Metabolic Profile in Vertically HIV-Infected Adults Compared to General Population

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ABSTRACT

Background: Cardiometabolic risk is poorly documented for the first generation of young adults living with HIV since childhood and exposed to synergic risk factors, including antiretroviral drugs (ARV), lipodystrophy and HIV itself. We compared the metabolic profiles of these young adults and the general population of the same age in France.

Methods: We used two French national studies: (1) COVERTE (ANRS-CO19), a cohort of 18- to 30-year-old patients infected with HIV since childhood, and (2) ENNS, a national cross-sectional population-based household nutrition survey. Body mass index, blood pressure, waist circumference, fasting glucose, triglycerides, HDL-, LDL- and total cholesterol were determined in both studies. Metabolic abnormalities were categorized according to the Joint Interim Statement definition of metabolic syndrome (2009). Their prevalences were compared, in COVERTE and ENNS, separately for men and women, with directed standardization for overweight and educational level, and logistic regression to estimate odds ratios (ORs) and their 95% confidence intervals (CI) adjusted for educational level, overweight and alcohol consumption.

Results: Most of the 269 HIV-infected patients included in COVERTE (47% male) had been on combined ARV therapy (40% including a protease inhibitor) for a mean of 19 years. Viral load remained detectable in 32%, but median CD4 count was 550 cells/mL. These subjects were compared with 245 young adults from ENNS (42% male). Tobacco use was similar in the two populations. After standardization, the prevalence of metabolic syndrome was 13.2% (CI: 7.1-19.2) in HIV-infected men versus 10.6% (CI: 1.5-19.7) in the general population. The corresponding prevalences in women were 9.8% (CI: 5.1-14.6) and 1.7% (CI: 0-4.1). HIV-infected men were more likely to have high triglyceride levels (OR 4.97; CI: 1.02-24.22) but less likely to be overweight (OR 0.23; 0.08-0.65) or have hyperglycemia (OR 0.25; CI: 0.07-0.86) than men from the general population. HIV-infected women were more likely to have a large waist circumference (OR: 3.47; CI: 1.14-10.55), low HDL-cholesterol levels (OR 2.68; CI: 1.30-5.50) and less likely to have high total cholesterol levels (OR 0.31; 0.14-0.66).

Conclusion: Young adults infected with HIV since childhood had no excess of behavioral risk factors, but were more likely to have dyslipidemia and metabolic syndrome than the general population, justifying close monitoring for cardiometabolic diseases.

OBJECTIVE : To compare the metabolic profile of vertically HIV-infected adults with that of adults of same age living in France

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METHODS

Sources of data

•**ANRS COVERTE-CO19:** ongoing cohort of adults with HIV infection diagnosed before 13 years of age, aged 18 to 25 years at inclusion, in France with a collaborative Belgian component started in June 2010.

•**ENNS (Etude Nationale Nutrition Santé):** national cross-sectional population-based household survey conducted in 2006-2007 to describe food intake, physical activity and nutritional status in metropolitan France (1), using a three-stage probability sampling with unequal inclusion probabilities.

Study population

•Inclusion of all participants in both studies aged 18 to 30 years at the study period, living in France and not pregnant, with level of education, weight, height and total cholesterol available.

• For HIV-infected patients with several follow-up visits, inclusion of the last visit with both biological parameters measured in the previous three months, and self-questionnaire completed.

Variables studied

•Metabolic abnormalities: according to the Joint Interim Statement definition of the metabolic syndrome (2): blood pressure ≥130/85 mmHg or blood pressure lowering medication; waist circumference ≥94 cm (men) or ≥80 cm (women); fasting glycaemia ≥5.6 mmol/l or antidiabetic medication; triglycerides ≥1.7 mmol/l or lipid lowering medication; HDL-cholesterol <1.03 mmol/l (men) or <1.29 mmol/l (women) or medication.

•Metabolic syndrome: ≥3 metabolic abnormalities.

•Main exposure: being HIV-infected since childhood (enrolled in COVERTE) or not (general population, enrolled in ENNS).

Statistical analysis

•Prevalences of abnormalities estimated with their 95% confidence intervals, according to the sampling design for ENNS (weighed to take into account unequal probabilities of inclusion and post-stratification).

•Direct standardization on the distribution of body mass index (BMI <25; ≥25) and education level (high school completion or not) of the general population from the ENNS survey used to estimate percentages in HIV-patients .

•Association between each metabolic parameter (as dependant variable) and the HIV status (main exposure) studied using logistic regression models adjusted for overweight, educational level and alcohol consumption (at least once a week).

RESULTS

Fig 1: Selection of study population

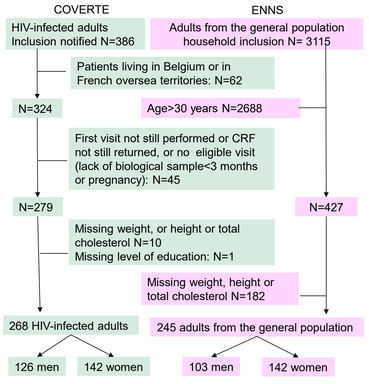


Table 1 : Characteristics of the study population

	MEN			WOMEN		
	HIV-infected (COVERTE: N=126)		General population (ENNS: N=103)	HIV-infected (COVERTE: N=142)		General population (ENNS: N=142)
	%	Stand. %	%	%	Stand. %	%
Age 25-30 (ref 18-24)	32.5	32.0	42.6	32.4	33.3	35.5
Undergraduate education level	50.8	54.7	54.7	39.4	36.7	36.7
Occupation						
Not working	30.2	33.9	8.1	37.8	36.8	18.2
Student	25.8	23.7	30.9	31.5	33	41.2
Working	44.0	42.4	61.0	30.7	30.2	40.6
Born in metropolitan France	68.2	67.8	94.7	70.4	70.1	94.8
Tobacco consumption						
Everyday	36.0	39.0	43.8	31.2	29.4	31.5
Not everyday	9.6	8.8	2.5	8.5	8.6	2.3
In the past	12.8	12.9	12.0	14.2	15	14.2
Never	41.6	39.3	41.8	46.1	47.0	52.0
Alcohol consumption	21.4	21.8	76.0	19.0	19.5	56.9
Body mass index						
BMI<18.5	7.9	6.9	0.5	9.8	9.9	10.2
18.5≤BMI<25	69.8	59.6	66.0	63.4	63.9	63.5
BMI≥25	22.2	33.5	33.5	26.8	26.2	26.2

Table 2 : Characteristics of HIV-infected patients

	Men (N=126)		Women (N=142)	
	N	%	N	%
ARV treatment				
Never treated	2	1.6	1	0.7
Treatment stopped	5	4.0	13	9.2
On treatment	119	94.4	128	90.1
Nature of ARV treatment				
2NRTI+1NNRTI	25	20.1	37	26.4
2NRTI+PI	50	40.3	56	40.0
II+other ARV	32	25.8	28	20.0
Other regimens	17	13.7	19	13.6
CDC Stage C	33	26.2	29	20.4
Undetectable viral load*	81	68.6	93	67.4
	Median	IQR	Median	IQR
Viral load (log_{10} copies/mL), when detectable	3.64	2. 11-4.25	3.03	2.01-4.39
CD4 (cells/µL)	559	372-755	552	399-704
Time on ARV (years)	18.8	12.4-22.1	18.9	12.1-21.8
Duration of exposure to ARV drugs with known metabolic toxicity (years)**	14.1	9.6-17.7	12.6	7.4-17.5

* median detection threshold: 1.3 log copies/mL ** Staduvine, didanosine, zidovudine, protease inhibitors

Table 3: Comparison of prevalences of metabolic abnormalities in HIV-patients and general population in men and women, after direct standardization on BMI and educational level (COVERTE and ENNS) and logistic regression taking into account unequal weighting adjusted on educational level, overweight (except for overweight adjusted on educational level only) and alcohol consumption

MEN	HIV-infected (COVERTE)				General population (ENNS)		OR	95%CI	p-value
	N	%	Stand.%	95%CI	%	95%CI			
Overweight	**28**	**22.2**	**22.2**	**14.9-29.5**	**33.5**	**21.2-45.8**	**0.23**	**0.08-0.65**	**0.005**
Elevated blood pressure	41	35.0	36.1	27.2-45.0	31.0	19.2-42.8	1.16	0.35-3.76	0.802
Elevated waist circumference	12	11.4	16.2	9.0-23.4	14.3	5.2-23.3	1.21	0.30-4.56	0.787
Elevated fasting glycemia	**10**	**8.1**	**9.8**	**4.1-15.4**	**14.9**	**4.9-24.8**	**0.25**	**0.07-0.86**	**0.027**
Elevated triglycerides	**28**	**22.4**	**22.9**	**15.3-30.5**	**9.5**	**1.0-18.0**	**4.97**	**1.02-24.22**	**0.047**
Reduced HDL-cholesterol	43	34.9	36.3	27.4-45.2	23.7	11.0-36.5	2.67	0.87-8.16	0.084
Elevated LDL-cholesterol	13	10.7	11.5	5.5-17.4	12.4	6.0-18.7	0.69	0.17-2.75	0.598
Elevated total cholesterol	21	16.7	17.8	10.8-24.9	14.6	7.6-21.7	0.86	0.25-2.92	0.810
Metabolic syndrome	**14**	**11.1**	**13.2**	**7.1-19.2**	**10.6**	**1.5-19.7**	**1.91**	**0.35-10.25**	**0.450**
WOMEN									
Overweight	38	26.8	26.8	19.5-34.1	26.2	16.3-36.2	0.80	0.36-1.76	0.572
Elevated blood pressure	29	22.0	20.8	13.9-27.6	13.6	5.8-21.5	1.21	0.49-2.94	0.677
Elevated waist circumference	**51**	**40.8**	**39.6**	**32.9-46.4**	**23.9**	**14.3-33.6**	**3.47**	**1.14-10.55**	**0.028**
Elevated fasting glycaemia	7	5.0	5.6	1.8-9.5	1.2	0-3.6	ND	ND	ND
Elevated triglycerides	13	9.2	8.3	4.0-12.6	7.9	1.2-14.7	0.71	0.18-2.69	0.610
Reduced HDL-cholesterol	**55**	**40.1**	**38.3**	**30.4-46.2**	**24.9**	**15.0-34.8**	**2.68**	**1.30-5.50**	**0.007**
Elevated LDL-cholesterol	19	14.0	14.2	8.2-20.2	16.8	8.7-25.0	0.74	0.28-1.88	0.523
Elevated total cholesterol	**28**	**19.7**	**20.5**	**13.6-27.4**	**32.4**	**22.4-42.4**	**0.31**	**0.14-0.66**	**0.002**
Metabolic syndrome	**15**	**10.6**	**9.8**	**5.1-14.6**	**1.7**	**0-4.1**	**5.31**	**0.88-31.81**	**0.068**

CONCLUSIONS

- French young adults infected with HIV since childhood reported similar tobacco consumption and less alcohol consumption than their counterparts from the general population of same age but exhibited an atherogenic lipid profile
- Elevated waist circumference (women) and elevated triglycerides (men) in association with reduced HDL-cholesterol, without difference in total or LDL cholesterol levels, were also observed, as previously reported in patients aged 35-44 years infected with HIV during adulthood and on protease inhibitors (3), compared to the general population.
- These abnormalities being strongly associated with an increased risk of cardiometabolic diseases, they warrant close monitoring.

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