



A Prospective Study of Abnormal Glucose Tolerance among Older Adults With or At-Risk for HIV Infection

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ABSTRACT

Background: The risk of impaired glucose tolerance (IGT) and diabetes in HIV(+) patients receiving HAART has not been well defined.

Methods: We performed two oral glucose tolerance tests (OGTTs) a median of 18.5 months (IQR 18.1-19.5) apart in 198 HIV(+) and 125 at-risk HIV(-) older adults without a history of diabetes at baseline. Standardized interviews were administered to assess sociodemographic and medical data including HAART use. Height and weight were measured. IGT was defined as fasting glucose <126 mg/dl and 2-hour glucose 140-199 mg/dl; diabetes was defined as fasting glucose ≥ 126 mg/dl or 2-hour glucose ≥ 200 mg/dl, or self-reported use of antidiabetic medication. Chi-square tests and logistic regression analysis were performed to determine the associations of HIV and HAART (none vs. protease inhibitor [PI] vs. non-PI) with incident abnormal glucose tolerance (IGT or diabetes).

Results: 42% were male, 55% Black, and 32% Hispanic. At baseline, median age was 49 y (range 35-73); 34% were overweight (body mass index [BMI] ≥ 25.0 kg/m²) and 31% were obese (BMI ≥ 30.0 kg/m²). 46% reported a history of injection drug use, with no difference by HIV status (p=.98). Among HIV(+) participants, 52% were on PI-HAART, 26% non-PI HAART, and 22% were HAART-naïve; median CD4+ count was 461 cells/mm³ (range 36-1369). On the baseline OGTT, 23/323 (7%) had diabetes and an additional 51/323 (16%) had IGT. On follow-up, 4% (12/300) had incident diabetes; 10/12 were diagnosed by OGTT and 2/12 self-reported new use of antidiabetic medication. Of 249 participants without IGT or diabetes at baseline, 23 (9%) had incident abnormal glucose tolerance. There was no difference in the incidence of abnormal glucose tolerance by HIV status (8% for HIV(+), 12% for HIV(-), p=.34), or among HIV(+) participants, by HAART use (7% for no HAART, 9% for PI-HAART, 8% for non-PI HAART, p=NS). In a model including HIV status and HAART use, factors associated with incident abnormal glucose tolerance were age ≥ 50 (OR_{adj} 3.9, 95% CI 1.4, 10.9) and obesity (OR_{adj} 3.2, 95% CI 1.3, 8.3).

Conclusions: In this prospective study of mostly Black or Hispanic older adults, classic diabetes risk factors, rather than HIV or HAART, predicted the development of abnormal glucose tolerance. In the HIV primary care setting, lifestyle interventions aimed at obtaining and maintaining a normal body weight should be implemented to reduce the risks of abnormal glucose tolerance and associated cardiovascular complications.

BACKGROUND

The risk of impaired glucose tolerance (IGT) and diabetes in HIV(+) patients receiving HAART has not been well defined, especially in older adults.

METHODS

Two 75 g oral glucose tolerance tests (OGTTs) were performed a median of 18.5 months (IQR 18.1-19.5) apart in 198 HIV(+) and 125 at-risk HIV(-) adults with a history of no diabetes at baseline

Enrollment groups:

- HIV seronegative
- HIV seropositive, antiretroviral (ART) naïve
- HIV seropositive, currently on HAART including a PI ("PI-HAART")
- HIV seropositive, currently on HAART, protease inhibitor (PI) naïve ("non-PI HAART")

Medical history including antiretroviral use and sociodemographic data were assessed by standardized interview

Assays for HIV antibody, CD4+ count, and glucose were performed

Weight and height were measured

IGT: fasting glucose <126 mg/dL AND 2-hour glucose 140 - 199 mg/dL

Diabetes (DM): fasting glucose ≥ 126 mg/dL, OR 2-hour glucose ≥ 200 mg/dL, OR self-reported use of antidiabetic medication

Chi-square tests and logistic regression analysis were performed to determine the associations of HIV and HAART use at follow-up with incident abnormal glucose tolerance (IGT or diabetes)

RESULTS

Participant characteristics at baseline are listed in Table 1. HIV(+) participants were more often Black, less often obese, and were less likely to have used opiates.

Baseline OGTT results are shown in Figure 1. Of 323 participants, 23 (7%) were first found to have diabetes and an additional 51 (16%) had IGT.

On follow-up, an additional 4% (12/300) had incident diabetes (Figure 2). 10/12 were diagnosed by OGTT and 2/12 self-reported new use of an antidiabetic medication.

Of 249 participants without IGT or diabetes at baseline, 23 (9%) had incident abnormal glucose tolerance (Figure 3).

There was no difference in the incidence of abnormal glucose tolerance by HIV status (p=.34), injection drug use history (p=.74), or among HIV(+) participants, by HAART use (p=.80, Figure 4).

In a model including HIV status and HAART use at follow-up, factors associated with incident abnormal glucose tolerance were age ≥ 50 y (p=.009) and obesity (p=.01) (Table 2).

Table 1. Baseline Participant Characteristics

	HIV (-) N =125	HIV (+) N =198
Median age, y (range)	49 (37-73)	49 (35-68)
Male, N (%)	49 (39)	85 (43)
Race/ethnicity, N (%) ^a		
Black	54 (43)	123 (62)
White	20 (16)	13 (7)
Hispanic	48 (38)	56 (28)
Other	3 (2)	6 (3)
Ever injected drugs, N (%)	57 (46)	90 (46)
Use heroin in last 5 years, N (%) ^a	42 (34)	36 (18)
Use heroin last 6 months, N (%) ^a	17 (14)	13 (7)
Use cocaine last 5 years, N (%)	68 (54)	93 (47)
Use cocaine last 6 months, N (%)	28 (23)	40 (20)
Currently on methadone, N (%) ^a	21 (17)	15 (8)
Body mass index (kg/m ²), N (%) ^a		
< 25.0 (Lean/normal)	34 (27)	79 (40)
25.0-29.9 (Overweight)	40 (32)	69 (35)
≥ 30.0 (Obese)	51 (41)	50 (25)
Family history of diabetes, N (%)	52 (42)	76 (38)
Median CD4+ count (range)		461 (36-1369)
Antiretroviral use, N (%)		
Naïve		44 (22)
PI-HAART		102 (52)
non-PI HAART		52 (26)

^ap<.05

Figure 1. Baseline OGTT Results (n=323)

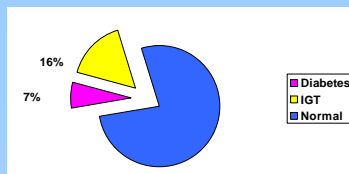


Figure 2. Incident Diabetes

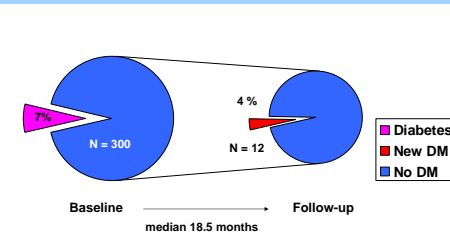


Figure 3. Incident Abnormal Glucose Tolerance

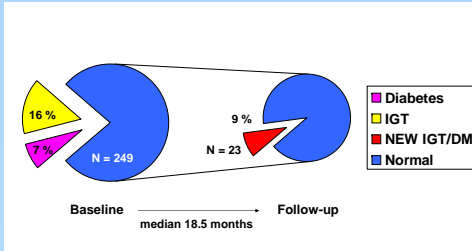


Figure 4. Incidence of Abnormal OGTT by HIV Status and HAART Use

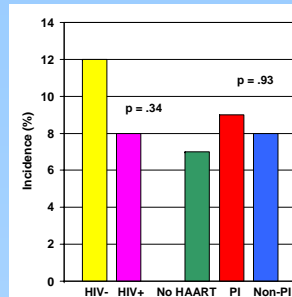


Table 2. Factors Associated with Incident Abnormal OGTT (IGT or Diabetes) on Multivariate Analysis

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age ≥ 50 y	2.8 (1.1, 7.4)	3.9 (1.4, 10.9)
Obesity (BMI ≥ 30 kg/m ²)	2.4 (1.0, 5.6)	3.2 (1.3, 8.3)
HIV (+), no HAART*	0.5 (0.1, 2.1)	0.5 (0.1, 2.0)
HIV(+), PI-HAART*	0.7 (0.2, 2.1)	0.8 (0.3, 2.4)
HIV(+), non-PI HAART*	0.7 (0.2, 2.5)	0.7 (0.2, 2.6)

*Reference: HIV (-)

CONCLUSIONS

- In this prospective study of mostly Black or Hispanic older adults, classic diabetes risk factors, rather than HIV or HAART, predicted the development of abnormal glucose tolerance.
- In the HIV primary care setting, lifestyle interventions aimed at obtaining and maintaining a normal body weight should be implemented to reduce the risks of abnormal glucose tolerance and associated cardiovascular complications.

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