch RJ, Shikuma C, McComsey GA (2010) Association Between Systemic Inflammation and Incident Diabetes in HIV-Infected Patients After Initiation of Antiretroviral Therapy. *Diabetes care* 33: 2244-2249.
- Boccaro F (2012) HIV and Coronary Heart Disease. *Journal of the American College of Cardiology* pp. 511-523.
- Shen Y, Zhenyan W, Li L, Renfang Z, Yufang Z, et al. (2013) Prevalence of hyperglycemia among adults with newly diagnosed HIV/AIDS in China. *BMC Infectious Diseases* 13: 79.
- Kalra S, Bharti K, Navneet A, Unnikrishnan AG (2011) Understanding diabetes in patients with HIV/AIDS. *Diabetology & Metabolic Syndrome* 3: 2.
- Galli L, Salpietro S, Pellicciotta G, Galliani A, Piatti P, et al. (2012) Risk of type 2 diabetes among HIV-infected and healthy subjects in Italy. *European journal of epidemiology* 27: 657-665.
- De Wit S, Sabin CA, Weber R, Worm SW, Reiss P, et al. (2008) Incidence and Risk Factors for New-Onset Diabetes in HIV-Infected Patients: The Data Collection on Adverse Events of Anti-HIV Drugs (D:A:D) Study. *Diabetes care* 31: 1224-1229.
- Feenay ER, Mallon PWG (2011) Insulin resistance in treated HIV infection. *Best Practice & Research Clinical Endocrinology & Metabolism* 25: 443-458.
- Abebe M, Kinde S, Belay G, Gebreegziabxier A, Challa F, et al. (2014) Antiretroviral treatment associated hyperglycemia and dyslipidemia among HIV infected patients at Burayu Health Center, Addis Ababa, Ethiopia: a cross-sectional comparative study. *BMC Research Notes* 7: 380.
- Hruz PW (2011) Molecular mechanisms for insulin resistance in treated HIV-infection. *Best Pract Res Clin Endocrinol Metab* 25: 459-468.
- Deminice R, Vassimon HS, Machado AA, de Paula FJA, Monteiro JP, et al. (2013) Plasma homocysteine levels in HIV-infected men with and without lipodystrophy. *Nutrition* 29: 1326-1330.
- Parikh NI, Gerschenson M, Bennett K, Gangcuangco LM, Lopez M, et al. (2015) Lipoprotein concentration, particle number, size and cholesterol efflux capacity are associated with mitochondrial oxidative stress and function in an HIV positive cohort. *Atherosclerosis* 239: 50-54.
- Masiá M, Martínez E, Padilla S, Gatell JM, Gutiérrez F (2013) Endothelial function in HIV-infected patients switching from a boosted protease inhibitor-based regimen to raltegravir: a substudy of the SPIRAL study. *Journal of Antimicrobial Chemotherapy* 68: 409-413.
- Kourtis AP, Bansil P, Kahn HS, Posner SF, Jamieson DJ (2009) Diabetes trends in hospitalized HIV-infected persons in the United States, 1994–2004. *Curr HIV Res* 7: 481-486.
- Paula AA, Schechter M, Tuboi SH, Faulhaber JC, Luz PM, et al. (2014) Continuous Increase of Cardiovascular Diseases, Diabetes, and Non-HIV Related Cancers as Causes of Death in HIV-Infected Individuals in Brazil: An Analysis of Nationwide Data. *PLoS One* 9: 4.
- Shikuma CM, Chow DC, Gangcuangco LM, Zhang G, Keating SM, et al. (2014) Monocytes Expand with Immune Dysregulation and Is Associated with Insulin Resistance in Older Individuals with Chronic HIV. *PLoS One* 9: e90330.
- Gekonge B, Kossenkov AV, Nebozyhn M, Yousef M, Mounzer K, et al. (2012) Constitutive Gene Expression in Monocytes from Chronic HIV-1 Infection Overlaps with Acute Toll-Like Receptor Induced Monocyte Activation Profiles. *PLoS* 7: 7.
- Sassé T, Wu J, Li Z, Saksena NK (2012) Monocytes and their Role in Human Immunodeficiency Virus Pathogenesis. *American Journal of Infectious Diseases* 8: 92-105.
- Arama V, Tiliscan C, Cercel AS, Ion D, Hristea A, et al. (2013) Insulin resistance and adipokines serum levels in a caucasian cohort of hiv-positive patients undergoing antiretroviral therapy: a cross sectional study. *BMC Endocrine Disorders* 13: 4.
- Polsky S, Floris-Moore M, Schoenbaum EE, Klein RS, Arnsten JH, et al. (2011) Incident hyperglycaemia among older adults with or at-risk for HIV infection. *Antiviral therapy* 16: 181-8.

23. Ngala RA, Fianko K (2014) Dyslipidaemia and dysglycaemia in HIV-infected patients on highly active anti-retroviral therapy in Kumasi Metropolis. African health sciences 13: 1107-1116.
24. Achhra AC, Pujari S, Choi JY, Suwimol K, Praphan P, et al. (2014) Relationship Between Hyperglycemia and the Risk of Tuberculosis in Asian HIV-Positive Individuals in the Antiretroviral Therapy Era: Cohort Study. JAIDS Journal of Acquired Immune Deficiency Syndromes 66: 108-111.
25. Cesari M, Caramma I, Antinori S, Adorni F, Galli M, et al. (2009) Impact of hyperglycaemia and cholesterol levels on the outcome of hepatitis C virus (HCV) treatment in HIV/HCV-coinfected patients. HIV medicine 10: 580-585.
26. Bhardwaj S, Bhattacharjee J, Bhatnagar MK, Tyagi S (2013) Atherogenic index of plasma, castelli risk index and atherogenic coefficient-new parameters in assessing cardiovascular risk. Int J Pharm Biol Sci 3: 359-364.
27. Anzinger JJ, Butterfield TC, Angelovich TA, Crowe SM, Palmer CS, et al. (2014) Monocytes as Regulators of Inflammation and HIV-Related Comorbidities during cART. Journal of Immunology Research.
28. Renga B, Francissi D, Carino A, Baldelli F, Fiorucci S, et al. (2012) HIV-1 infection is associated with changes in nuclear receptor transcriptome, pro-inflammatory and lipid profile of monocytes. BMC Infectious Diseases 12: 1-7.

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