



# Self-Reported Lipodystrophy and Self-Perception of Body Image in Adults with HIV

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## Abstract

**Introduction and Objectives** Nutritional assessment in individuals infected with HIV-1 holds significance as it allows for indirect monitoring of physiological and morphological changes, identification of nutritional risks, and effective intervention to maintain or restore nutritional status. This, in turn, contributes to enhancing the quality of life for this population. This study aims to establish a connection between self-image perceptions and body composition, biochemical profiles, and the use of lipid-lowering medications among adults with HIV who are undergoing outpatient follow-up in São Paulo, Brazil.

**Methods** A retrospective cross-sectional study was conducted involving 231 adults, both on and off antiretroviral drugs. The study subjectively assessed two aspects: (1) alterations in the redistribution of body fat (referred to as self-reported lipodystrophy) and (2) self-perceptions of body image. These variables were subsequently correlated with the individuals' self-perceived body image.

**Results** The study included 67% ( $n = 154$ ) men and 33% ( $n = 77$ ) women, with 28.5% ( $n = 66$ ) having been exposed to some form of protease inhibitor. Among the participants, 40% ( $n = 98$ ) perceived alterations in the redistribution of body fat (lipodystrophy). Notable changes included fat loss in the face, arms, thighs, and buttocks ( $p = 0.004$ ,  $0.006$ ,  $0.001$ , and  $0.001$ , respectively), along with increased waistlines ( $p = 0.001$ ), prominent veins ( $p = 0.001$ ), and the presence or increase of lipomas ( $p = 0.046$ ).

**Conclusion** A positive correlation was observed between the use of lipid-lowering medications and self-perceptions of body image. In this study, anthropometric and biochemical parameters proved more effective in assessing changes in the distribution of body fat among people living with HIV/AIDS compared to the subjective self-reported method.

## Keywords

- ▶ HIV
- ▶ body image
- ▶ body composition
- ▶ biochemical profile

## Introduction

In Brazil, between 2010 and 2020, an integrative review revealed the significance of assessing the nutritional status of people living with HIV/AIDS (PLHIV). This importance arises from the fact that the utilization of antiretroviral therapy (ART) has contributed to an increase in the number of overweight patients. Specifically, associations have been observed between the use of ART and the development of chronic noncommunicable diseases among this population, notably obesity and metabolic syndrome. The rise in cases of overweight and/or obesity among PLHIV using ART can be attributed to the impact of certain antiretroviral drugs, such as protease inhibitors (PIs), on altering the lipid profile and contributing to changes in the redistribution of body fat (lipodystrophy). In the medium and long term, these alterations may have adverse effects on both physical and mental health, and treatment adherence.<sup>1,2</sup>

In the current sociocultural context, where physical appearance holds high value, satisfaction and self-perception play pivotal roles in the self-acceptance of individuals. Lipodystrophy can give rise to situations of dissatisfaction (resulting from disparities between the perceived and ideal body) and perceptual discrepancies (involving overestimation or underestimation of the entire body image or its specific parts). A negative body image can detrimentally impact both physical and mental well-being.<sup>1-5</sup>

While some studies have delved into the presence of body image dissatisfaction (BID) in PLHIV, limited information is available regarding its potential impact in relation to the side effects of ART usage and its connection to self-perceived body image.<sup>1,3-7</sup> This study aims to investigate self-reported lipodystrophy, ascertain self-perceptions of body image, analyze biochemical profiles and anthropometric data, and seek associations with body image. Additionally, the study seeks to correlate feelings concerning body self-image with body composition among adults living with HIV who are undergoing outpatient follow-up in São Paulo, SP, Brazil.

## Materials and Methods

The study adopted a retrospective cross-sectional design involving 231 adults living with HIV, aged between 19 and 59 from both the sexes, during the years 2014 to 2016 at the Secondary Immunodeficiencies Outpatient Clinic of the Department of Dermatology, Hospital das Clínicas, Faculty of Medicine of the University of São Paulo (ADEE 3002-HCFMUSP).

All patients, irrespective of their ART usage, were invited to participate in the study. Pregnant women, children, adolescents, individuals aged 60 or older, those previously diagnosed with cardiovascular disease, and those who declined to sign the informed consent form or had limitations for the bioimpedance test at the time of evaluation were excluded. The data collected for this study represented 72.18% of the total sample of 320 individuals infected with HIV-1 and being followed up at the clinic. All volunteers provided their informed consent in-line with the guidelines

of Resolution number 466/2012 of the National Health Council, and the study was approved under protocol number 0221/07. The research adhered to the principles outlined in the Declaration of Helsinki and upheld the ethical standards of Brazil.

The subjective assessment of self-reported lipodystrophy followed the methodology outlined by Soares et al<sup>2</sup> and aimed to identify (1) body fat redistribution (lipodystrophy) and (2) patients' feelings towards their own body self-image. Patients rated themselves on a scale from 0 to 100% based on their level of satisfaction with their body self-image at the time.

Objective measurements included body composition analyzed through tetrapolar bioimpedance, anthropometric measurements via abdominal perimeter (BP) measurements as recommended by the Guidelines on HIV in adults (2018), and waist-to-height ratio calculations following Ashwell and Hsieh.<sup>3</sup> Body fat percentage was determined by the Durnin and Womersley<sup>4</sup> method, utilizing a combination of skinfold measurements and anatomical points and body mass index (BMI) in accordance with World Health Organization guidelines.<sup>5</sup> The technique and classification adhered to Lohman's recommendations (1992).<sup>6</sup> Skinfolts were measured using a branded adipometer (Cescorf Innovare3<sup>®</sup>, Curitiba, PR, Brazil) in triplicate, incorporating measurements such as arm muscle perimeter (AMP), arm perimeter (BP), corrected arm muscle area (AMA), and triceps skinfold thickness (TST). The body adiposity index (BCI) was employed to estimate total body fat percentage, and the conicity index (CI) was calculated.<sup>7-12</sup>

The study also investigated the use of lipid-lowering drugs with the objective of establishing associations with patients' body self-image and laboratory tests conducted in a fasting state at the Hospital das Clínicas, Faculty of Medicine of the University of São Paulo laboratory (HCFMUSP), in alignment with the laboratory's clinical care routine. Parameters analyzed encompassed total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglycerides (TGs), blood glucose, and viral load. The analyses were guided by Brazilian Dyslipidemia Guidelines (2021).<sup>9</sup>

Qualitative variables were characterized using both absolute and relative frequencies, while quantitative variables were represented through median, 25th and 75th percentile values, along with 95% confidence intervals, and minimum and maximum values. A data normality test, specifically the Shapiro-Wilk test, was employed. To establish correlations between self-image perception, body composition, and biochemical profiles, the Spearman test was utilized. The connection between the use of lipid-lowering drugs and self-perceived body image was assessed using the Mann-Whitney test. The statistical analysis was conducted using Stata version 11.0 software, with a significance level set at 5%.

## Results

A total of 231 adult people living with HIV were included, of which 67% ( $n = 154$ ) were male and 33% ( $n = 77$ ) were

female, aged approximately 40 years, and the mean time of HIV diagnosis was 42 months. The mean time for treatment with ART was 60 months, 28% ( $n=64$ ) were without ART, 28.5% ( $n=66$ ) were exposed to some type of PI, most volunteers 38.5% ( $n=89$ ) used scheme with some type of nucleoside analogue transcriptase inhibitor + non-nucleoside analogue transcriptase inhibitor (INTR + INNTR), and 59% ( $n=134$ ) with an undetectable viral load. Self-reported lipodystrophy was prevalent in 40% ( $n=98$ ) of respondents while 84% (194) were aware of the term (► **Table 1**).

The most self-perceived bodily changes that had the greatest statistical influence in relation to body self-image were loss of facial fat ( $p=0.04$ ), loss of fat in the arms and

thighs ( $p=0.006$ ,  $0.001$ , respectively), loss of fat and increased sagging in the buttocks ( $p=0.001$ ), increased waistline thickness, therefore they were wearing larger sized clothes ( $p=0.001$ ), the most visible veins ( $p=0.001$ ), and the presence and/or increase of lipomas ( $p=0.046$ ), as lower scores were given by the patients (► **Table 2**).

By correlating the body composition and biochemical profile with the feeling of self-image of PLHIV, it was noted that the triceps skinfold-TST (50th percentile—reference standard for eutrophy) was the only anthropometric measure that correlated positively with self-perceived body image ( $\rho=0.14$ ,  $p=0.031$ ). The variables—IAC, Percent Gord bioimpedance analysis (BIA), very low-density

**Table 1** Characterization of the 231 people living with HIV/AIDS who participated in the study

Variables	<i>n</i>	Percentage
<b>Sex</b>		
Female	77	33.33
Male	154	66.67
<b>Classification of viral load</b>		
High	11	4.82
Low	134	58.77
Undetectable	37	16.23
Moderate	46	20.18
<b>Do you know what lipodystrophy is?</b>		
No	37	16.02
Yes	194	83.98
<b>Auto image of LD</b>		
No	133	57.58
Yes	98	42.42
<b>Satisfied with current weight</b>		
No	80	34.63
Yes	151	65.37
<b>Current treatment</b>		
No HAART	64	27.71
INTR + INNTR	89	38.53
INTR + PI	56	24.24
INTR + INNTR + PI	10	4.33
INTR	12	5.19
	<b>Median (p25–p75)</b>	<b>Minimum; maximum</b>
<b>Age</b>	40.28 (34.13–46.20)	19.79; 59.81
THIV (months)	42.00 (12.00–128.00)	2.00; 177.00
Current time of TTO (months)	60.00 (24.00–108.00)	1.00; 168.00
Desired weight (kg)	59.00 (55.00–71.00)	47.00; 98.00
Desired BMI (kg/m <sup>2</sup> )	22.30 (20.76–24.13)	17.91; 28.81

Abbreviations: BMI, body mass index; HAART, highly active antiretroviral therapy; INNTR, non-nucleoside analogue reverse transcriptase inhibitor; INTR, analogue reverse transcriptase nucleoside/nucleotide inhibitor; PI, protease inhibitor; PLHIV, people living with HIV/AIDS; p25–p75: percentages 25 and 75; THIV, time of infection diagnosis from HIV; TTO, time of treatment with antiretroviral therapy.

**Table 2** Association between morphological changes in body fat redistribution and feelings in relation to body self-image, of the 231 people living with HIV/AIDS

Variables	Body image	$p^a$
	Median (CI 95%)	
Face		
No	70.0 (70.0, 70.0)	0.004
Yes	50.0 (40.2, 60.0)	
Arms		
No	70.0 (70.0, 70.0)	0.006
Yes	60.0 (50.0, 69.3)	
Nose		
No	70.0 (60.0, 70.0)	0.070
Yes	50.0 (0, 73.7)	
Breasts or chest		
No	70.0 (70.0, 70.0)	0.070
Yes	50.0 (50.0, 70.0)	
Abdomen		
No	70.0 (70.0, 70.0)	0.001
Yes	60.0 (50.0, 60.0)	
Buttocks		
No	70.0 (70.0, 70.0)	<0.001
Yes	50.0 (50.0, 60.0)	
Thighs		
No	70.0 (70.0, 70.0)	<0.001
Yes	50.0 (50.0, 60.0)	
Veins		
No	70.0 (70.0, 70.0)	<0.001
Yes	50.0 (34.9, 60.0)	
Lipomas		
No	70.0 (60.0, 70.0)	0.046
Yes	50.0 (21.1, 77.8)	

Abbreviation: CI 95%, confidence interval of 95%.

<sup>a</sup>Mann-Whitney test.

lipoprotein (VLDL), and TG ( $\rho = 0.14$ ,  $p = 0.036$ ;  $\rho = 0.14$ ,  $p = 0.030$ ;  $\rho = 0.14$ ,  $p = 0.038$ ;  $\rho = 0.13$ ,  $p = 0.045$ , respectively)—correlated inversely with the patients' body self-image. Thus, the relevance of measuring body composition, added to the biochemical profile in comparison with self-perceived body image, was evidenced in this study, as apparently the patients self-reported their body image worse than they actually are in the bioimpedance, anthropometric, and biochemical assessment (► **Table 3**).

More importantly, there was a positive association between the use of lipid-lowering drugs and the feeling of body self-image ( $p = 0.023$ ). Thus, the fact of using this medication was related to self-perception of body appearance and not necessarily to the altered biochemical profile, for this population living with HIV (► **Table 4**).

**Table 3** Correlation between body composition, biochemical profile, and feeling in relation to body self-image, of the 231 people living with HIV/AIDS in the Secondary Immunodeficiencies Outpatient Clinic of the Department of Dermatology, Hospital das Clínicas, Faculty of Medicine of the University of São Paulo

Variables	Body image	
	Rho	$p^a$
Current BMI	-0.06	0.377
Waist	-0.07	0.283
Hip	-0.02	0.734
WHC	-0.04	0.546
WTHR	0.13	0.052
C-index	-0.09	0.137
BA	-0.14	0.036
Abdominal perimeter	-0.04	0.569
AC	0.01	0.914
MCA	0.01	0.914
MCAc	-0.02	0.703
TSF 50th percentile	0.14	0.031
Total of all skinfold tests	-0.05	0.429
Total of central skinfold tests	-0.08	0.239
Total of skinfolds on extremities	-0.01	0.978
Percent fat BIA	-0.14	0.030
Total cholesterol	-0.02	0.733
Non-HDL cholesterol	-0.04	0.527
HDL-c	0.02	0.722
LDL-c	-0.05	0.417
VLDL	-0.14	0.038
TG	-0.13	0.045
Glucose	-0.08	0.212

Abbreviations: AC, arm circumference; BA, body adiposity; BMI, body mass index; C-index, conicity index; HDL-c, high-density lipoprotein cholesterol; LDL-c, low-density lipoprotein cholesterol; MCA, muscular circumference of arm; MCAc, muscular circumference of arm corrected; Percent fat BIA, percentage of fat by bioimpedance analysis; TSF, skinfold of the triceps; WHC, waist-to-hip ratio; WTHR, waist-to-height ratio; TG, triglyceride.

<sup>a</sup>Correlation test from Spearman.

## Discussion

Currently, the survival of PLHIV with good virological control, approaches that of general population. This is mainly due to effective ART regimens and early institution of therapy. At the moment, efforts are focused on the search for efficacy to minimize long-term toxicities and, if possible, the drug load. Thus, identifying HIV infection time in research studies is relevant, as it is the best variable to express the effect of the virus' influence on body composition and metabolic changes over time.<sup>10,13</sup>

**Table 4** Use of lipid-lowering drugs and the feeling in relation to body self-image of the 231 people living with HIV/AIDS

Variable	Body image	<i>p</i> <sup>a</sup>
	Median (CI 95%)	
Lipid-lowering drugs		
No	70.0 (70.0, 80.0)	0.023
Yes	60.0 (50.0, 70.0)	

Abbreviation: CI 95%, confidence interval of 95%.

<sup>a</sup>Mann–Whitney test.

The increase in life expectancy associated with the prolonged use of antiretroviral drugs is not free from side effects, such as arterial hypertension, insulin resistance, lipodystrophy, and coronary artery disease. In their sample, most had been on ART for more than 5 years and noticed a higher percentage of fat in women compared to men. As for body composition, there were no significant changes after the nutritional intervention, even after stratification by gender.<sup>14,15</sup>

Throughout the history of the epidemic, PLHIV have experienced drastic bodily changes, evolving from severe malnutrition to bodily changes related to changes in the redistribution of body fat (lipodystrophy) and, finally, there has been a significant increase in the prevalence of overweight individuals. However, there is little information available on the potential impact of the nutritional trend towards overweight/obesity and the perception of the presence of lipodystrophy and its significant effects on physical appearance, which can directly affect individuals' self-esteem and therapeutic adherence. A psychological experience about appearance, body functioning, and discontent—often related to weight—may be associated with dissatisfaction with body image.<sup>1</sup>

The issue of body image in Brazil has received attention in the last three decades, with changes in socio-political-cultural and epidemiological contexts, as the Brazilian population glorifies the body, which must comply with certain aesthetic standards. For Brazilians, the body plays a fundamental role in people's lives to achieve social ascension and develop successful relationships. In order to reach the body glorified by the media, the subjects spare no effort to submit themselves to bodily "sacrifices" to reach the so-called "ideal" body: miraculous diets, physical exercises, medications, and surgeries.<sup>11</sup>

Lipodystrophy in HIV is closely linked to the individual's fear of losing their body image due to changes in body composition, and these feelings are difficult to be found separately, as one is a consequence of the other, generating dissatisfaction with self-image in the subject.<sup>12</sup>

Depending on the diagnostic criteria adopted, lipodystrophy varies from 31 to 65%, where the most applied are self-perception, medical examination, measurement of skinfolds. A study compared signs of self-reported lipodystrophy (subjective method) with anthropometric measurements (objective method) in 815 HIV patients, where it noted an

increase in fat, mainly in the waist and a decrease in the upper and lower limbs, corroborating our findings.<sup>13</sup>

For a real process of restructuring the body image, the attitudes and feelings that each individual has about their body are considered and many mental disorders arise from the incessant search to be physically equal or similar to the other and one of them, the dysmorphic disorder body, shows the direct relationship of self-collection and the development of distortions in relation to their bodies. Alongside these disorders, there are dysfunctional physical complaints that lead to several other consequences, including making the subject feel uncomfortable or dissatisfied with their body image in different degrees and aesthetic ways.<sup>14</sup>

A Brazilian study showed a progressive reduction in BID in most participants, identified by the current approach to the ideal image at each assessment, proving the effectiveness of the program in controlling lipodystrophy with regard to physical changes and body image satisfaction in the assessed group, thus demonstrating how it contributed to reduce the bodily stigmatization experienced by PLHIV.<sup>15</sup>

The negative combination of morphological changes, with loss of self-esteem, can socially impact the individual with consequences associated with the infection and the stigma of the disease, and may be another unfavorable combination for this population. A survey of HIV patients who underwent hump liposuction increased the degree of satisfaction with body image, self-esteem, and adherence to ART, revealing that lipodystrophy is related to self-image, concern with social stigmatization, adherence to ART, and quality of care/life.<sup>16</sup>

Studies revealed that the uses of simple anthropometric measurements were as efficient as those derived from dual-energy X-ray absorptiometry to diagnose lipodystrophy (loss of fat/lean mass) and lipohypertrophy (accumulation of visceral fat), as well as to characterize the redistribution of body fat (lipodystrophy), by anthropometry and biochemical tests and such measures are important strategies for the prevention and monitoring of both bodily and metabolic disorders in individuals living with HIV.<sup>17</sup>

In this study, it was found that self-perceived body image by PLHIV was inversely correlated and statistically significant with anthropometric and biochemical parameters, where only the triceps skinfold was positively correlated with self-reported body image ( $\rho = 0.14$ ,  $p = 0.03$ ). It was also noted that the aesthetic way in which the patient sees himself is different from how he actually looks, measured by biochemical and anthropometric exams. There was also a positive association between the use of lipid-lowering drugs and self-assessment of body image, revealing that, in this population, the use of such medication is related to self-perception of changes in body appearance and not to their altered biochemical profile.

It was observed that in determining the body composition distribution of PLHIV, the use of objective methods (anthropometry; tetrapolar BIA) in clinical practice and research are important, in addition to being simple and noninvasive methods to classify the individuals according to the redistribution of body fat. The anthropometric models have

advanced in the field of public health, facilitating early diagnosis and better management of lipodystrophy in PLHIV, and a prediction of at least 80% for the diagnosis of this disorder can be achieved with such tools, in this population. Research showed self-perceptions and attitudes towards body appearance and found that, regardless of gender, the higher self-image consequentially led to less depression, greater self-esteem, and better intentions for general health care.<sup>12,17</sup>

In this study, the average duration since HIV infection ranged from 3.5 to 5 years. Although most participants had been exposed to some form of Protease Inhibitors (PIs), the majority were following a specific treatment regimen (INTRbINNTR). Notably, lipodystrophy was observed in 40% of cases, with antiretrovirals used between 1997 and 2015 being more likely to contribute to this condition. This finding was considered a noteworthy aspect of the research.

Furthermore, a significant aspect of this study was the exploration of the relationship between body image perception and self-identified bodily changes among adults living with HIV, particularly in Brazil. This is a relatively understudied perspective in this population and age group, further highlighting the importance of the research.

## Conclusion

Anthropometry and biochemical tests were the best parameters to assess changes in body fat distribution in PLHIV. The results of this study showed that associating the self-perception of body changes with body image in patients infected with the virus is a valid method to demystify the patient's self-reported feeling about their physical appearance, which looks worse than it actually is, in relation to lipodystrophy.

### Authors' Contributions

L.R.S. and J.C. participated in the preparation of the research project and the collection, analysis, and discussion of the data, as well as the writing of the manuscript. L.V.A.S., G.L.V., and F.L.A.F. participated in the preparation of the research project and the analysis and discussion of the data, as well as the writing and editing of the final manuscript. G.L.V. contribution: read and reviewed the final version of the manuscript. T.G. and B.C.A.A. reviewed the final version of the article.

### Ethical Approval

The study was approved by the Ethical Committee of Hospital de Clinicas, protocol number: 0221/07.

### Informed Patient Consent

All patients signed an informed consent form.

### Conflict of Interest

None declared.

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