



Relationship between Bone Composition and Fat Indexes in HIV-Infected Patients.

Anna Bonjoch¹, Carla Estany¹, Núria Pérez-Álvarez^{1,2}, Joaquim Rosales³, Patricia Echeverría¹, Bonaventura Clotet^{1,4}, Eugènia Negrodo^{1,5}

¹Fight against AIDS Foundation, AIDS Care Unit, Infectious Diseases Service, HUGTIP Universitat Autònoma de Barcelona; ²Department of Statistics and Operations Research, Technical University of Catalonia-Barcelona Tech; ³DIGEST, Badalona; ⁴Irsicaixa Foundation, Barcelona; ⁵Universitat de Vic-Universitat Central de Catalunya

ABSTRACT

Background: Body composition among the HIV infected people is influenced by several factors including antiretrovirals and the virus itself. This study aims to determine the relations between bone and fat distribution of this population.

Methods: We collected T and Z scores and bone mineral density (BMD) from lumbar spine (L1-L4) and femoral neck, and the overall BMD by dual energy x-ray absorptiometry (DXA) from our cohort of HIV infected people. The following fat indexes were included: Fat mass index (FMI), Fat mass ratio (FMR), total and percentages of trunk fat/limb fat, of trunk fat/total fat, of limb fat/total fat and leg fat/BMI. Linear regression analyses were performed.

Results: 1,480 subjects were included, 75% were male and the median (IQR) of age was 45.6 (45:53) in men and 46.9 (41:52) in women. Significant results from the univariate model were incorporated to the multivariate analysis. Results are showed at Table 1. In summary, a positive relation were observed in both genders regarding total BMD and FMI (p<0.001, B=+0.009 in women, p<0.001, B=+0.015 in men) and a negative relation between total BMD and percentage of left leg fat/ BMI (p<0.001, B=-0.058 in women; p<0.001, B=-0.097 in men). In women, L1-L4 T score was related with % left leg fat/ BMI (p<0.001, B=-0.581); Z score with FMI (p=0.014, B=-0.042) and limb fat/total fat index (p<0.001, B=-2.342); and BMD in lumbar spine with % left leg fat/ BMI (p=0.001, B=-0.072), Femoral neck T score presented a relation with FMI (p<0.001, B=+0.07) with %left leg fat/BMI (p=0.008, B=-0.412), and BMD of femoral neck with FMI (p=0.001 B=0.007). For men, lumbar spine T score, Z score and lumbar BMD were related with % left leg fat/BMI (p=0.001, B=-0.386; p=0.001, B=-0.242 and p=0.002 B=-0.044, respectively). The variable related with femoral neck T score was trunk fat/limb fat (p<0.001, B=-0.203); Z score, was related with: % left leg fat/BMI (p<0.001, B=-0.334), and BMD of femoral neck with trunk fat/total fat (p<0.001, B=-0.115) and leg fat/total fat (p<0.001, B=+0.159).

Conclusions: Percentage of left leg fat/ BMI exhibit the most consistent correlation with bone indexes in both genders. The index that more positive correlation showed was FMI in women (more values in FMI corresponding to more values in the bone index). In men, negative correlation was observed in left leg fat/ BMI index.

INTRODUCTION

Antiretroviral therapy (ART) has increased the overall life expectancy of HIV-infected patients, turning HIV infection into a chronic disease, with long-term treatment¹. However, both HIV and ART are associated with changes in body composition which may have an impact on morbidity and mortality.

It was published that weight and body composition are major determinants of bone size and density. This is revealed in positive associations between fat mass and BMD in adults and the negative correlation between risk of fracture and weight in the elderly². This study aims to assess the relations between bone and fat distribution of our HIV infected population.

METHODS AND MATERIALS

This is a retrospective, cross-sectional and observational study. Dual-energy X-ray absorptiometry (DXA) using a Lunar Prodigy Advance (General Electric Healthcare). The last available DXA was included in the analysis (from March 2000 to December 2016). The methods used were statistics frequency and percentage calculations and multiple linear regression models. The effects of the independent variables (fat related) in our outcomes (bone measurements) were assessed by the coefficient B in the regression models. The method for estimating parameters was Least Squares and the multicollinearity between independent variables was avoided. Models for women and men are fitted separately and age was not included in the model.

RESULTS

This study included 1,480 persons, 75% were male and the median (IQR) of age at the last DXA scan was 45.6 (45:53) years old. 25% were female and the median (IQR) of age at the last DXA scan was 46.9 (41:52) years old. Sample distribution was explain at Table 1.

		Age		Total
		<50	≥50	
Gender	Female	222	139	361
	% Gender	61.5%	38.5%	100%
	% Age	23.7%	25.5%	24.4%
Male	713	406	1119	
	% Gender	63.7%	36.3%	100%
	% Age	76.3%	74.5%	75.6%
Total	All	935	545	1480
	% Gender	63.2%	36.8%	100%
	% Age	100%	100%	100%

Table 1. Crosstab Gender by Age <=50 years old. Frequency (percentage).

Linear regression models for the assessed bone markers (T and Z score of L1-L4, femoral neck and total BMD), were fitted using fat indexes as independent variables.

The results from the multiple linear regression are displayed in Table 2, the significant coefficients of the model (B), its Standard Error (SE) and p-value are given. The coefficients and the error bars for male and female are shown in Figure 1.

	B (SE)	p-value
FEMALE		
L1-L4 T score		
% left leg fat /BMI	-0.581 (0.172)	0.001
L1-L4 Z score		
FMI	-0.042 (0.017)	0.014
limb fat/ total fat index (gr)	-2.342 (0.660)	<0.001
L1-L4 BMD		
% left leg fat /BMI	-0.072 (0.020)	0.001
Femoral neck T score		
FMI	0.07 (0.018)	<0.001
% left leg fat /BMI	-0.412 (0.155)	0.008
Femoral neck BMD		
FMI	0.007 (0.002)	0.001
Total BMD		
FMI	0.009 (0.002)	<0.001
% left leg fat /BMI	-0.058 (0.014)	<0.001
MALE		
L1-L4 T score		
% left leg fat /BMI	-0.386 (0.120)	0.001
L1-L4 Z score		
% left leg fat /BMI	-0.242 (0.087)	0.001
L1-L4 BMD		
% left leg fat /BMI	-0.044 (0.014)	0.002
Femoral neck T score		
Trunk fat / limb fat (gr)	-0.203 (0.031)	<0.001
Femoral neck Z score		
% left leg fat /BMI	-0.334 (0.088)	<0.001
Femoral neck BMD		
Trunk fat/ total fat (gr)	-0.115 (0.021)	<0.001
Leg fat/ total fat (gr)	0.159 (0.034)	<0.001
Total BMD		
FMI	0.015 (0.001)	<0.001
% left leg fat /BMI	-0.097 (0.012)	<0.001

Table 2. Multiple models for assessed bone measure by gender. BMI =Body Mass Index, BMD = Bone Mineral Density, gr. = grams.

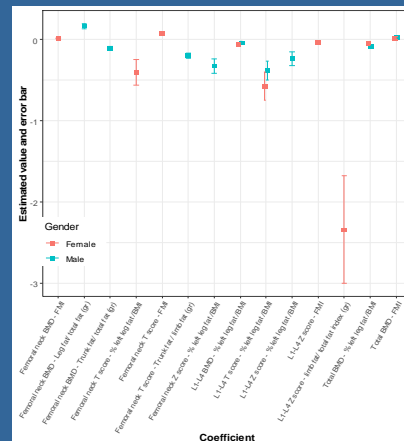


Figure 1. Multiple regression coefficients and its error bar for male (colored in green) and female (colored in red). Only coefficients which are significantly different from 0 are shown.

Summary of significant relationships (positive or negative) found between bone and fat variables:

BOTH GENDERS

- Total BMD and FMI
- Total BMD and percentage of left leg fat / BMI

WOMEN

- T score of lumbar spine and percentage of left leg fat /BMI
- Z score of lumbar spine and FMI and limb fat to total fat index
- BMD in lumbar spine and percentage of left leg fat / BMI
- T score of Femoral neck and FMI
- T score of Femoral neck and percentage of left leg fat / BMI
- BMD in Femoral neck and FMI

MEN

- Lumbar spine T score and percentage of left leg fat / BMI.
- Lumbar spine Z score and percentage of left leg fat / BMI.
- Lumbar BMD and percentage of left leg fat / BMI.
- Femoral neck T score and trunk fat /limb fat
- Femoral neck Z score and percentage of left leg fat / BMI
- BMD of femoral neck and trunk fat / total fat
- BMD of femoral neck and leg fat/ total fat.

CONCLUSIONS

Percentage of left leg fat/ BMI exhibit the most consistent correlation with bone indexes in both genders. The index that more positive correlation showed was FMI in women (that is, more values in FMI corresponding to more values in the bone index). In men, negative correlation was observed in left leg fat/ BMI index.

→ NEED OF MONITORING THE BODY COMPOSITION AND THEIR CHANGES IN CLINICAL CARE.

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CONTACT

Anna Bonjoch, MD, PhD
Email: abonjoch@flsida.org