**INTRODUCTION**

The COVID-19 pandemic significantly disrupted healthcare systems worldwide, posing substantial challenges to the continuity of care for chronic diseases such as HIV. In many settings, stringent public health measures—including lockdowns, travel restrictions, and healthcare resource reallocations—unintentionally affected HIV service delivery, leading to disruptions in antiretroviral therapy (ART) adherence, access to clinic visits, and medication refills​. Ensuring uninterrupted HIV care is critical, as ART adherence is essential for viral suppression, reducing transmission, and improving long-term health outcomes​.

The COVID-19 pandemic significantly disrupted healthcare systems worldwide, posing substantial challenges to the continuity of care for chronic diseases such as HIV. In many settings, stringent public health measures—including lockdowns, travel restrictions, and healthcare resource reallocations—unintentionally affected HIV service delivery, leading to disruptions in antiretroviral therapy (ART) adherence, access to clinic visits, and medication refills​. Ensuring uninterrupted HIV care is critical, as ART adherence is essential for viral suppression, reducing transmission, and improving long-term health outcomes​.

Uganda, home to a high HIV burden, implemented strict containment measures that further restricted healthcare access. The Rakai Community Cohort Study (RCCS), a long-standing population-based HIV surveillance program in southern Uganda, provides a unique opportunity to examine the extent and impact of these disruptions. RCCS, established in 1994 by the Rakai Health Sciences Program (RHSP), is one of the longest-running HIV surveillance programs in sub-Saharan Africa​. It operates across 40 communities, including agrarian, semi-urban, and high-risk fishing populations, which exhibit diverse HIV prevalence levels and healthcare access challenges​. RCCS conducts biennial household censuses and surveys among individuals aged 15–49 years, systematically collecting data on HIV incidence, prevalence, ART coverage, viral load suppression, and healthcare service utilization​. Through longitudinal follow-up and routine HIV testing, RCCS has provided critical insights into HIV transmission dynamics, treatment outcomes, and the effectiveness of prevention strategies in Uganda​

This study aims to evaluate the factors associated with ART interruptions post-COVID-19, the proportion of individuals who experienced treatment disruptions and were viraemic, and how these trends vary across age, sex, and community type. By leveraging RCCS data, we seek to generate insights that can inform interventions to mitigate the impact of future public health crises on HIV care.

**Cohort Description**

This study utilizes data from the Rakai Community Cohort Study (RCCS), a population-based, open HIV surveillance cohort conducted across 40 communities in the Rakai region of southern Uganda. The RCCS covers a diverse range of community types, including agrarian, semi-urban, and high-risk fishing communities, each exhibiting varying HIV prevalence rates, from 9–26% in inland areas to 38–43% in fishing communities. The region, located along the border with Tanzania to the south and Lake Victoria to the east, experiences high population mobility, influenced by seasonal labor migration patterns associated with fishing and other local industries.

RCCS conducts biennial household censuses and surveys (every 12–18 months), enrolling individuals aged 15–49 years who have resided in the study area for at least six months (or one month in fishing communities). Structured interviews collect data on socioeconomic factors, sexual behaviors, and HIV service utilization. HIV testing is performed using a validated three-test rapid diagnostic algorithm, with confirmatory enzyme immunoassay testing conducted in laboratories. Viral load testing is conducted on stored plasma using the Abbott RealTime HIV-1 assay (Abbott Molecular, Inc., Des Plaines, IL).

For this analysis, we included individuals living with HIV who contributed study visits during Round 18 (October 2016–May 2018) and Round 19 (June 2018–October 2020).

**Statistical Analysis**

Descriptive and inferential statistical analyses were conducted to evaluate the impact of COVID-19-related ART disruptions among participants in the Rakai Community Cohort Study (RCCS). The analysis aimed to assess the prevalence and predictors of ART disruptions post-COVID-19, as well as their association with viraemia, defined as ≥200 RNA copies/ml.

Baseline characteristics of the study population were summarized using medians and interquartile ranges (IQR) for continuous variables and counts with percentages for categorical variables. Key demographic and clinical variables included age, sex, marital status, educational attainment, occupation, migration status, community type (inland vs. fishing), and time on ART. Differences in these characteristics were assessed to describe the distribution of ART disruption and viraemia across the study population.

To evaluate factors associated with ART disruptions and viraemia post-COVID-19, log-binomial regression models were employed to estimate prevalence risk ratios (PRRs) and 95% confidence intervals (CIs). However, given the frequent convergence challenges associated with log-binomial models, Poisson regression with robust standard errors was used as an alternative approach to obtain adjusted PRRs (AdjPRRs). In the multivariate models, adjustments were made for age group (<30, 30–39, 40–49 years), sex (male vs. female), community type (inland vs. fishing), mobility status (in-migrant vs. long-term resident), time on ART (<2 years, 2–5 years, >5 years), and history of ART disruption prior to COVID-19.

The association between ART disruptions and viraemia post-COVID-19 was further examined using adjusted log-binomial regression models. Covariates included age, sex, community type, ART history, and mobility status. Subgroup analyses were conducted to assess differences in viraemia prevalence among individuals with and without ART disruptions across age groups, sex, and community type.

To explore potential sex-based differences in ART disruption and viraemia risk, additional analyses stratified by sex were performed. Separate log-binomial models were fitted for male and female participants, and results were summarized using forest plots to visualize adjusted and unadjusted PRRs with their corresponding confidence intervals.

Regression results were presented in tables summarizing both univariate and multivariate models. Additionally, forest plots were generated to compare prevalence risk ratios across different subgroups. This analytical approach provides a comprehensive assessment of how COVID-19-related disruptions to HIV care affected ART adherence and treatment outcomes within the RCCS population in Uganda.