Assessment of Associations between Physical-related Quality of Life and Early Signs of Comorbidities in HIV-positive Subjects enrolled in the HIV UPBEAT Study

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Introduction

In a previous analysis of the HIV UBPEAT cohort, a prospective cohort of HIV-positive and HIV-negative subjects from similar demographic backgrounds, we analysed overall self-reported quality of life (QoL) plus physical and mental components scores and common sub-domains of the measures including physical functioning (PF), role physical (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role emotional (RE) and mental health (MH) using the MOS-HIV Health Survey.

The HIV-positive group reported lower QoL compared to the HIV-negative group with the lowest scores reported for general health (evaluation of overall health) and vitality (feeling tired/worn out versus full of energy).

In the current study, we aim to explore associations of low to high physical-related QoL (Ph-QoL) with early signs of comorbidities in HIV-positive subjects.

Methods

HIV-positive UPBEAT participants were stratified into four equally-sized groups based on the quartiles of the distribution of baseline Ph-QoL.

Socio-demographic, medical/clinical history and biochemistry assessments including vitamin D, parathyroid hormone (PTH) and estimated glomerular filtration rate (eGFR) were obtained from the UPBEAT data base.

Surrogate markers of bone, renal and cardiovascular disease were investigated including:

- bone mineral density (BMD) assessments at femoral neck (FN), total hip (TH) and lumbar spine (LS)
- excretion of total and tubular proteins in urine using the protein:creatinine ratio (PCR) and the retinol binding protein:creatinine ratio (RBPCR)
- estimation of 10 year risk of atherosclerotic cardiovascular disease (ASCVD-10y) which calculates the risk for individuals aged 40-79 years

Between-group comparisons were assessed using Kruskal-Wallis/Chi-square tests with confounder-adjusted analyses performed using multivariable regression models, with adjustment for age, ethnicity, current smoking, socio-economic status, previous fractures and CD4-T cell count.

Results

In 167 HIV-positive subjects, the quartiles defining the four groups of Ph-QoL were: 1st quartile (group 1) <70.7; 2nd quartile (group 2) ≥70.7 to <83.9; 3rd quartile (group 3) ≥83.9 to 90.6; and 4th quartile (group 4) ≥90.6.

Group 1 was, on average, 2 years older than the other groups, and contained higher proportions of Caucasians, current smokers and those of lower socio-economic status (Table 1). Whilst Group 1 had a lower CD4-cell count (median 433 cells/mm3), there were no between-group differences in years since HIV diagnosis or receipt of antiretroviral treatment.

Table 1. Baseline characteristics stratified by Ph-QoL groups.

Variables N (%) (unless stated)	Group 1 Ph-QoL<70.7 (N=42)	Group 2 70.7≤Ph-QoL<83.9 (N=41)	Group 3 83.9≤Ph-QoL<90.6 N=(42)	Group 4 Ph-QoL≥90.6 (N=42)	P-value
Demographics					
Age (years)*	41 (34, 51)	39 (33, 46)	37 (33, 43)	39 (34, 46)	0.36
Male	23 (54.8)	28 (68.3)	29 (69.0)	21 (50.0)	0.18
Caucasian	31 (73.8)	25 (60.9)	19 (45.2)	22 (52.4)	0.34
Risk factors					
Current Smoking	25 (59.5)	15 (36.6)	12 (28.6)	16 (38.1)	0.03
Current Alcohol	29 (69.0)	19 (46.3)	22 (52.4)	27 (64.3)	0.13
Income<€575/week	37 (88.1)	32 (78.0)	35 (83.3)	35 (83.3)	0.68
< 3rd Educ. level	21 (55.3)	20 (51.3)	19 (46.3)	17 (40.5)	0.58
IVDU	8 (19.0)	6 (14.6)	7 (16.7)	6 (14.3)	0.93
HTN	8 (25.0)	9 (30.0)	8 (23.5)	7 (24.1)	0.94
Previous Fractures	14 (33.3)	13 (31.7)	13 (31.0)	17 (40.5)	0.78
Previous Falls	2 (4.8)	0 (0.0)	2 (4.8)	5 (11.9)	0.12
HCV-coinfection	4 (9.5)	4 (9.8)	5 (11.9)	2 (4.8)	0.71
HIV-parameters					
VL<40 copies/mL	28 (66.7)	27 (65.9)	31 (73.8)	29 (69.0)	0.86
CD4-T cell count (cells/mm3)*	433 (348, 643)	541 (376, 748)	445 (350, 548)	520 (372, 676)	0.12
On ART	38 (90.5)	34 (82.9)	38 (90.5)	35 (87.9)	0.68
Time since HIV diagnosis*	5.0 (3.0, 8.0)	4.0 (2.0, 9.0)	3.5 (0.8, 8.3)	5.0 (1.3, 8.0)	0.47
Body Composition					
BMI (kg/m2)*	26.0 (21.7, 28.3)	25.0 (23.0, 30.5)	26.0 (23.0, 32.0)	26.5 (24.0, 29.0)	0.42

*Median (IQR). ART: Antiretroviral treatment; BMI: body mass index; HTN: hypertension; HCV: hepatitis C Virus; IVDU: intravenous drug use; VL: HIV viral load

Results

BMD (at all sites) was greater in individuals with higher PhQoL(Figure 1); similar trends were seen for vitamin D, PTH and eGFR. In contrast, RBPCR was lower in those with higher Ph-QoL and whilst ASCVD-10y risk was particularly high in persons with the lowest Ph-QoL category, there did not appear to be any additional association among those with Ph-Qol ≥70.7 (Figure 1).

Figure 1. Markers of bone, renal and cardiovascular disease stratified by Ph-QoL category
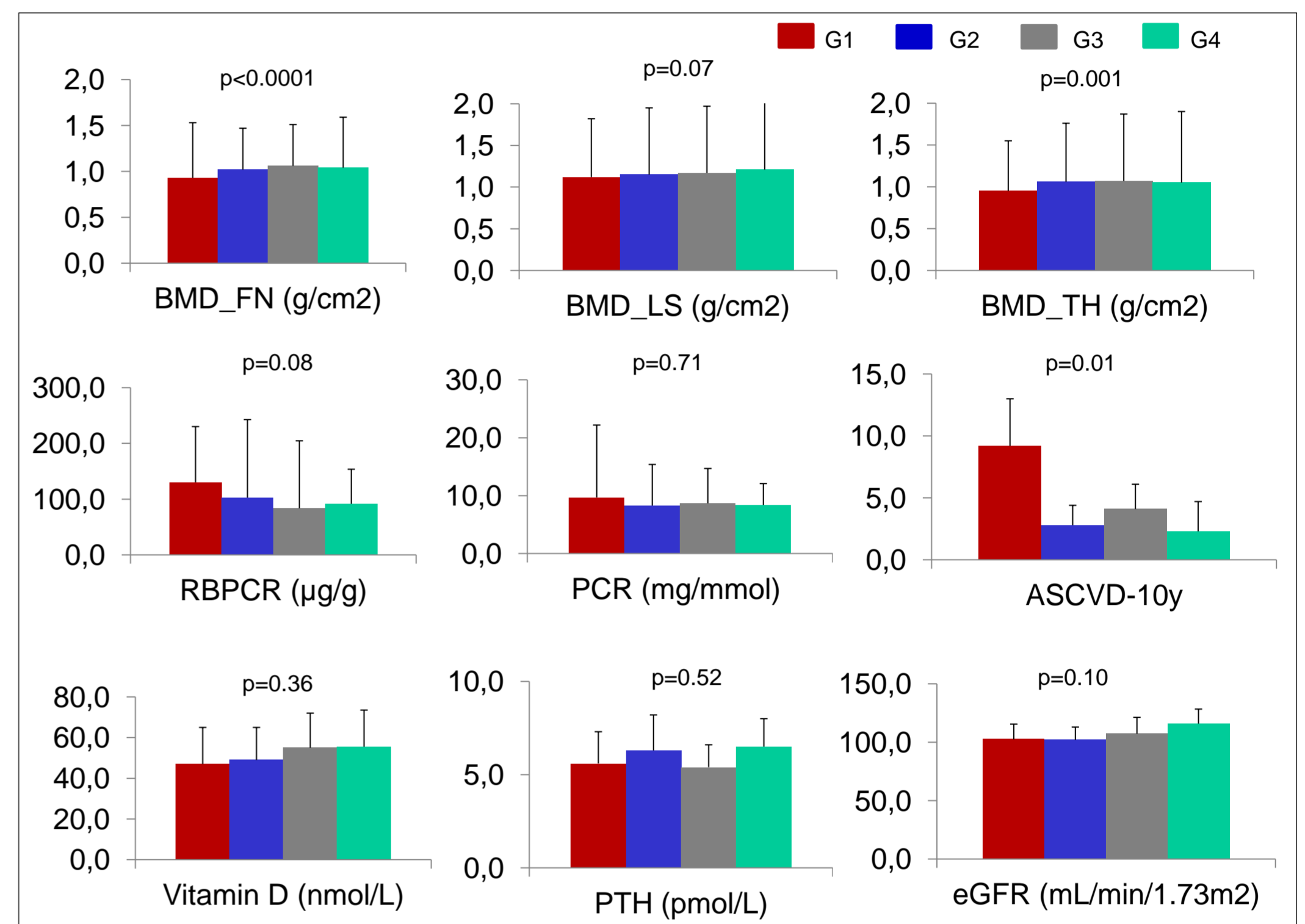
After adjustment for potential confounders, there continued to be significant associations between BMD at the 3 sites and Ph-QoL: BMD increased by 0.033, 0.029 and 0.028 g/cm2 at FN, LS and TH, respectively, with each category increase in Ph-QoL (Table 2). Vitamin D levels increased by 4.09 nmol/L with each increase in the Ph-QoL category (p=0.09) whereas there was no evidence of an association between PTH and Ph-QoL after adjustment.

None of the renal parameters demonstrated a strong association with Ph-QoL in multivariable analyses, suggesting that differences seen in univariate analyses were likely to be due to confounding. The association between a low ASCVD-10y risk score and Ph-QoL remained significant after adjustment for confounders.

Table 2. Estimate change in bone, renal and cardiovascular measures (with 95% confidence interval (95%)) associated with each category increase in Ph-QoL, obtained from multivariable linear regression models adjusted for age, ethnicity, smoking status, previous fractures and CD4-T cell count.

Outcome	Estimated change in outcome measure associated with each 1 category increase in Ph-QoL		
	Mean	95% CI	P-value
Bone			
BMD-FN (g/cm2)	0.033	0.012, 0.054	0.002
BMD-LS (g/cm2)	0.029	0.006, 0.053	0.015
BMD-TH (g/cm2)	0.028	0.008, 0.049	0.008
Vitamin D (nmol/mL)	4.090	-0.645, 8.824	0.090
PTH (pmol/mL)	-0.174	-0.604, 0.256	0.426
Renal			
RBPCR (µg/g)	-19.027	-46.214, 8.161	0.170
PCR (mg/mmol)	-1.676	-4.080, 0.728	0.170
eGFR (mL/min/1.73m2)	1.481	-1.807, 4.768	0.375
Cardiovascular			
ASCVD-10y risk	-0.844	-1.653, 0.035	0.041

Discussion

Lower self-reported physical function was associated with worse surrogates for bone and cardiovascular health after controlling for traditional risk factors such as age, smoking, previous fractures and HIV-related parameters.

Although these data are derived from an observational study where the direction of causation cannot be inferred, our results indicate that the MOS-HIV questionnaire may be a useful tool in detecting early signs of comorbidities in PLWH.

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