SARS-CoV-2 seroprevalence in Kenyan youth living with HIV

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BACKGROUND

- SARS-CoV-2 seroprevalence can capture asymptomatic and symptomatic cases, estimate cumulative disease incidence and inform pandemic spread
- Laboratory-confirmed infections among national Kenyan population of around 53 million people numbered approximately 100,000 (~0.2%) by February 2021 and 250,000 (~0.5%) by September 2021
- Seroprevalence studies demonstrated a 11%-62% range in diverse Kenyan populations by early 2021, with geographic variability and temporal increase
- Impact of HIV on seropositivity or COVID-19 clinical outcomes is unclear; data in youth living with HIV (YLWH) are particularly lacking
- Serological studies add to body of literature pertaining to HIV infection and immunological status as independent risk factors for severe COVID-19 outcomes, and can help to inform decision-making and behaviors at individual and population levels

METHODS

- Perinatally-infected YLWH receiving care within the AMPATH (Academic Model Providing Access to Healthcare) program and participating in an ongoing multisite cohort study were enrolled in supplemental study to examine the impact of COVID-19 on them
- During February to September 2021, participants in the parent study were enrolled at four sites (Eldoret, tertiary referral center; urban Kitale, peri-urban Turbo, rural Webuye; Figure 1) during in-person visits coinciding with their biannual blood draw
- SARS-CoV-2 seropositivity was determined using Bio-Rad Platelia SARS-CoV-2 Total Ab assay, detecting anti-nucleocapsid antibodies reflecting past SARS-CoV-2 infection
- Additional evaluations included HIV viral load (VL), historical CD4 and a COVID-19-focused survey including self-report of symptoms
- Multiple logistic regression was used to measure associations of seropositivity with age, gender, enrollment month, site, HIV treatment failure (VL> 1,000 copies/ml), and historical CD4 (≥ 500 vs < 500 cells/μL)

RESULTS

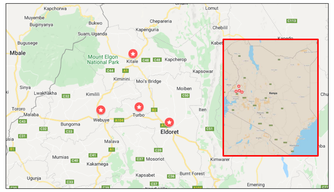

Figure 1. Site Map with inset depicting the four study sites' location in Kenya; main figure depicting individual study site location

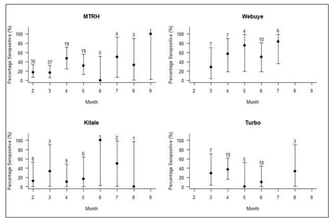

Figure 2. Seroprevalence by month and site (95% CI)

- Of 432 participants in the parent study, 241 YLWH were enrolled (Eldoret-129, Turbo-47, Kitale-30, Webuye-35); 50% male; median age 17 years, (range 8-24), median CD4 839 cells/μL (range 33-2557); median duration since CD4 measurement 3.75 [range 2.74 - 4.29] years prior to enrollment
- Of enrolled participants, 29% were seropositive, 68% seronegative and 4% equivocal (removed from analyses)
- Seropositive participants were more likely to be aged between 15-17 years (Table 2)
- Seropositivity was not found to be associated with gender, virologic failure, or CD4 count of less than 500 cells/μL (Table 2)
- A temporal trend in seropositivity was observed (significant linear relationship per subsequent enrollment month; Figure 2)
- A significant geographic variability in seropositivity was observed between study sites (Eldoret-25%, Kitale-20%, Turbo-25%, Webuye-56%; p=0.027, remaining significant after date adjustment) (Figures 1&2, Table 2)

Table 1. Participant characteristics

Characteristic	Number (Percent)
Gender	
Male	121 (50)
Female	120 (50)
Age in years	
<15	66 (27)
15-17	82 (34)
>=18	93 (39)
School enrollment status	
Enrolled	207 (86)
Not enrolled	34 (14)
Employment status	
Employed, public-facing	25 (10)
Employed, not public-facing	13 (6)
Not employed	203 (84)
Site	
Eldoret	128 (53)
Kitale	31 (13)
Turbo	47 (20)
Webuye	35 (15)
Viral Load	
Undetectable	186 (77)
Detectable <1,000 copies/mL	42 (17)
Detectable >1,000 copies/mL	22 (9)
Missing	13 (5)
Historical CD4 count (cells/μL)	
<50	3 (1)
>=50 & <100	2 (1)
>=100 & <200	6 (2)
>=200 & <350	20 (8)
>=350 & <500	21 (9)
>=500	192 (75)
Missing	7 (3)

Table 2. Associations between SARS-CoV-2 seropositivity and demographic, immunologic and study characteristics, * Values are Odds Ratio (95% Confidence Interval)

Characteristic	SARS-CoV-2 seropositivity* (n = 231)
Age 15 to 17 vs <15	2.66 (1.19, 6.21)
Age 18+ vs <15	1.68 (0.73, 3.97)
Male vs Female	1.06 (0.57, 1.98)
Treatment Failure vs Suppression	0.58 (0.16, 1.80)
CD4 >= 500 vs <500 cells/μL	1.71 (0.77, 4.04)
Eldoret vs Kitale	1.48 (0.56, 4.47)
Turbo vs Kitale	1.29 (0.40, 4.39)
Webuye vs Kitale	4.08 (1.32, 13.92)
Per subsequent month of enrollment	1.29 (1.06, 1.58)

RESULTS (CONTINUED)

- Among seropositive participants, above-range titers were seen in 57%
- Presumptive or laboratory-confirmed COVID-19 diagnosis, hospitalization, or death were absent
- Self-reported illness was similar among seropositive and seronegative participants, and highest in Webuye
- Overall seroprevalence of 29% among our participants was lower than that of earlier Kenyan cohorts, even those studied during the initial stages of the pandemic and prior to circulation of the Delta variant

CONCLUSIONS

- Surveillance for antibodies to SARS-CoV-2 among 241 perinatally infected Kenyan YLWH revealed evidence of substantial viral transmission, with significant geographical, temporal, and age variation
- Lower seroprevalence in our cohort compared to other Kenyan cohorts, as well as variations within our cohort, may potentially be explained by differences in level of exposure to SARS-CoV-2, by likelihood of seroconversion, or by seroreversion
- Increased prevalence in rural Webuye may reflect less widespread mask-wearing, or its location on a busy transit route
- Findings may inform efforts to promote anticipatory guidance, optimization of active and passive immunization, as well as further evaluation of the cell-mediated immune response to SARS-CoV-2 infection or vaccination

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