Effect of patient smoking status on CD4 count change after initiation of antiretroviral therapy

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Background

- It is known that in the general population, smokers have higher CD4 counts than non-smokers.
- It is unclear whether CD4 count change after initiation of antiretroviral therapy (ART) in people with HIV differs between smokers and non-smokers.

Methods

- Patients at the Royal Free Clinic who started ART for the first time with at least three drugs between 1998 and 2008 were included if data were available on their smoking status, and if a CD4 count in the six months prior to starting ART was available.
- Patients who were known to have been smokers at any time were assumed to have always been smokers.
- CD4 count one year after starting ART was defined as the CD4 count measurement closest to one year (±75 days) while on ART.
- The effect of smoking status on CD4 count change was evaluated using a linear regression model.
- Change in CD4 percentage one year after starting ART was also considered.

Results

- 1139 patients started ART with at least three drugs between 1998 and 2008. Of these, 961 (84%) had a baseline CD4 count and were included in the analysis (Table).
- 401 (42%) were smokers. Baseline CD4 counts were similar overall in both smoking groups, but lower in smokers when compared within risk groups (Figure 1).
- 315 (79%) of smokers and 458 (82%) of non-smokers had a one-year CD4 count measurement while on ART.
- Smokers had a mean (95% CI) increase in CD4 count of 256 (237-275) cells/mm^3, compared to 217 (204-231) cells/mm^3 (Figure 2).
- The estimated mean (95% CI) change in CD4 count was 39 (16-62) cells/mm^3 higher in smokers (p<0.001).
- After adjustment for baseline CD4 count, age, gender and risk group, the estimated mean (95% CI) change in CD4 count was 37 (13-62) cells/mm^3 higher in smokers (p=0.003).
- The CD4 percentage change was known for 294 (93%) of smokers and 411 (90%) of non-smokers included in the CD4 count analysis, and was similar in both groups (mean CD4 percentage increases of 9.6 and 9.4 respectively; p=0.53).

Figure 1: Median pre-ART CD4 counts

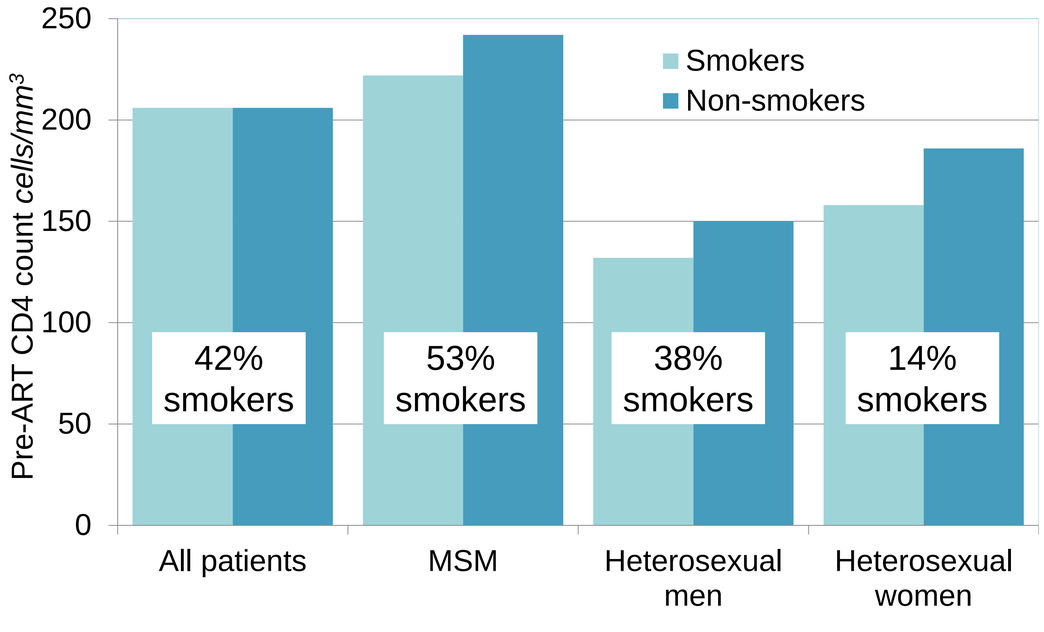


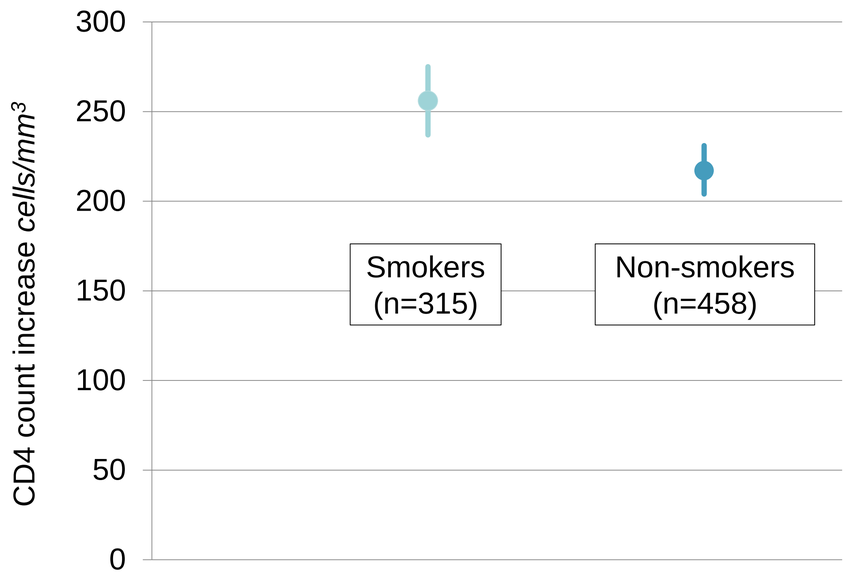
Table: Patient characteristics by smoking status

Patient characteristics		Smokers	Non-smokers
Included patients		401 (100%)	560 (100%)
Gender and risk group	MSM Heterosexual men Heterosexual women IDU Other / unknown	289 (72%) 67 (17%) 30 (7%) 15 (4%) 0 (0%)	258 (46%) 108 (19%) 183 (33%) 7 (1%) 4 (<1%)
Pre-ART AIDS diagnosis	Yes	81 (20%)	131 (23%)
Age at start of ART	Median (IQR) years	38 (33-43)	37 (33-44)
Pre-ART CD4 count	Median (IQR) cells/mm^3	206 (100-292)	206 (89-298)
Pre-ART CD4 percentage	Median (IQR)	13 (8-19) *14% missing*	13 (8-18) *16% missing*
Pre-ART viral load	Median (IQR) $\log_{10}$ copies/ml	5.1 (4.6-5.6) *6% missing*	5.0 (4.5-5.5) *6% missing*

Conclusions

- There was a significant but modest difference in CD4 count response one year after starting ART between smokers and non-smokers. There was no such association between smoking status and change in CD4 percentage.
- While this difference is plausible, given the higher CD4 count seen in smokers in the general uninfected population, it is not possible to rule out that this is due to confounding by some other factors.
- Smoking status should be accounted for when assessing a patient's immunological response to ART and risk of disease, for example when considering stopping prophylaxis to prevent opportunistic disease.

Figure 2: Mean (95% CI) change in CD4 counts one year after starting ART



Royal Free HIV Cohort Database Clinical: S Bhagani, F Burns, P Byrne, A Carroll, I Cropley, Z Cuthbertson, T Drinkwater, T Fernandez, E Garusu, AM Geretti, D Grover, B Killingley, G Murphy, D Ivens, M Johnson, S Kinloch-de Loes, M Lipman, S Madge, N Marshall, H Montgomery, B Prinz, A Rodger, R Shah, L Swaden, M Tyrer, M Youle Data management: C Chaloner, J Holloway, M Miah, S Rhule, J Sweeney, R Tsintas Epidemiology/Biostatistics: V Cambiano, F Lampe, R Lodwick, F Nakagawa, J O'Connor, A Phillips, C Smith, A Speakman Laboratory: M Connell, G Clewley, L Gardner, G Janossy, S Martin, M Thomas