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Sociodemographic, behavioral, and geriatric characteristics in older adults with and without HIV

A case-control study

Joana Perotta Titon, MSc[a,b], Odirlei João Titon, MD[b], Valdir Spada Júnior, MD[b], Guilherme Welter Wendt, PhD[b], Franciele Aní Caovilla Follador, PhD[a], Ana Paula Vieira, PhD[a], Lirane Elize Defante Ferreto, PhD[a,*]

Abstract

Older adults with human immunodeficiency virus (HIV) have higher risks for early manifestations of age-related disabilities. The objective of this study was to compare HIV-positive and HIV-negative adults aged ≥50 years in relation to sociodemographic, behavioral, and geriatric characteristics. A case-control study was conducted with a >90% estimated statistical power. A total of 52 individuals living with HIV were matched by age, sex, and neighborhood of residence with 104 community controls. Age-related disabilities were assessed throughout a comprehensive geriatric assessment. Review of medical records and interviews were used to obtain behavioral and clinical covariates. No statistical differences on clinically significant age-related disabilities were found. However, multivariate regression analyses, controlling for education and income, revealed that behavioral (use of condom [odds ratio {OR}: 7.03; 95% confidence intervals {CI}: 2.80–7.65] and number of medical visits [OR: 1.25; 95%CI: 1.09–1.43]), along with faster gait speed (OR: 17.68; 95%CI: 2.55–122.85) and lower body and muscle mass indexes were independently associated with HIV (OR: .88; 95%CI: .79–.98 and OR: .72; 95%CI: .54–.97, respectively). In summary, results on age-related disabilities between groups could mean that public policies on HIV might be contributing to patients' positive outcomes regardless of the effects of aging, albeit gait speed, body and muscle mass indexes were independently associated with HIV. Screenings for age-related disabilities in specialized HIV services are recommended.

Abbreviations: ADL = Barthel Index for Activities of Daily Living, ART = antiretroviral treatment, BMI = body mass index, CGA = comprehensive geriatric assessment, CNID = chronic non-infectious diseases, GS = geriatric syndromes, HIV = human immunodeficiency virus, IADL = Lawton Scale for Instrumental Activities of Daily Living, MNA = Mini Nutritional Assessment, PLWHIV = people living with HIV, PNLWHIV = people not living with HIV, TCC = testing and counseling center.

Keywords: aging, developing nations, geriatric assessment, HIV

1. Introduction

Pharmacological and non-pharmacological developments have increased life expectancy in the elderly population and among individuals infected with the human immunodeficiency virus (HIV). However, considering the prevalence of chronic non-infectious diseases (CNID) and age-related disabilities, quality of life is not always present in these extra years lived. One might assume that age-related disabilities are exclusive – and should only be screened – to those over 60/65 years old. Nonetheless, clinical, social, and behavioral factors associated with HIV might accelerate biological aging, leading to conditions that compromise optimal health.[1–3]

Healthcare workers might be neglecting early predictors of negative outcomes in HIV-infected patients or missing essential variables that could augment the chances of infection. For example, alcohol abuse and risky sexual behavior predicted HIV infection among adults aged ≥50 years.[4] Similarly, a case-control study indicated that being male, having a low income, and reporting the previous diagnosis of sexually transmitted diseases were independently associated with HIV infection among those aged 50 years old or more.[5]

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The datasets generated during and/or analyzed during the present study are not publicly available, but are available from the corresponding author on reasonable request.

[a] Western Paraná State University, Department of Health Sciences, Postgraduate Program in Applied Health Sciences, Francisco Beltrão, Paraná, Brazil, [b] Western Paraná State University, Department of Health Sciences, Francisco Beltrão, Paraná, Brazil.

[*] Correspondence: Lirane Elize Defante Ferreto, Department of Life Sciences, 1440 Maringa Street, Francisco Beltrão, Paraná 85.605-010, Brazil (e-mail: lirane.ferreto@unioeste.br).

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It makes sense that people living with HIV (PLWHIV) without antiretroviral treatment (ART) might be predisposed to early occurrence of age-related disabilities, multimorbidity, and geriatric syndromes (GS), conditions that affect individuals' autonomy and independence. It is also sensible to infer that some more pronounced age-related disabilities, including dementia, might increase the odds of someone acquiring a sexually transmitted disease. However, even among PLWHIV in ART, cross-sectional evidence showed a high prevalence of age-related disabilities and GS, with falls and mobility issues affecting nearly one-third of the studied sample.[6] In addition, frailty seems to occur prematurely in PLWHIV[2] while polypharmacy appears higher among older adults living with HIV in comparison to community counterparts.[7]

Research on age-related disabilities in PLWHIV has focused on biological (lower CD4+ values and multimorbidity) and socio-demographic (income and education) factors.[8,9] However, it is essential to distinguish covariates that might be underpinning age-related disabilities in the context of HIV. Reasons for this include, but are not limited to, higher risk of drug interactions for PLWHIV in ART,[10] premature cognitive impairment,[2] malnutrition, emotional disorders,[11] and combinations of multiple diseases. Thus, beyond the standard clinical care, there is the support that older adults living with HIV should receive geriatric supervision.[9]

Notwithstanding that Brazil was a pioneer among developing countries in offering free HIV treatment to its population, the lack of research has led to scarce information in terms of specific needs for young and older HIV patients.[12–14] Although diagnosing age-related disabilities is useful in facilitating healthcare planning and resource management, the latest national HIV protocol does not differentiate strategies for assisting young and older Brazilian patients,[12] which seems to be the case also in developed nations.[4,6,9] To our best understanding, there are currently no studies comparing a variety of age-related disabilities via comprehensive geriatric assessments (CGA) between PLWHIV and matched controls. The absence of such data might compromise specialized care and epidemiological knowledge of risk factors associated with HIV in the context of aging.[6]

In summary, this research sought to assess and compare the frequency of age-related disabilities in older adults living and not living with HIV while also examining the role of clinical and behavioral factors associated with them. Based upon past research, a higher occurrence of age-related disabilities among PLWHIV in comparison to controls were expected.[2,3,7,9,11] Beyond descriptions and comparisons of GS between PLWHIV and people not living with HIV (PNLWHIV), this research attempts to offer information for clinicians and policymakers involved in public health and translational medicine. Moreover, the study aims to contribute to the literature outlined above by assessing a myriad of GS in combination with clinical and behavioral to provide further evidence on the correlates of HIV status in older adults.

2. Materials and methods

2.1. Participants, procedures, and design

This is a case-control study[15] that involved a total of 156 older PLWHIV (n = 52) and PNLWHIV (n = 104). For each PLWHIV, 2 controls were recruited. Positive HIV status, age (≥50), and being a registered patient in continuous treatment at a specialized HIV testing and counseling center (TCC) were the inclusion criteria for PLWHIV. Out of the 60 PLWHIV registered at the TCC, 52 accepted the invitation. Community controls were enlisted from primary health units according to the matching criteria, which were sex, age, and neighborhood of residence. Out of 200 community controls invited, 104 accepted and had negative HIV status confirmed by 2 consecutive blood rapid tests. The study was conducted in 2019 in the city of Francisco Beltrão, PR, Brazil.

2.2. Variables

2.2.1. Outcome. The outcome variable was HIV status (n = 52 PLWHIV and 104 PNLWHIV).

2.2.2. Independent variables. The independent variables were age-related disabilities. Measurements were obtained by the CGA, which comprises: polypharmacy, functionality (measured using the Barthel Index for Activities of Daily Living [ADL] and the Lawton Scale for Instrumental Activities of Daily Living [IADL]); nutritional status (assessed via Mini Nutritional Assessment [MNA] and body mass index [BMI]); occurrence of falls in the past 12 months; affect and cognition (Mini-mental State Examination and the Geriatric Depression Scale); gait speed, frailty syndrome, and physical activity; sarcopenia; medications in use; and adherence to treatment.[16,17] Details on these assessments are provided next.

2.3. Polypharmacy

Polypharmacy was considered if ≥5 medications were in use; drugs were counted by the number of active ingredients. For patients undergoing HIV/AIDS treatment, ART medication was not counted for diagnosing polypharmacy.[7,16]

2.4. Functionality

Functionality was evaluated considering ADL and IADL. For ADL, we used the Barthel Index, a questionnaire with a score ranging from 0 to 100. A score from 91 to 100 denotes complete independence in all activities. Scores between 60 and 90 indicate little dependence; values less than 60 indicate severe dependence; and values less than 20 indicate total dependence.[18] In this research, IADL was computed as follows: independent individuals (>27 points); partially dependency (26–18 points); and total dependency (≤17 points).[18]

2.5. Nutritional status

The evaluation of nutritional status was performed via the MNA.[19] The MNA assesses changes in food intake, weight loss in recent months, mobility, psychological stressors or acute illness in the last trimester, neuropsychological problems, and BMI. If the score is ≤11, there is a risk for malnutrition; then, a second part of the evaluation should be performed: the global evaluation. The global examination explores lifestyle habits, the occurrence of skin lesions or skin ulcers, medications in use, a dietary investigation (number of meals, intake of food and liquids, ability to feed), self-assessment regarding health, and anthropometric measurements. Results from the MNA were interpreted as follows: normal scores range from 24 to 30 points; 17 to 23.5 points indicate nutritional risk; and values <17 points denote malnourished patients.[16,19] BMI analyses were interpreted

according to the elderly classifications (ie, BMI $<22\,kg/m^2$: low weight; between 22 and $27\,kg/m^2$: normal weight; and BMI $>27\,kg/m^2$: overweight).[15]

2.6. Falls

The occurrence of falls in the last year was investigated through questions made by the geriatrician. The first question explored if the participant experienced falls in the last year (yes/no), and the second question asked about their frequency.

2.7. Affect and cognition

The Mini-mental State Examination consists of 11 items assessing temporospatial orientation, attention, calculus, and language. The maximum score is 30 and cutoff points suggesting alteration vary depending on education (<20 points for those illiterate; <25 for those with 1–4 years of education; <26.5 for those between 5 and 8 years of education; <28 for those with 9–11 years of education; and <29 for 11 years of education or more).[20] The Geriatric Depression Scale, Portuguese version, inspected risks for depression.[21] Scores up to 5 are normal, while ≥6 indicate risk for depression.

2.8. Gait speed and frailty syndrome

Gait speed was evaluated by asking participants to walk 4.57 m (demarcated on the ground) with his/her habitual speed. If the participant used orthosis, instructions to keep it during the test were given. The patient could not be helped at the time of the test. The speed was calculated taking the average of 3 attempts and recorded in m/s. In frailty syndrome, evaluation of gait speed varies according to height and gender, and the cutoff point is given in seconds. In males ≤173 cm, and in females ≤159 cm, the cutoff point is ≥7 seconds for altered gait speed. In males with ≥174 cm and females with ≥160 cm, 6 seconds indicate altered gait speed.

Frailty syndrome was assessed considering data from palmar grip strength, gait speed, unintentional weight loss, exhaustion, and low physical activity. Each of these tasks is scored as 0 (not present) to 1 (present). Total scores of frailty syndrome range from 0 to 5. When no point is present, the patient is assumed to not have frailty syndrome; when the score is 1 or 2, the pre-frailty syndrome is suspected; and scores between 3 and 5 suggest frailty syndrome. The reduction of palmar grip strength was evaluated in kilogram using a hydraulic dynamometer (Saehan Corporation, SH5001). Palmar grip was considered altered (1 point) when it fell below the fifth percentile of the mean of 3 measurements on the dominant hand. For males, strength guidelines are BMI ≤24.0: strength ≤29; BMI 24.1 to 28.0: strength ≤30.0; and BMI ≥28.1: strength ≤32.0. For females, the guidelines are BMI ≤23.0: strength ≤17.0; BMI 23.1 to 26.0: strength ≤17.3; BMI 26.1 to 29.0: strength ≤18.0; and BMI ≥29.1: strength ≤21.0. Unintentional weight loss received 1 point when loss of at least 4.5 kg or 5% of body weight occurred in the last year.[16,17] Exhaustion was examined in the interview with 2 specific questions. Responses were scored from 0 (rarely) to 3 (all the time) and answers higher than 2 denoted exhaustion. Finally, the International Physical Activity Questionnaire was used in its short version.[22] The patient was scored as inactive when the physical activity was less than 150 minutes of moderate weekly activities, or when reported less than 3 weekly sessions of 20 minutes of intense activities.

2.9. Sarcopenia

Guidelines from the European Working Group on Sarcopenia in Older People were adopted. Participants were classified as follows: reduction only in muscle mass is marked as pre-sarcopenia and reduction of muscle mass associated with loss of muscle strength, or when associated with altered physical performance, is marked as sarcopenia. Finally, loss of muscle mass associated with decreased strength and poor physical performance is considered severe sarcopenia.[23]

2.10. Medications and adherence to treatment

Medications in use and adhesion were asked by the geriatrician (3 questions). Possible answers were "yes/no." If at least 1 answer was "yes," then we considered that patients did not have sufficient adherence to treatment.

2.10.1. Covariates. Sex, age, skin color, education, marital status, occupation, income, smoking and alcohol consumption, history of blood transfusion, active/not active sexual life, use of the condom, and the number of medical consultations at both the TCC and in other health units were the covariates assessed by individual interview. Moreover, medications in use and the quantity of diagnosed CNID were obtained from medical records by trained research assistants. These covariates were previously found to play a significant clinical and behavioral role with HIV in those aged ≥50.[5,8,9,24]

2.11. Data collection

Data collection took place from April to November 2019 and commenced after the approval from the Western Paraná State University Research Ethics Committee (Approval number 07934919.4.0000.0107). Following the signature of informed consent, a geriatrician performed the interviews and the CGA. PLWHIV participated at the specialized TCC; controls took part in primary health units. In general, each assessment was completed in less than 50 minutes and there were no obvious signs of fatigue or tiredness that could have interfered in the CGA, even among senior participants. The ratio of participants who accepted to take part in the research was higher for PLWHIV probably because they were recruited immediately after their follow-up appointment with the infectious diseases doctor, while PNLWHIV were invited to take part in the research based on the matching criteria. Consequently, PNLWHIV were invited to visit the primary health unit solely with the purpose of contributing to this research.

2.12. Analyses

Frequencies, means, and standard deviations were used to describe the sample. Since all variables were not normally distributed (Kolmogorov–Smirnov test statistically significant), differences in categorical variables were investigated using the Chi-square test with Yates continuity correction. Comparisons between continuous variables were carried out using the Mann–Whitney test. Binary logistic regression with bootstrapping procedure (10,000 resamples) was performed to calculate odds ratios (OR) and 95% bias-corrected and accelerated confidence intervals. Bootstrapping was adopted to reduce bias regarding inflated OR in regression analyses with moderate sample sizes.[25] Aside from the matching criteria described earlier, crude and

adjusted models were tested to verify confounders in the variables associated with HIV. Precisely, multivariate models accounted for income and education, since low income has been linked with higher vulnerability for HIV infection, an early manifestation of age-related disabilities, and less education.[8,24] These analyses were performed in Statistical Package for the Social Sciences 25 with significance set at $P \leq .05$. Considering that all eligible PLWHIV throughout the study period were included, statistical power was computed on a post hoc basis using G*Power v. 3.1.9. By entering data from our multiple regression analyses (ie, OR = .88), the achieved power was over 90% (two-tailed; $\alpha = .05$). No missing data were present in the database.

3. Results

3.1. Descriptive results

Participants' average age was 60 ± 7.8 years (PLWHIV: 60.5 ± 7.9; community controls: 60.8 ± 7.8, $p = .818$). Among PLWHIV, the mean age of HIV diagnosis was 51.2 ± 10.6 years. The majority (44.2%) of them were diagnosed before the age of 50, 38.5% between 50 and 60 years, and 17.3% after 60 years. The time since HIV diagnosis was 9.2 ± 7.7 years, and the meantime when viral load was undetectable was 5.6 ± 5.3 years. When the research was conducted, all PLWHIV were using ART, following the Brazilian treatment protocol. Adhesion to ART was reported by 86.5% of PLWHIV, while 84.6% had a VL of less than 40 copies/mL. CD4+ T lymphocyte counts of 0 to 199, 200 to 349, and ≥350 were observed in 11.5%, 15.4%, and 73.1% of PLWHIV, respectively. There were few significant differences between descriptive variables (Table 1).

3.2. Frequency of age-related disabilities and geriatric syndromes

Figure 1 displays the percentages of PLWHIV and community controls who had age-related disabilities and the co-occurrence of 2 or more GS. The most common alteration among those with HIV was related to physical inactivity, while community-controls reported a higher occurrence of obesity and overweight. Differences between these frequencies were only significant for obesity and overweight, with PLWHIV having a lower proportion in

Table 1

Sociodemographic characteristics of the sample (n = 156).

	Cases (n = 52)		Controls (n = 104)		
Variable	**N**	**%**	**N**	**%**	***P* value**
Sex					
Male	20	38.5	40	38.5	1.00
Female	32	61.5	64	61.5	
Age					
Up to 60 yrs	33	63.5	60	57.7	.60
More than 60 yrs	19	36.5	44	42.3	
Skin color					
White	27	51.9	78	75.0	.01*
Brown	20	38.5	23	22.1	
Black	5	9.6	3	2.9	
Education					
Up to 7 yrs	29	55.8	62	59.6	.77
More than 7 yrs	23	44.2	42	40.4	
Marital status					
Single	13	25.0	16	15.4	.005*
Married	15	28.8	57	54.8	
Divorced	16	30.8	13	12.5	
Widowed	8	15.4	18	17.3	
Income					
Up to R$ 99,800	26	50.0	47	45.2	.69
More than R$ 99,800	26	50.0	57	54.8	
Smoking					
No	30	57.7	61	58.7	1.00
Current or previous	20	42.3	43	41.3	
Alcohol consumption					
No	39	75.0	68	65.4	.30
Current or previous	13	25.0	36	34.6	
Blood transfusion					
No	41	78.8	89	85.6	.40
Yes	11	21.2	15	14.4	
Sexual life					
Not active	19	36.5	30	29.1	.45
Active	33	63.5	73	70.9	
Use of condom					
No	20	38.5	81	79.4	<.001*
Yes	32	61.5	21	20.6	

* Denotes statistical significance.

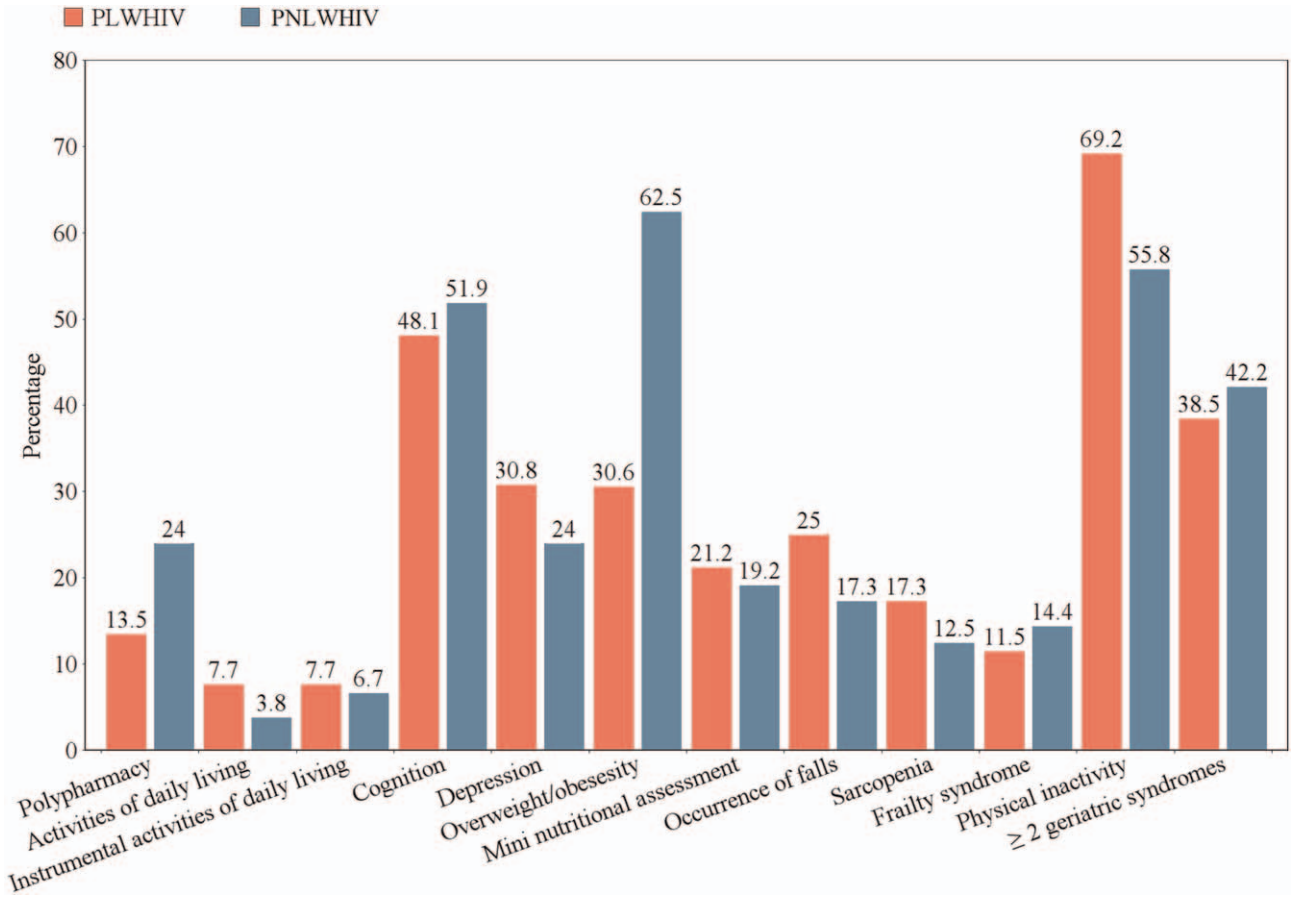

Figure 1. Percentages of age-related disabilities in PLWHIV and community controls.

comparison to community controls (30.6% vs 62.5%, $P < .001$). When the Brazilian criteria for the geriatric syndrome were adopted (co-occurrence of 2 or age-related disabilities), we found no statistically significant differences between PLWHIV and community controls (38.5% and 42.3%, respectively); importantly, these comparisons did not change when controlling the analyses for education and income.

Beyond the examination of categorical differences between groups (Figure 1), Table 2 explores differences in continuous indicators of clinical and behavioral data. Among PLWHIV,

Table 2

Comparison of measures of age-related disabilities in PLWHIV and community controls from Francisco Beltrão, Paraná, Brazil (n = 156).

Variable	Cases (n = 52)	Controls (n = 104)	*P* value
Number of medications	2.0 ± 2.2	2.9 ± 2.5	.019*
Number of chronic non-infectious diseases	1.9 ± 1.7	2.1 ± 1.5	.25
Number of medical consultations	5.3 ± 3.0	3.5 ± 3.3	<.001*
Activities of daily living	96.3 ± 15.6	99.8 ± 1.3	.28
Instrumental activities of daily living	26.0 ± 4.0	26.8 ± 1.0	.77
Mini-mental state examination	25.0 ± 3.6	24.9 ± 3.6	.91
Geriatric depression scale	4.1 ± 4.0	3.9 ± 3.6	.98
Waist circumference	91.5 ± 12.3	100.5 ± 11.5	<.001*
Arm circumference	30.2 ± 4.5	33.0 ± 3.8	<.001*
Calf circumference	35.2 ± 4.1	38.2 ± 4.3	<.001*
Body mass index	25.5 ± 4.3	29.0 ± 5.5	<.001*
Mini nutritional assessment	25.24 ± 4.3	25.83 ± 3.2	.66
Number of falls	0.29 ± 0.57	0.28 ± 0.70	.41
Gait speed	0.95 ± 0.27	0.87 ± 0.23	.017*
Palmar grip strength	29.5 ± 11.5	29.1 ± 10.2	.95
Muscle mass index	7.80 ± 1.76	9.20 ± 1.77	<.001*
Frailty syndrome	1.04 ± 1.30	1.17 ± 1.14	.26

* Denotes statistical significance.

Table 3

Multivariate models for the correlates of HIV among older adults from Francisco Beltrão, Paraná, Brazil (n = 156).

Variables	Model 1* OR (95% CI)	Model 2† OR (95% CI)	Model 3‡ OR (95% CI)
Skin color			
White	1	1	1
Brown	4.81 (1.08–21.51)	5.53 (1.21–25.31)	—
Black	1.92 (.41–9.05)	2.04 (.43–9.79)	—
Marital status			
Single	1	1	1
Married	.55 (.18–1.66)	.54 (.18–1.65)	—
Divorced	1.69 (.62–4.63)	1.63 (.59–4.55)	—
Widowed	.36 (.12–1.09)	.35 (.12–1.09)	—
Use of condom			
No	1	1	1
Yes	6.17 (2.96–12.89)	6.54 (3.06–13.99)	7.03 (2.80–17.65)
Number of medications	.84 (.73–.99)	.84 (.72–.98)	—
Number of medical consultations	1.18 (1.06–1.31)	1.18 (1.06–.1.32)	1.25 (1.09–1.43)
Waist circumference	.94 (.91–.97)	.94 (.91–.97)	—
Arm circumference	.84 (.77–.92)	.84 (.77–.92)	—
Calf circumference	.83 (.76–.92)	.83 (.76–.91)	—
Body mass index	.86 (.79–.93)	86 (.79–.93)	.88 (.79–.98)
Gait speed	3.99 (.93–17.00)	4.73 (1.04–21.52)	17.68 (2.55–122.58)
Muscle mass index	.62 (.50 to.78)	.61 (.49–.77)	.72 (.54–.97)

Values are expressed as odds ratio (OR) and 95% confidence intervals (95% CI).

* Model 1: unadjusted.

† Model 2: adjusted for education and income.

‡ Model 3: adjusted for independent variables with $P \leq .05$ within the model.

there was less use of medications. They also had a higher number of medical visits, smaller circumferences in body measurements (calf, arm, and waist), lower BMI, lower muscle mass index, and higher gait speed. Table 3 presents multilevel correlates of HIV in the studied sample. Models were built based on both statistical (variables with $P \leq .20$ from Tables 1 and 2) and theoretical reasoning (ie, controlling for education and income).[22,23] It was observed that associations identified in crude analyses (model 1) were maintained after controlling for education and income (model 2). In the final model, the use of condoms, number of medical consultations, low/normal weight, higher gait speed, and lower muscle mass index were independently associated with HIV. A P value $\leq .05$ was set for statistical significance, and analyses were carried out using the Statistical Package for the Social Sciences (v. 23).

4. Discussion

The goals of this study were to investigate the frequency of age-related disabilities in older PLWHIV and PNLWHIV and to examine the role of clinical and behavioral factors associated with HIV. The case of geriatric syndromes playing a role when investigating HIV outcomes is certainly puzzling for most of our society. However, according to some experts, there is a clear necessity in drawing attention to factors that are usually not explored among adults living with HIV.[5,6,9,26] Our main hypothesis that age-related disabilities would be higher among PLWHIV was not fully supported by the data, thus contradicting previous reports.[7,9,10] Comparisons with past studies on geriatric syndromes and HIV are rather limited since we could not locate investigations adopting the co-occurrence of 1 or more age-related disabilities to diagnose GS.[16]

Initially, 80.8% of PLWHIV and 74.0% of community controls had at least 1 domain affected as measured by the CGA. However, clinically significant results would imply deficits in ≥2 domains. Thus, 41% had at least 2 GS,[16] with no group differences. The most frequent age-related disabilities found were cognitive impairment (48.1% in PLWHIV vs 51.9%), depression (30.8% in PLWHIV vs 24.0%), and obesity (30.6% in PLWHIV vs 62.5%). Mild dementia and depression can be easily confused in elderly patients, thus denoting the importance of critical judgment by the clinician. In the current study, depression and cognitive impairment were the most frequent GS for the PLWHIV group, albeit no statistically significant differences with community controls were found. Ávila-Funes et al (2016) reported an incidence of depression of 15.9% in PLWHIV,[27] whereas our data estimated 30.8%. Furthermore, evidence for cognitive impairment was present in 48.1% of PLWHIV and in 51.9% of community controls, which is well above the 21.3% found by Melo et al.[28] Remarkably, factors commonly associated with cognitive impairment – such as low education, tobacco use, obesity, and low levels of physical activity – were present in our study in the same proportions between groups, which could have influenced the high frequency of cognitive impairment[29] when compared to past reports. As for BMI, we found statistically significant differences in proportions of overweight and obesity (62.5% in controls vs 30.6%). Cumulative evidence suggests a tendency of increased BMI in PLWHIV, which seems abrupt in the first year of ART[30] and more apparent in patients using protease inhibitors.[31] Nonetheless, the proportion of obesity in PLWHIV was comparable to what has been reported previously (ie, about one-third of PLWHIV).[30,31]

Inferential statistics had divergent findings in comparison with past investigations. For example, contrary to our results, Schrack et al found a faster decline in gait speed in PLWHIV aged ≥50 years when compared to those PNLWHIV ($P < .001$).[32] Albeit direct comparisons are not possible due to distinct study designs, we found that PLWHIV had a faster gait speed in comparison to

community controls ($P = .017$). These differences could be better explained when data on malnutrition and obesity are considered. It is known that both extremes (ie, very low and very high weight) are associated with slower gait speed.[33]

Frailty syndrome was present in 11.5% of PLWHIV and in 14.4% of community controls. These results deserve proper attention since the literature indicates that frailty is related to higher mortality and higher incidence of comorbidities, regardless of the presence of HIV.[26] In previous studies, the prevalence ranged from 7.5% to 19.4%, being higher as the individuals get older.[6,26,34] In this respect, ART might have protective effects by reducing the prevalence of frailty.[12,35] For instance, data from an 11-year follow-up cohort investigation revealed that HIV treatment was associated with a reduction in frailty syndrome in people aged ≥50 years but increased in people aged 75.[35]

Evidence linking polypharmacy to HIV – especially in the elderly population[6,9] – was not supported by the data. Results indicated that 13.5% of PLWHIV met the criteria for polypharmacy, which is smaller when compared to what Levett and Wright reported (~30%) in a study with older adults living with HIV in the United Kingdom.[6] The importance of this specific GS is paramount. As the number of medications increases, greater are the risks of drug interactions, adverse events, clinical complications, and risk of falls. Indeed, the addition of 1 medication might increase the risk of falls by 1.4 times.[36] Likewise, the frequency of falls varies widely between studies from 11% to 37.2%,[9,36,37] and risks are higher for women, Caucasians, and smokers.[36] In our study, 25% of PLWHIV reported falls, albeit no statistically significant differences were found between groups.

The onset of CNID appears to be premature in PLWHIV[35,38,39] and we expected to find more CNID among PLWHIV. For instance, data from a Nigerian sample of PLWHIV and PNLWHIV found that those living with HIV had more CNID (2.0 vs 1.3, $p = .004$), differently from what we found (1.9 vs 2.1, $p = .249$).[38] However, the number of medical consultations was significantly higher among PLWHIV who participated in our investigation, which might indicate greater access to health services and explain the results regarding CNID.

Most PLWHIV in this study (82.7%) acquired the virus before the age of 60, comparable to a previous report (82.4%).[40] This fact alone poses increased risks for mortality and morbidity. When compared to national determinants of survival of PLWHIV on ART from 2006 to 2015, older age has been linked to increased mortality.[14] Perhaps, preventive measures on sexual health might include early assessment of GS in PLWHIV and raise public awareness that HIV is not age-limited.[29] Astonishingly, 38.5% of PLWHIV reported not using condoms, which is higher than the 26.7% prevalence found earlier.[41] This certainly deserves attention from professionals and policymakers as unprotected sex increases the risk of contamination by other sexually transmitted infections and HIV superinfection.[42] Also, 79.4% of controls reported not using condoms, which increases the susceptibility to contamination by HIV and other sexually transmitted infections.

Even though PLWHIV aged in the presence of HIV and were possibly affected by ART toxicity,[35] their frequency of age-related disabilities and GS were not directly affected. PLWHIV performed slightly better in the overall occurrence of clinically significant GS when compared to past reports (ie, 39.6%–53.6%).[6,9] Nevertheless, most studies on age-related disabilities and GS in populations not living with HIV have been carried out either with people aged 65 years old or more, or examined specific indicators alone (ie, only frailty, only polypharmacy, cognitive impairment, etc).[12] Moreover, national guidelines on geriatric assessment in Brazil require alteration in at least 2 domains to diagnose an individual with GS.[16] These factors could explain distinct frequencies of GS than we encountered.[11]

With demographic transitions occurring in many parts of the world, combined with improved treatment and early diagnosis, health services must be better prepared to deal with HIV patients. Nonetheless, there are some limitations of this research. First, our sample impedes the generalization of the results to other regions. Moreover, giving the nature of the study design and the methods used to perform the CGA, some results could have been influenced by participant's recall bias. Although attempts to minimize selection bias were made by matching the sample by age, sex, and neighborhood of residence, other pairing criteria could be considered in future studies, such as educational level and socioeconomic status. Likewise, research involving more health centers, with larger samples are very necessary.

Author contributions

Conceptualization: Joana Perotta Titon, Odirlei Titon, Ana Paula Vieira, Lirane Elize Defante Ferreto.
Data curation: Joana Perotta Titon.
Formal analysis: Guilherme Wendt, Lirane Elize Defante Ferreto.
Investigation: Joana Perotta Titon, Odirlei Titon, Franciele Aní Caovilla Follador, Ana Paula Vieira, Lirane Elize Defante Ferreto.
Methodology: Joana Perotta Titon, Odirlei Titon, Valdir Spada Júnior, Ana Paula Vieira, Guilherme Wendt, Lirane Elize Defante Ferreto.
Project administration: Valdir Spada Júnior, Ana Paula Vieira, Lirane Elize Defante Ferreto.
Supervision: Odirlei Titon, Valdir Spada Júnior, Franciele Aní Caovilla Follador, Guilherme Wendt, Lirane Elize Defante Ferreto.
Writing – original draft: Joana Perotta Titon, Valdir Spada Júnior, Ana Paula Vieira, Guilherme Wendt.
Writing – review & editing: Odirlei Titon, Franciele Aní Caovilla Follador, Guilherme Wendt, Lirane Elize Defante Ferreto.

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