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The Association of Self-perception of Body Fat Changes and Quality of Life in the Women's Interagency HIV Study

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Abstract

Body fat changes are of concern to HIV-seropositive adults on highly active antiretroviral therapy (HAART). Studies examining the association of body fat changes and quality of life (QOL) in the setting of HIV infection have been conducted predominately in men. We examined the relationship of self-perceived body fat change with QOL among 1,671 HAART-using HIV-seropositive women (mean age 40 ± 8 years; 54% African American, 24% reporting ≤ 95% HAART adherence) from the Women's Interagency HIV Study. Self-perception of any fat loss was associated with lower overall QOL. Report of any peripheral fat loss was strongly associated with nearly all QOL domains (i.e., physical functioning, role functioning, energy/fatigue, social functioning, pain, emotional well-being, health perception, and perceived health index) except cognitive functioning, whereas report of any central fat loss was significantly associated with lower social and cognitive functioning. Report of any central fat gain was associated with lower overall QOL, but only physical functioning, energy/fatigue, and cognitive functioning were significantly affected. A significant association of report of any peripheral fat gain with overall QOL was not observed, however peripheral fat gain was significantly associated with lower physical functioning and pain. We found that any report of fat loss, especially in peripheral body sites is associated with lower QOL, as was any report of central fat gain. Ultimately health providers and patients need to be informed of these associations so as to better support HIV-seropositive women who live with these effects.

Keywords

body image perception; lipoatrophy; lipohypertrophy; Quality of life; HIV-seropositive women; HAART

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Introduction

Several studies that have examined the association of body fat changes with quality of life have demonstrated varied results due to a lack of a universally accepted definition of lipodystrophy (i.e., the loss or gain or both of body fat often associated with metabolic abnormalities, including dyslipidemia and insulin resistance) as well as the use of different methods to measure quality of life (i.e., the overall sense of well-being including happiness and life satisfaction as a whole) (Guaraldi et al., 2008). Most of these studies included predominantly men.

While early studies suggested that lipohypertrophy (or fat gain) may be more common among HIV-seropositive women, studies using objective measures of fat such as MRI (Tien et al., 2006) DEXA (Mulligan et al., 2005) and anthropometry (Tien et al., 2003) show that fat loss and not fat gain is prominent among HIV-seropositive women. Despite these findings, we recently reported that self perception of fat gain (and not fat loss) in HIV-seropositive women was associated with poor HAART adherence (Plankey et al., 2009). Thus, it is not clear whether or not self-perception of fat loss or fat gain has an impact on the quality of life of HIV-seropositive women.

Therefore, we examined the relationship of self-perceived body fat changes in central and peripheral body sites separately on quality of life using longitudinal data from the Women's Interagency HIV Study, a well characterized, ethnically diverse cohort of HIV-seropositive women, representative of HIV-seropositive women nationally in the US.

Methods

Study Sample and Procedures

The Women's Interagency HIV Study (WIHS) is a multicenter prospective cohort study that was established in 1994 to investigate the progression of HIV infection. A total of 3,766 women (2,791 HIV-seropositive and 975 HIV-seronegative) were enrolled in either 1994–1995 (n=2,623) or 2001–2002 (n=1,143) from six United States cities [New York (Bronx and Brooklyn), Chicago, Los Angeles, San Francisco and Washington DC] (Bacon et al., 2005). Every six months, participants complete a comprehensive physical examination, provide blood specimens for CD4 cell count and HIV-RNA determination, and complete an interviewer-administered questionnaire, which provides data on demographics, disease characteristics, and specific HAART use. At each semi-annual study visit, participants are shown photo-medication cards and are asked the names of specific HAART medications used since their prior study visit. The WIHS uses a standard definition of HAART adapted from the Department of Health and Human Services/Kaiser Panel guidelines (US Department of Health and Human Services and Henry J. Kaiser Family Foundation Panel on Clinical Practices for the Treatment of HIV Infection [DHHS], 2008).

There were 1,759 of 2,182 HIV-seropositive women with a study visit between April 1999 and March 2006 who had used HAART at least once and had perception of body fat change and quality of life data at one or more follow-up semiannual visits. The first study visit where the participant reported using HAART and had available perception of body fat change and quality of life data, is referred to as the baseline visit. Visits for which women were currently pregnant or had been pregnant at any of the four preceding visits or reported using hormones including growth hormone were excluded resulting in 88 women having no usable visits. Therefore our final study sample included 1,671 women who contributed 11,132 study visits of follow-up (including the index visit) with a median of 6 visits (IQR: 3, 10).

Outcome Variable

Quality of life data were collected in the WIHS using a shortened version of the Medical Outcome Study (MOS)-HIV instrument developed by Bozzette, et al. (Bozzette, Hays, Berry, Kanouse, & Wu, 1995) annually beginning in October 1998. The shortened version has 21 items representing 9 domains that include: physical functioning, role functioning, energy/fatigue, social functioning, cognitive functioning, pain, emotional well-being, perceived health index and current health perception. The score for each domain is calculated by averaging the raw scores for each corresponding item based on a 0–100 scale with higher scores representing better physical, mental and social functioning. A summary score is calculated using the scores from 6 domains (physical functioning, role functioning, energy/fatigue, social functioning, pain and emotional well-being) based on an established algorithm (Liu et al., 2006). The summary and 9 domain scores are the outcomes analyzed in this study.

Primary Predictor Variable

At each semiannual study visit beginning in April 1999, participants were asked whether they noticed any changes in the shape of their body or in the amount of fat (either loss or gain) in the chest, abdomen, face, upper back, arms, legs and buttocks. A “yes” or “no” response and an “increase”, “decrease” or “no change” response were collected for each anatomic site. The self-perception of any central fat gain or loss variables were defined as any report of fat increase or decrease in the chest, abdomen, or upper back in the last 6 months, respectively, whereas the self-perception of any peripheral fat gain or loss variables were defined as any report of fat increase or decrease in the face, arms, legs or buttocks in the last 6 months.

Covariates

Demographic, clinical, and behavioral variables included or evaluated in multivariate models to adjust for potential confounding were: race/ethnicity (White Non-Hispanic, White Hispanic, African American Non-Hispanic, African American Hispanic, and Other), study site (Bronx, Brooklyn, Washington, DC, Chicago, Los Angeles, San Francisco), education, age, alcohol consumption (abstain, <3 drinks/week, 3–13 drinks/week, >14 drinks/week), and likelihood of clinical depression indicated by a score of 16 or higher using the Center for Epidemiologic Study of Depression (CESD) symptom checklist (Radloff & Rae, 1979), report of drug use since the last visit, history of intravenous drug use (IDU), any switch of HAART regimen since the last visit, CD4+ T-cell count, and log10 HIV RNA. Participants were asked to indicate how often they had taken their antiretroviral medications as prescribed in the prior six months. Participants categorized their level of adherence into one of five categories: 100% of the time, 95–99% of the time, 75–94% of the time, <75% of the time, and have not taken any of the prescribed medications. For these analyses, HAART adherence was dichotomized as < 95% vs ≥ 95% the validity of which has been supported by prior research in the WIHS cohort (Wilson et al., 2002).

HIV RNA data at the visit immediately prior to the current visit was included in the analysis. When HIV RNA data from the prior visit was not available, then the HIV RNA data from 2 visits prior was used if the participant was taking HAART then. HIV RNA was measured using a nucleic acid sequence-based amplification (NASBA) technique (Organon Teknika, Durham, NC, USA) with a lower threshold of detection of 80 copies/ml.

Differences in waist and hip circumferences and weight between two consecutive visits were also calculated. Waist and hip circumferences were measured by a certified examiner at each study visit using methods adapted from the National Health and Nutrition Examination Survey (NHANES III) (Centers for Disease Control and Prevention [CDC], National Center

for Health Statistics [NCHS], 1996). Except for race, the factors were all time-varying, i.e., they were updated at each visit.

Data Analyses

The beta coefficients of self-perceived and measured changes in body fat and the summary and 9 quality of life domain scores were estimated using linear regression models with random effects to account for within-participant correlation in outcomes over time. Because self-perception of fat changes in specific body sites (as opposed to a composite of fat changes in central or peripheral body sites) might be associated with lower quality of life, we also studied the effect of perceived fat gain or fat loss in each anatomic site separately; the composite perception of body fat change in central or peripheral body sites was replaced with a perception of body fat change in a specific body site in each of the multivariable models. All analyses were performed using SAS version 9.2 (SAS Institute Inc., USA).

Results

Table 1 shows the characteristics of the 1,671 HIV-seropositive women included in the analysis. At baseline, the mean age was 40 years with the majority being African-American (54%), non-drinkers (60%) and non-drug users (76%). The median log 10 HIV RNA level was 3.0 (or 1000 copies/ml) with 24% of the women reporting less than 95% HAART adherence. The proportion of women reporting fat gain in central and peripheral sites appeared higher than those reporting fat loss; the proportion reporting peripheral fat loss appeared higher than those reporting central fat loss. The majority of women reported no change in fat both peripherally and centrally. At the baseline visit, the average quality of life summary score was 628 and ranged from 57 for health perception to 80 for cognitive functioning.

Table 2 shows the estimates and 95% confidence intervals for the association of self-perception of body fat change (gain or loss in central or peripheral sites) and measured change in weight, hip and waist circumference with overall quality of life and the individual domain scores. We found that self-perception of any peripheral fat loss was strongly associated with a lower overall quality of life and with lower scores for each of the individual components; only the cognitive functioning did not reach statistical significance. Self-perception of any peripheral fat gain was not significantly associated with a lower overall quality of life score, but the association did not reach statistical significance. Self-perception of any central fat gain was associated with a lower overall quality of life score; but only the individual components of physical functioning, energy/fatigue, and cognitive functioning reached statistical significance. When we examined the association of regional anthropometry with quality of life, we found that a 5 cm change in waist circumference was associated with lower quality of life. A change in weight (per 10 lbs) was significantly associated with an improved quality of life. A change in hip circumference (per 5 cm) was not significantly associated with quality of life.

Discussion

Using longitudinal data from a large sample of predominantly African American women in the U.S., our study is the first to separately examine the association of fat changes (gain or loss) in central sites and peripheral sites and their impact on quality of life. We found that self perception of any fat loss in peripheral sites was strongly associated with lower overall quality of life, with all domains statistically significantly affected except cognitive functioning. While we also found that self-perception of any fat gain or loss in central sites

was associated with lower overall quality of life, only some domains were statistically significantly affected.

Our finding that report of peripheral fat loss was strongly associated with lower overall quality of life in HIV-seropositive women is consistent with our original hypothesis. Other studies show that HIV is associated with subcutaneous fat loss in peripheral and central sites in women and the loss may be preferential in peripheral sites especially the leg (Bacchetti et al., 2005; Study of Fat Redistribution and Metabolic Change in HIV Infection (FRAM), 2006). Specific antiretroviral drugs, particularly the thymidine analogs may further aggravate fat loss. While fat loss may be associated with patients who are treated, loss of lean and fat mass also can occur in the setting of advanced HIV disease and thus also lead to poor quality of life. Our results are consistent with a Brazilian study conducted by Santos, et al. (Santos et al., 2005) among 457 HIV-seropositive subjects. That study demonstrated that self-perception of peripheral fat loss was associated with decreased social relationships with sexual partners, and family and friends independent of gender.

Interestingly, report of fat loss in any central or peripheral sites were both independently associated with lower social functioning scores. Fat loss in HIV is a stigmatizing condition that may account for impairments in social functioning (Shattuck, 2001). Patients may fear that changes in body fat, especially fat loss in the face, may lead to an undesired and premature disclosure of HIV status, while fat accumulation would not have similar outcomes (Guaraldi et al., 2008). Changes in breast, face, and legs were significantly associated with psychosocial impairment (Blanch et al., 2002). This fear of being ‘found out’ may contribute to decreased engagement in social activities; increased despondency, loneliness, and isolation may result in loss of social relationships (Martinez, Garcia-Viejo, Blanch, & Gatell, 2001). Moreover, individuals who perceive themselves as being less attractive may avoid intimacy.

Our findings of an association between central fat gain and lower quality of life scores were not unexpected, given the known health consequences of central obesity. It is noteworthy that only the domains of physical functioning, energy/fatigue, and cognitive functioning were significant. Our findings corroborate the findings of a study conducted by Blanch et al. (Blanch et al., 2004) among 28 HIV-seropositive women diagnosed with clinical lipodystrophy; the study found that HIV-seropositive women, predominantly displaying lipohypertrophy had problems in performing daily activities such as dressing and sexual functioning. Unusual fat gain may impair women’s agility, movement and overall energy level. Thus they may find it harder to engage in social activities with unfortunate psychological implications of increased social isolation and withdrawal from intimate activities.

A limitation of our study is that self-reported questionnaire data limits interpretation; a detailed individualized interview conducted with each study participant to elucidate nuances related to how changes in body fat impact quality of life may enhance our results.

In conclusion, HIV-associated fat loss especially in peripheral sites strongly affects quality of life in women. Providers who care for HIV-seropositive women should be aware of the impact of body fat changes on the well being of these women (e.g. decrease in self esteem, engagement in social activities, physical functioning and/or energy/fatigue). Perception of body fat changes along with any concomitant change in quality of life should and can be easily assessed as part of the routine interviewing process during a clinical care visit. Appropriate referrals for additional health and wellness support should be considered as soon as concerns arise.

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Table 1

Characteristics of the 1,671 HIV-seropositive women from the Women's Interagency HIV Study included in this analysis.

	At the baseline visit (n=1,671)	For all visits (n=11,132)
Summary QOL Score, mean (SD)	628 (170)	630 (174)
Physical functioning	70 (28)	70 (28)
Role functioning	78 (27)	78 (28)
Energy/fatigue	58 (26)	58 (26)
Social functioning	76 (25)	77 (26)
Cognitive functioning	80 (24)	81 (24)
Pain	73 (26)	73 (27)
Emotional well-being	65 (24)	66 (24)
Health perception	57 (24)	58 (24)
Perceived health index	71 (21)	72 (20)
Non-Adherence (< 95%)		
Yes	401 (24%)	2718 (24 %)
Age in years, mean (SD)	40 (8)	43 (8)
Race/Ethinicity		
White, non-Hispanic	243 (14.5%)	1816 (16.3%)
White, Hispanic	174 (10.4%)	889 (8.0%)
African-American, non-Hispanic	896 (53.6%)	5890 (52.9%)
African American, Hispanic	36 (2.2%)	250 (2.2%)
Other	322 (19.3%)	2287 (20.5%)
Study Site		
Bronx	329 (19.7%)	2215 (19.9%)
Brooklyn	274 (16.4%)	2137 (19.2%)
Washington, DC	242 (14.5%)	1500 (13.5%)
Los Angeles	355 (21.2%)	2163 (19.4%)
San Francisco	244 (14.6%)	1507 (13.5%)
Chicago	227 (13.6%)	1610 (14.5%)
Alcohol consumption		
Abstainer	958 (59.5%)	6173 (58.1%)
Light (<3 drinks/week)	426 (26.5%)	3211 (30.2%)
Moderate (3–13 drinks/week)	173 (10.7%)	985 (9.3%)
Heavier (≥ 14 drinks/week)	53 (3.3%)	252 (2.4%)
Drug Use Since Last Visit		
No drugs	1229 (76.0%)	8411 (79.1%)
Marijuana only	202 (12.5%)	1209 (11.4%)
Use of heroin, cocaine, crack, methadone, or methamphetamine	186 (11.5%)	1013 (9.5%)
History of Intravenous Drug Use	335 (25.1%)	2738 (27.7%)
Depressive Symptom Score		

	At the baseline visit (n=1,671)	For all visits (n=11,132)
≤ 16	916 (58.0%)	6440 (61.4%)
> 16	662 (42.0%)	4050 (38.6%)
Self-Perception of Central Fat		
Any gain	465 (27.8%)	3172 (28.5%)
Any loss	224 (13.4%)	1789 (16.1%)
No change	1061 (63.5%)	6685 (60.1%)
Self-Perception of Peripheral Fat		
Any gain	419 (25.1%)	2366 (21.3%)
Any loss	328 (19.6%)	2366 (21.3%)
No change	924 (55.3%)	6400 (57.5%)
Log10 HIV RNA at the previous visit, median (25^{th}, 75^{th} percentiles)	3.00 (1.90, 3.84)	2.71 (1.09, 3.44)
Any HAART Switch		
Yes	75 (16.3%)	1057 (11.9%)

Table 2

Multivariable regression coefficients associated with overall and domain quality of life (QOL) scores (n=1,671 women with 11,132 visits).

	Summary QOL Score		Physical functioning		Role functioning		Energy/fatigue		Social functioning		Cognitive functioning		Pain		Emotional well-being		Health perception		Perceived health index	
Variable	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**	**β**	**95% C.I.**
Any Fat Loss																				
Peripheral Fat Loss	−31.9‡	−47.3, −16.5	−3.50*	−6.43, −0.56	−4.76†	−7.94, −1.57	−4.82‡	−7.64, −2.01	−3.81†	−6.60, −1.02	−2.53	−5.11, 0.06	−4.36†	−7.29, −1.43	−3.00*	−5.49, −0.51	−4.51‡	−6.87, −2.15	−2.34*	−4.52, −0.16
Central Fat Loss	−17.9*	−34.3, −1.48	−1.54	−4.68, 1.59	−2.64	−6.05, 0.76	−1.00	−4.01, 2.01	−4.57†	−7.55, −1.58	−3.07*	−5.83, −0.31	−0.60	−3.73, 2.52	−1.73	−4.39, 0.93	−1.45	−3.98, 1.07	−2.31	−4.63, 0.02
Any Fat Gain																				
Peripheral Fat Gain	−13.6	−29.9, 2.65	−3.34*	−6.46, −0.22	−2.38	−5.76, 1.00	−1.10	−4.10, 1.89	−1.13	−4.10, 1.83	0.04	−2.71, 2.78	−4.98†	−8.09, −1.88	−0.73	−3.37, 1.92	−1.48	−3.99, 1.02	0.58	−1.74, 2.89
Central Fat Gain	−17.0*	−30.7, −3.29	−2.65*	−5.27, −0.03	−2.31	−5.15, 0.54	−3.02*	−5.54, −0.50	−1.88	−4.37, 0.62	−2.64*	−4.95, −0.33	−1.91	−4.52, 0.70	−1.16	−3.39, 1.06	−1.29	−3.39, 0.82	−1.43	−3.37, 0.52
Change in Weight	9.75†	2.44, 17.1	1.25	−0.15, 2.65	1.61*	0.09, 3.14	2.14†	0.79, 3.49	1.45*	0.11, 2.79	−0.50	−1.73, 0.74	1.50*	0.10, 2.90	0.47	−0.72, 1.67	1.69†	0.57, 2.82	0.69	−0.36, 1.73
Change in Hip Circumference	1.58	−5.05, 8.20	−0.02	−1.29, 1.25	−0.28	−1.66, 1.11	−0.68	−1.91, 0.54	0.10	−1.11, 1.31	0.78	−0.34, 1.90	0.71	−0.56, 1.97	0.06	−1.03, 1.14	0.07	−0.95, 1.09	0.33	−0.61, 1.28
Change in Waist Circumference	−6.41*	−12.0, −0.82	−0.33	−1.40, 0.74	−0.79	−1.96, 0.37	−0.92	−1.95, 0.11	−0.59	−1.61, 0.43	−0.49	−1.44, 0.45	−0.72	−1.78, 0.35	−0.76	−1.67, 0.16	−1.07*	−1.93, −0.21	−0.53	−1.32, 0.27

[1]Models adjusted for age (per 10 years), race/ethnicity, study site, alcohol consumption, drug use since last visit, change in weight (per 10 lbs), change in hip circumference (per 5 cm), change in waist circumference (per 5 cm), log10 viral load at previous visit, CESD score since last visit, HAART adherence at the previous visit, and any HAART switch since the last visit.

*p<0.05;

†p<0.01;

‡p<0.001.