Viral load levels measured at set-point have risen over the last decade of the HIV epidemic in the Netherlands

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Background

A rising trend in plasma HIV-1 RNA concentration at set-point over calendar time might implicate an increase in the efficiency with which HIV-1 is transmitted. Contrasting results on the trend over time have been reported.

Objective

To determine whether the level of plasma HIV-1 RNA concentration and CD4 cell count measured 9-27 months after estimated HIV-1 seroconversion has changed between 1984 and 2007.

Methods

Patients

- Patients with recent HIV-1 infection (last negative and first positive test <1 year apart) and >1 plasma HIV-1 RNA concentration available 9-27 months after seroconversion without having received antiretroviral therapy were selected from the ATHENA observational cohort.
- Analyses were repeated in MSM from W-Europe/N-America with a proven or likely subtype B infection: a) first HIV-1 RNA measurement 9-27 months after seroconversion between 1984-1995, b) at 12, c) at 18 and d) at 24 months.

Outcome

- HIV-1 RNA concentration and CD4 cell count at viral set-point. Defined as: 1. The earliest HIV-1 RNA and CD4 cell count measurement 9-27 months after seroconversion and without having received ART. 2. CD4 cell count and HIV-1 RNA concentration at 12, 18 and 24 months after seroconversion. 3. As a sensitivity analysis the earliest HIV-1 RNA and CD4 cell count measurement after seroconversion (without having received ART) was also analysed.

Statistical analyses

- Linear regression models with a normal error distribution were used.
- HIV-1 RNA concentration below the lower detection limit and above the upper detection limit were interval and right censored, respectively.
- CD4 cell counts were cube root transformed, HIV-1 RNA concentration log10 transformed.
- Estimated calendar year of seroconversion was modeled using categories: 1984-1995, 1996-2002 and 2003-2007 and continuously using restricted cubic splines. Potential confounders were: gender, region of origin, age at seroconversion, HIV-1 subtype, transmission of resistant virus, interval between measurement and seroconversion, transmission risk group, HCV/HBV co-infection, sensitivity and technique of the quantitative HIV-1 RNA assay used.

Results

HIV-1 RNA concentration

- Mean HIV-1 RNA concentration at set-point was 0.32 log10 copies/ml (95% CI 0.12-0.51; p=0.002) lower in women compared to men, 0.40 (0.14-0.67; p=0.003) log10 copies/ml lower in patients with non-B subtype infection compared to B subtype and 0.16 log10 copies/ml (0.00-0.32; p=0.04) higher in patients from W-Europe/N-America compared to elsewhere.
- HIV-1 RNA concentration at viral set-point and at 12, 18 and 24 months after seroconversion was significantly higher between 2003-2007 compared to 1984-1995 and 1996-2002 (Figure 1).
- Results were robust for type and sensitivity of assay and co-infection with HCV or HBV.

Figure 1. HIV-1 RNA concentration at viral set-point in MSM from W-Europe/N-America with proven/likely subtype B infection: a) first HIV-1 RNA measurement 9-27 months after seroconversion (n=612), b) at 12 (n=552), c) at 18 (n=370), d) at 24 months (n=315).

Conclusion

The HIV-1 RNA plasma concentration at viral set-point has increased over the last decade of the HIV epidemic in the Netherlands. This is accompanied by a decreasing CD4 cell count over the period 1984-2007 and may have implications for both the course of the HIV infection and the epidemic.

Figure 2. CD4 cell count at viral set-point in MSM patients from W-Europe/N-America with proven/likely subtype B infection: a) first CD4 cell count between 9-27 months after seroconversion, b) at 12, c) at 18 and d) at 24 months.