Predictors of Cognitive Performance Among HIV-Infected Patients in East Africa

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Abstract

Background: Cognitive impairment remains a frequent complication of HIV despite access to antiretroviral therapy. Few data exist regarding risk factors in resource-limited settings.

Methods: The African Cohort Study (AFRICOS) aims to longitudinally assess the impact of clinical practices, biological factors and socio-behavioral issues on HIV infection and disease progression in an African context. All enrollees undergo the International HIV Dementia scale (IHDS), an auditory verbal learning and delayed recall task (AVLT-DR), the grooved pegboard (GP) test in both hands, the Trail Making A test and an action fluency task. We examined factors that correlate to neuropsychological testing performance including CD4 count, nadir CD4 count, plasma HIV RNA, age, educational attainment, infectious and non-infectious comorbidities among other clinical variables from data captured in Kenya, Uganda, and Tanzania.

Results: 779 HIV-infected and 149 HIV-uninfected subjects were evaluated. The HIV-infected group was 58% female, had a mean (SD) age of 41 (10) and 63% had 6 or fewer years of education. 73% were taking combination antiretroviral therapy at the time of testing. Mean (SD, range) IHDS was 8.7 (1.7, 1-12) for the HIV infected group compared to 9.0 (1.7, 3-12) for the HIV-uninfected controls (p = 0.022). HIV status, age, and educational attainment were all associated with performance on all tests (p's<0.02). CD4 nadir count was associated with AVLT-DR (p=0.003) and at trend level for GP dominant hand (p=0.096). We found no association between cognitive performance and the number of infectious nor non-infectious comorbidities.

Conclusions: This study investigated correlates to neuropsychological performance in over 900 study participants from East Africa. Cognitive impairment is associated with HIV-infection, age and educational attainment. Similar to findings from resource-rich regions, CD4 nadir count was associated with performance on two tests. Unlike resource-rich areas, where cognition is increasingly associated with non-HIV factors, the number of comorbidities did not correlate to cognitive performance, a factor that may be due to the relative younger age of the group.

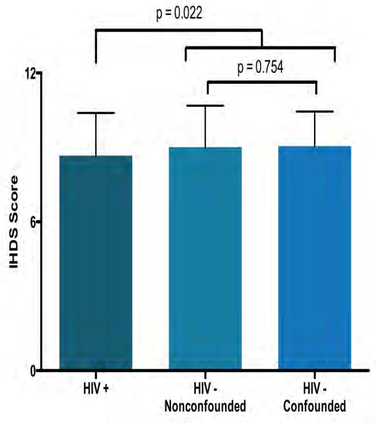


Figure 1: Association of HIV status with IHDS score.

- Statistically significant differences were seen by HIV status. All groups, on average, performed well below the recommended cut point of 10 for dementia.
- HIV status was significantly associated with performance on other cognitive tests including: (1) grooved pegboard test non-dominant hand, (2) AVLT-DR, and (3) action fluency test (see Table 1).
- Confounding criteria did not capture differences across HIV-uninfected individuals, statistically significant differences only seen in AVLT-DR (p = 0.016) and Trail Making A test (p = 0.026). Confounding defined as: (1) endorsing at least one cognitive symptom, (2) symptoms identified by physician or nurse in cognitive evaluation, (3) history of traumatic brain injury, (4) drinking more than 3 drinks per day, or (5) drug use.

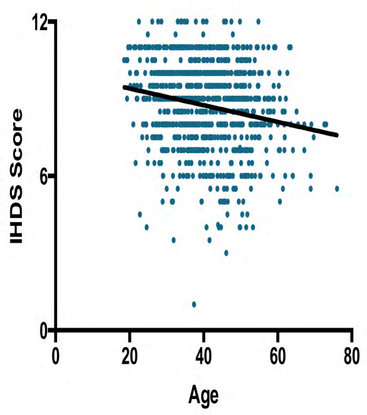


Figure 2: Association of age with IHDS score (p < 0.001).

- Age was strongly correlated with performance on neuropsychological tests including: (1) IHDS, (2) grooved pegboard test non-dominant hand, (3) AVLT-DR, and (4) Trail Making A test (see Table 1).

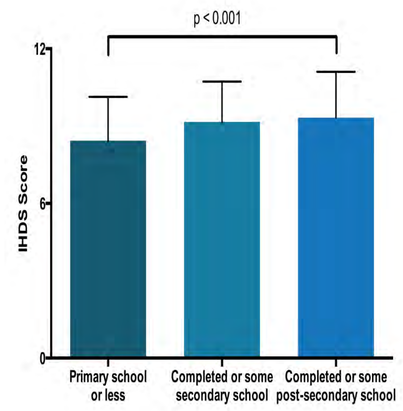


Figure 3: Association of educational attainment with IHDS score.

- Statistically significant differences were seen by educational attainment, but all groups, on average, performed below the recommended cut point of 10 for dementia.
- Educational attainment was significantly associated with performance on all other cognitive tests, except the grooved pegboard test non-dominant hand (see Table 1).

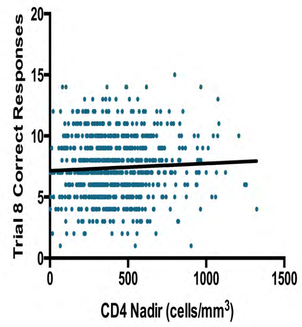


Figure 4: Association of CD4 nadir with AVLT-DR (p = 0.003).

- Statistically significant differences were seen by CD4 nadir count on verbal memory tested by the WHO-UCLA auditory and verbal learning delayed recall task.
- CD4 nadir count was associated at trend level for performance on the grooved pegboard test dominant hand (p = 0.096).

Table 1: P values of associations with performance on cognitive tests.

	IHDS	AVLT-DR	GP-ND	Trail Making A	Action Fluency
HIV Status	0.022*	0.003*	0.060	0.336	0.032*
Age	<0.001*	<0.001*	<0.001*	<0.001*	0.072
Education	<0.001*	<0.001*	0.264	0.015*	<0.001*

Background

- U.S Military HIV Research Program (MHRP) prospective observational HIV focused cohort
- Longitudinally assess the impact of clinical practices, biological factors and socio-behavioral issues on HIV infection and disease progression in African context
  - Evaluation tool for MHRP PEPFAR program
  - HIV pathogenesis and impact of comorbidities
  - Measurement of long term outcomes
- 3,000 HIV-infected and 600 HIV-uninfected individuals to be enrolled
- Enrolling at HIV clinical care and treatment sites across 5 programs in 4 countries



Kayunga District Hospital, Uganda

South Rift Valley, Kenya: Kericho, Kapkatet, Nandi Hills, and Kapsabet District and AC Litein, Tenwek Mission Hospitals

Kisumu West District Hospital, Kenya

Defence Headquarters Medical Center, Abuja, and 68th Nigerian Army Reference Hospital, Lagos, Nigeria

Mbeya Referral Hospital, Tanzania

Conclusions

- HIV status, age, and education all associated with performance on all tests except Trails A regarding HIV status
- Significant differences across sites substantially attenuated in models that include education
- No association between cognitive performance and infectious or non-infectious comorbidities

Future Directions

- More cases from Uganda to see how well IHDS captures performance on other tests to develop impairment rating
- Gender-based violence and cognitive performance

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