# Neurocognitive performance in adolescents living with HIV in Zimbabwe

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## BACKGROUND

Neurocognitive impairment in adolescents living with HIV (ALWH) is complex and multifactorial. This study aimed to characterise cognitive impairment in ALWH and describe interactions between, HIV, cognition and stunting.

## METHODS

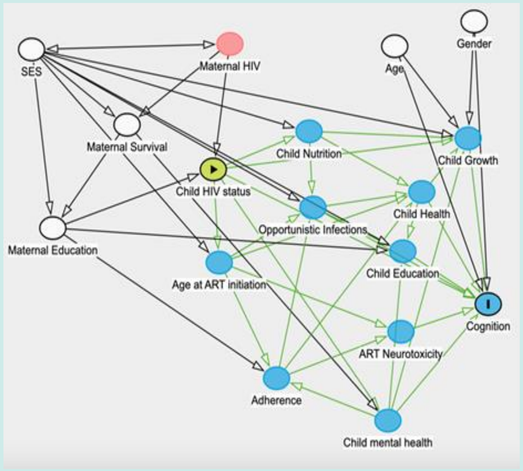
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|---|---|
| **WHEN** | September 2022 to June 2023 |
| **WHERE** | Harare, Zimbabwe |
| **WHO** | • Adolescents with perinatally acquired HIV aged 11-19 years, established on ART for at least 6 months from public sector HIV sector clinics<br>• Age-matched HIV negative comparison group from the same catchment area |
| **WHAT** | Cross sectional study |
| **HOW** | Neurocognitive function was assessed using the Kaufmann Assessment Battery for Children 2nd Edition (KABC-II) |




- The effect of HIV on cognition was assessed using the DAG in Figure 1.

Adolescents with HIV have ***impaired cognitive function*** compared to peers, especially if they are ***stunted.***

***Fig 1: Directed acyclic graph showing effect of HIV on cognition***




## RESULTS

- 507 participants enrolled (253 ALWH, 254 HIV negative)
- ALWH were more likely to be 2 years below expected grade for age, in the poorest socioeconomic status group, stunted, experienced orphanhood and had fewer mothers who had reached tertiary education compared to HIV negative peers (Table 1).

***Table 1:Demographic characteristics of enrolled participants by HIV status***

| Variable | | ALWH n(%) | HIV negative n(%) | $X^2$, p |
|---|---|---|---|---|
| | **N** | **253** | **254** | |
| **Sex** | Male | 113 (44.7) | 125 (49.2) | 1.05, p=0.31 |
| | Female | 140 (55.3) | 129 (50.8) | |
| **Age** | Median (IQR) | 16 (14-18) | 15 (13-17) | |
| **In education (aged 11-16)** | Yes | 142 (95.3) | 155 (90.6) | 2.6, p=0.11 |
| | No | 7 (4.7) | 16 (9.4) | |
| **School grade for age** | >=2 years below | 24 (13.0) | 10 (5.2) | 6.8, p=0.009 |
| | <2 years below | 161 (87.0) | 181 (94.8) | |
| **SES** | Poorest | 74 (29.3) | 28 (11.0) | 36.4, p<0.001 |
| | 2 | 57 (22.5) | 45 (17.7) | |
| | 3 | 47 (18.6) | 53 (20.9) | |
| | 4 | 39 (15.4) | 64 (25.2) | |
| | Least poor | 36 (14.2) | 64 (25.2) | |
| **Stunted (height for age z-score <-2)** | Yes | 81 (32.1) | 27 (10.6) | 34.9, p<0.001 |
| | No | 171 (67.9) | 227 (89.4) | |
| **Both parents alive** | Yes | 137 (55.0) | 201 (79.8) | 34.9, p<0.001 |
| | No | 112 (45.0) | 51 (20.2) | |
| **Maternal education** | None/Any primary | 15 (6.5) | 15 (6.4) | 17.8, p<0.001 |
| | Any secondary | 205 (89.1) | 181 (77.4) | |
| | Postgraduate | 10 (4.4) | 38 (16.2) | |

- Adjusting for age, sex, socioeconomic status, maternal education and orphanhood, ALWH scored lower than HIV negative peers on the KABC-II total cognition score (Mental Processing Index (MPI)) and Simultaneous and Planning domains.

***Table 2: Association of HIV status with KABC-II scores***

| Cognitive domain | Coefficient (95% CI) | p |
|---|---|---|
| Total (MPI) | -2.16 (-4.17, -0.14) | 0.036 |
| Sequential | -0.75 (-3.08, 1.53) | 0.53 |
| Simultaneous | -3.04 (-5,54, -0.53) | 0.018 |
| Learning | -0.26 (-3.06, 2.54) | 0.86 |
| Planning | -4.19 (-6.49, -1.88) | <0.001 |

- ALWH who were stunted scored 5-points lower in the KABC-II total cognition score (MPI) compared to peers. The effect of stunting on KABC-II MPI scores was not observed in HIV negative peers.

***Table 3: Association of stunting with KABC- II MPI score with interaction by HIV status***

| | Coefficient (95% CI) | p | Likelihood ratio test for interaction |
|---|---|---|---|
| ALWH | -5.24 (-10.15, -0.34) | 0.036 | p=0.034 |
| HIV negative | 0.42 (-3.65, 4.48) | 0.84 | |

## CONCLUSION

ALWH face a multitude of adverse childhood experiences including poverty, poor growth and orphanhood which may impact cognitive and physical development.

- Future longitudinal studies are required to evaluate the impact of nutritional interventions on growth and cognition in ALWH.

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