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Effects of HIV and ART on diabetes in Tanzanian adults

Introduction:
The phenotype and risk factors for diabetes appear different among Africans from among people in high-income countries. The increased burden of infection and the higher prevalence of malnutrition may contribute to these differences.

Methods:
We measured diabetes by three methods –haemoglobin A1c (HbA1c), fasting plasma glucose (FPG), and oral glucose tolerance test (OGTT) –among the Chronic Infections, Co-morbidities, And Diabetes in Africa (CICADA) cohort. The cohort comprised 1942 Tanzanian adults belonging to one of three groups: 652 HIV-uninfected (HIV-), 954 HIV-infected, antiretroviral therapy (ART)-naïve (HIV+ART-), and 336 HIV-infected and on ART for a median of 5.4 (SD 2.8) years (HIV+ART+). The last group were undernourished (body mass index (BMI) <18.5 kg/m2) when starting ART, as they participated in a previous trial for which low BMI was an inclusion criterion. WHO cut-offs were used to define diabetes (HbA1c ≥6.5%, FPG ≥7 mmol/L, OGTT ≥11.1 mmol/L) and dysglycemia (HbA1c 5.7-6.5%, FPG 6.1-7 mmol/L, OGTT 7.8-11.1 mmol/L). Risks of these outcomes by HIV categories were analysed by multinomial logistic regression, controlling for classic risk factors: age, sex, BMI, current or previous smoking, intake of fruits and vegetables, and achievement or not of recommended levels (75 minutes/week) of vigorous physical activity.

Results:
Mean participant age was 41 (SD 12) years and 59% were women. BMI >25 kg/m2 was found in 55% of HIV-, 35% of HIV+ART-, and 9% of HIV+ART+. 13.2% of participants had diabetes indicated by HbA1c, 25.7% by FPG and 6.4% by OGTT; of these, 1.9% had diabetes by all three measures. Percentages with diabetes and dysglycemia in each HIV status group and for each test are shown in the table.
In univariable analysis the HIV+ART- group had increased risk of diabetes by all measures and the HIV+ART+ group by FPG and borderline by OGTT. In the adjusted multinomial logistic regression, the HIV+ART- group still had increased risk by all three measures but the HIV+ART+ group only by FPG. Of the standard risk factors for diabetes, age tended to increase risk and having adequate vigorous physical activity was associated with lower risk of dysglycemia and diabetes by HbA1c and OGTT.

Conclusion:
Untreated HIV infection increased the risk of dysglycemia and diabetes by HbA1c, FPG and OGTT. The lesser risk of diabetes in the ART-treated group could have resulted from less active infection and inflammation than in untreated patients, with therefore less inflammation-induced raised glucose. It could also have resulted from the lower BMI in that group, although high BMI itself did not significantly increase diabetes risk in the cohort. Vigorous activity was associated with better glucose control, so improving the health of HIV-infected people so that they are able to be active is an important goal.

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