Triglycerides to Glucose Ratio as a Predictor of Incident Hypertension in People with HIV

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BACKGROUND

- People with HIV (PWH) may have an increased risk of hypertension (HTN), partly related to metabolic disturbances.
- The Triglycerides-glucose (TyG) index is a surrogate marker of insulin resistance and hepatic steatosis(1). TyG has been associated with mortality and cardiovascular outcomes in the general population(2,3).
- Still, its role in predicting incident HTN in PWH remains unclear. We aimed to evaluate the role of the TyG as a predictor of HTN in PWH starting its first antiretroviral (ART) regimen.

References: 1. Guerrero-Romero F. J Clin Endocrinol Metab 2010;95:3347. 2. Lopez-Jaramillo P. Lancet Healthy Longev 2023; 4(1):e23. 3. Liu X. Cardiovasc Diabetol 2022;21(1):124

METHODS

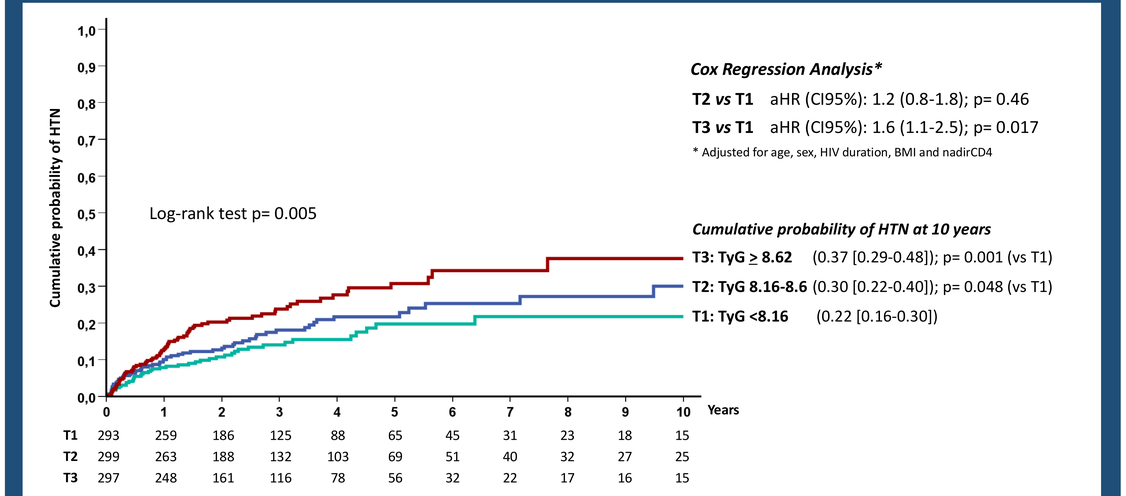
- We conducted a retrospective cohort study of adult normotensive treatment-naïve individuals who initiated ART between January 2009 and December 2023 without changes in ART for at least 48 weeks at Hospital Universitario La Paz, Madrid, Spain.
- ART included were: ABC/3TC/DTG, 3TC/DTG, B/F/TAF, TDF/FTC/EFV, TDF/FTC/RPV, TAF/FTC/EVG/c, TDF/FTC + DRV/r, and TDF/FTC + RAL
- Participants were followed from ART initiation until incident HTN, ART change or interruption, death or censoring (31 December 2024). Subjects with HTN, diabetes, lipid lowering therapy or missing data to calculate baseline TyG were excluded.
- We defined incident HTN as two consecutive visits with BP ≥ 140/90 mmHg, diagnosis in clinical records, or initiation of antihypertensive medication
- TyG formula: Ln([TG (mg/dL)*Glu (mg/dL)] / 2)
- Cox proportional hazard models were used to assess the association between baseline TyG and HTN adjusting for age, sex, HIV duration, body mass index (BMI), and nadir CD4+ T-cell count.

The TyG index independently predicted incident hypertension in PWH initiating ART

RESULTS

Table 1. Baseline Characteristics		Total N = 889	TyG < 8.16 N= 293	TyG ≥ 8.16 and < 8.62 N= 297	TyG ≥ 8.62 N= 297	P
Age, median (P25-P75)		34.9 (29.7-41.8)	32 (28.3-38)	34.8 (29.5-41.2)	38.5 (31.9-45.4)	**< 0.001**
Sex, male n (%)		793 (89.2)	263 (89.8)	269 (90)	262 (87.9)	0.665
Race, Caucasian n (%)		702 (81.8)	234 (82.7)	234 (81.3)	234 (81.5)	0.895
Mode of transmission, MSM n (%)		663 (74.6)	234 (79.9)	236 (78.9)	193 (65.0)	**< 0.001**
Stage C n (%)		72 (9.8)	15 (6.3)	13 (5.6)	44 (14.8)	**< 0.001**
HIV duration, years median (P25-P75)		0.4 (0.1-2.5)	0.3 (0.1-2.2)	0.4 (0.1-2.4)	0.5 (0.1-3.2)	0.570
Nadir CD4+ T cell count median (P25-P75)		320 (207-440)	328 (230-444)	327 (246-456)	284 (155-405)	**0.001**
BMI, median (P25-P75)		23.3 (21.5-25.1)	22.6 (20.8-24.3)	23.5 (21.6-25.2)	24 (21.8-25.9)	**< 0.001**
Overweight, ≥ 25 Kg/m² n (%)		210 (26.9)	46 (18.1)	71 (27)	93 (35.1)	**< 0.001**
Obesity, ≥ 30 Kg/m² n (%)		38 (4.9)	6 (2.4)	9 (3.4)	23 (8.7)	**0.002**
Blood pressure mmHg, median (P25-P75)	SBP	125 (116-134)	124 (115-135)	126 (117-134)	126 (117-134)	0.694
	DBP	75 (68-81)	73 (67-80)	75 (70-81)	77 (69-83)	**0.001**
TyG index, median (P25-P75)		8.40 (8.07-8.76)	7.95 (7.77-8.07)	8.40 (8.27-8.52)	8.92 (8.76-9.11)	--------
ART régimen	NNRTI-based regimen, n (%)	401 (45.1)	133 (45.4)	138 (46.2)	130 (43.8)	
	PI-based regimen, n (%)	113 (12.7)	38 (13)	29 (9.7)	46 (15.5)	
	INSTI-based regimen, n (%)	375 (42.2)	122 (41.6)	132 (44.1)	121 (40.7)	0.332
Follow-up, years median (P25-P75)		2.4 (1.4-4.6)	2.8 (1.8-5.1)	3.3 (1.8-5.2)	3.0 (1.6-5.3)	0.448
First ART regimen duration, years median (P25-P75)		3 (1.8-5.2)	2.5 (1.5-4.6)	2.5 (1.5-4.9)	2.2 (1.2-4.2)	**0.045**

Figure 1. Cumulative probability of HTN at 10 years and Cox Regression Analysis



RESULTS

- A total of 889 individuals (89% male), median age 35 years, 81.8% Caucasians with a median follow-up of 2.4 (1.4-4.6) years were included (Table 1).
- During follow-up, 176 participants (19.8%) developed HTN, with an incident rate of 5.6 per 100 person-years.
- The risk of HTN increased across TyG strata: 15.2% in the lowest tertile (<8.16), 19.5% in the middle tertile (8.16-8.61), and 26.4% in the highest tertile (≥ 8.62); p=0.003).
- The incidence rate ratio (IRR) per 100 persons/year for hypertension in the third tertile compared with the first tertile was 1.9 (95% CI 1.3-2.8); p < 0.001.
- Survival analysis confirmed a higher cumulative incidence of HTN in higher TyG categories (log-rank p=0.005).
- In Cox regression, TyG, as a continuous variable, predicted incident HTN (aHR 1.54, 95% CI 1.13-2.10, p = 0.006). Compared with the lowest tertile, individuals in the highest tertile had a significantly higher risk (aHR, 1.6; 95% CI, 1.1-2.5; p = 0.017).

CONCLUSION

- The TyG index independently predicted incident hypertension in PWH initiating ART, with a stepwise increase in risk across higher strata.
- Pre-ART TyG may provide a simple tool to identify individuals at higher risk of HTN and support early preventive interventions in this population.

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PLAIN LANGUAGE SUMMARY

People with HIV who had higher triglycerides-to-glucose (TyG) values before starting antiretroviral therapy were more likely to develop high blood pressure.
Measuring the TyG index, which is simple and inexpensive, may help clinicians identify individuals at higher risk of hypertension and start preventive strategies earlier.