HIV data informed care – using routine data to identify persons at risk of rebound viremia

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BACKGROUND

One key pillar of Ending the HIV Epidemic in the USA is to treat all persons with HIV (PWH) with effective antiretroviral therapy (ART). PWH who develop rebound viremia are at risk of complications of HIV and onward transmission to other HIV-uninfected individuals. Identifying PWH at increased risk of developing rebound viremia or falling out of care could identify people in need of adherence support to prevent viral rebound. We sought to evaluate factors associated with developing rebound viremia among PWH who were newly diagnosed and had achieved initial viral suppression.

METHODS

Population: The study included all PWH residing in San Diego County who were newly diagnosed with HIV between June 2017 and April 2023. De-identified data were obtained from the Enhanced HIV/AIDS Reporting System (eHARS). The analysis was limited to persons whose diagnosis date was known and had subsequently attained initial viral suppression at any point (VL </= 50 copies/mL).

Outcome: The primary outcome was the presence of subsequent rebound viremia, defined as VL >200 copies/mL and occurring after initial viral suppression.

Independent variables: Age at diagnosis, race, ethnicity, HIV disease stage, birth sex, gender, transmission risk category, low level viremia (i.e. viral blips 50-200 copies/ml), and frequency of viral load testing.

Analysis: Summary statistics of the population were calculated. Characteristics of PWH with rebound viremia >200 copies/ml were compared to those without rebound using Chi-squared/Wilcoxon rank sum tests. Kaplan-Meier survival analysis with right censoring was performed using independent variables identified on initial comparison. Time varying viral load testing patterns were incorporated into the analysis using a Cox model including frequency of viral load tests since viral suppression, log10 of the most recent viral load and whether the last available viral load was suppressed (<50 copies/mL) or represented low level viremia (50-200 copies/mL).

1 in 6 persons with HIV developed rebound viremia >200 copies/ml within 2 years of achieving initial suppression after diagnosis. Young age at diagnosis, Black or Hispanic race/ethnicity, female gender, a history of IDU or AIDS, and recent viral blips (50-200 copies/ml) were associated with rebound viremia.

RESULTS

- 2515 PWH were included. The median number of VL results per participant was 5 (IQR 2-9) and median follow up was 75 (IQR 26-151) weeks.
- During follow up, 302 (12%) developed rebound viremia. Participant demographics stratified by rebound viremia vs no rebound are in **Table 1**.
- In the survival analysis, younger age at diagnosis (p=0.006), Black/Hispanic race/ethnicity (p=0.03), Female gender (p=0.005), Injection drug use transmission risk (p=0.001), and HIV disease stage (p<0.001) were associated with shorter time to rebound viremia (**Figure 1**).
- By 2 years after viral suppression, rebound viremia had occurred in 15% of participants.
- Viral load testing time-varying covariates including low level viremia (blips) (p<0.001) and frequency of VL testing (p<0.001) were associated with rebound viremia (**Table 2**)

TABLE 1	Overall	Rebound	No Rebound	P- value
N	2515	302	2213	
Age at Diagnosis, n (%)				
<20 years	94 (3.7)	15 (5.0)	79 (3.6)	<0.001
20-30 years	918 (36.5)	140 (46.4)	778 (35.2)	
30-40 years	750 (29.8)	65 (21.5)	685 (31.0)	
>40 years	753 (29.9)	82 (27.2)	671 (30.3)	
Race/Ethnicity, n (%)				
Black	287 (12.1)	41 (13.7)	246 (11.9)	0.071
Hispanic, any race	1282 (54.0)	177 (59.0)	1105 (53.3)	
Other	201 (8.5)	18 (6.0)	183 (8.8)	
White	694 (25.4)	64 (21.3)	540 (26.0)	
Gender, n (%)				
Female	283 (11.8)	47 (15.7)	236 (11.3)	0.04
Male	2044 (85.4)	239 (79.9)	1805 (86.2)	
Transgender male-to-female	59 (2.5)	12 (4.0)	47 (2.2)	
Other	7 (0.3)	1 (0.3)	6 (0.2)	
Exposure Category, n (%)				
Heterosexual	146 (5.8)	21 (7.0)	125 (5.6)	<0.001
IDU	96 (3.8)	21 (7.0)	75 (3.4)	
MSM	1453 (57.8)	170 (56.3)	1283 (58.0)	
MSM & IDU	90 (3.6)	19 (6.3)	71 (3.2)	
Other	730 (29.0)	71 (23.5)	659 (29.8)	
Disease stage, n (%)				
HIV, stage 1 or 2	1998 (79.6)	202 (66.9)	1796 (81.3)	<0.001
HIV and later AIDS	135 (5.4)	39 (12.9)	96 (4.3)	
HIV & AIDS simultaneously	378 (15.1)	61 (20.2)	317 (14.4)	

Figure 1: Kaplan-Meier survival curves indicating probability of remaining free from viral rebound (>200 copies/ml) after achieving initial viral suppression following diagnosis

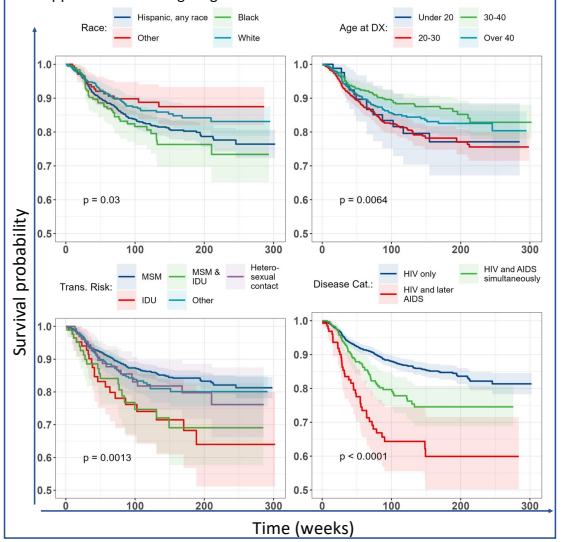


Table 2: Cox model for time-varying covariates and association with developing rebound viremia (>200 copies/ml)

Variable	Hazard Ratio (95% CI)	P-value
Log10 most recent viral load	1.79 (1.29 – 2.48)	<0.001
Low level viremia (blips) (50-200 copies/mL)	3.17 (2.52 – 3.97)	<0.001
Frequency of viral load testing	2.98 (2.42 – 3.67)	<0.001

CONCLUSIONS

- Rebound viremia is more likely among PWH who are younger, Black or Hispanic, female or have IDU as a transmission risk – further studies evaluating the underlying causes in these populations are needed.
- The presence of low-level viremia (blips) (50-200 copies/ml) and more frequent VL testing are potential time-varying predictors of a person developing rebound viremia.
- Variables identified in this study could be considered as part of a risk score to identify PWH who are at risk of developing rebound viremia. Comparative studies with existing data-to-care programs are needed.

ADDITIONAL KEY INFORMATION

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