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Brief communication

Human immunodeficiency virus infection and its association with sarcopenia

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ABSTRACT

Presarcopenia and sarcopenia were evaluated in HIV-infected individuals and in healthy elderly controls according to the consensus definitions of the European Working Group on Sarcopenia in Older People. Bioelectrical impedance, a hydraulic hand dynamometer, and gait speed were used to evaluate muscle mass, muscle strength, and physical performance, respectively. Adjusted and unadjusted binary logistic regression predicted the risk of sarcopenia. Predictor contribution was assessed by the Wald test. Significance was established at $p \leq 0.05$. The HIV-infected group consisted of 33 patients on treatment (42.4% women; mean age 59 ± 7 years; mean BMI $25 \pm 6\,kg/m^2$; viral load undetectable in 30 cases). The HIV-uninfected group consisted of 60 individuals (71.7% women; mean age 70 ± 7 years; mean BMI $28 \pm 6\,kg/m^2$). Of the controls, 4 (6.7%) individuals had presarcopenia and 4 (6.7%) sarcopenia compared to 4 (12.1%) and 8 (24.2%), respectively, in the HIV-infected group. The HIV-infected patients had a 4.95 higher risk (95% CI: 1.34–18.23) for sarcopenia compared to the controls. It should be pointed out that the control group was on average 10 years older. This risk increased further (RR = 5.20; 95% CI: 1.40–19.20) after adjusting for age and BMI. HIV-infected patients were shown to be at a greater risk of sarcopenia, an indicator of frailty, even following adjustment for age and BMI.

The term sarcopenia (*sarx* meaning flesh and *penia* poverty) was first proposed by Irwin Rosenberg in 1989 to describe the decline in muscle mass associated with age.[1,2] Currently, the European Working Group on Sarcopenia in Older People (EWGSOP) has broadened this concept by including muscle strength and physical performance as additional diagnostic criteria, and proposing the stages presarcopenia, sarcopenia, and severe sarcopenia.[3]

Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is currently considered a chronic disease due to the advances made in antiretroviral therapy (ART) in recent years. As the prevalence of opportunistic

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infections decreased, there was an increase in the prevalence of chronic pathologies such as cardiovascular, liver, and kidney diseases, cognitive disorders, and osteoporosis.[4] This fact has generated speculations in relation to a probable "accelerated aging syndrome" in HIV-infected patients.[5] Several investigators have demonstrated bone mass loss and a greater fracture risk in HIV-infected patients.[6] Whenever premature age-related comorbidities are detected in HIV-infected patients, it is crucial to evaluate the presence of sarcopenia, an important condition responsible for an increased risk of falls and fractures that may ultimately lead to immobility and dependency.[7] Indeed, sarcopenia may increase morbidity and mortality.[8]

The objective of this cross-sectional, analytical study was to compare the prevalence of sarcopenia, presarcopenia, and severe sarcopenia in HIV-infected patients compared to healthy HIV-uninfected elderly individuals.

The study was conducted at the sexually transmitted infections/AIDS outpatient clinic and at the geriatric outpatient clinic of the *Santa Casa de Misericórdia*, a university teaching hospital in Vitória city, Brazil between December 2013 and July 2014. The sample consisted of HIV-infected individuals of 50 years of age or more under antiretroviral therapy (ART) and HIV-uninfected individuals of 60 years of age or more. Individuals with neurological diseases, chronic pulmonary disease, partial paralysis, or any other morbidity that could affect their physical performance were excluded from the study. The study protocol was approved by the internal review board of the *Escola Superior de Ciências da Saúde da Santa Casa de Misericórdia de Vitória* (EMESCAM) under reference CAAE: 09180512.9.0000.5065. All participants signed an informed consent form.

A bioelectrical impedance scale (InBody 520 device; Biospace Inc., Beverly Hills, CA, USA) was used to evaluate muscle mass. The reproducibility of this method is good and it represents an acceptable alternative to the gold standard tests, magnetic resonance imaging and dual-energy X-ray absorptiometry (DXA).[9] Using the Janssen equation, the normalized skeletal muscle index (SMI) (absolute muscle mass in kilograms/squared height in meters) was calculated. SMI was defined as low when values were ≤10.75 for men and ≤6.75 for women.[3,10]

Muscle strength was evaluated using a Jamar hydraulic hand dynamometer (Sammons Preston, Bolingbrook, IL, USA). The arithmetic mean of three measurements taken with the dominant hand was calculated and then adjusted for body mass index (BMI).[3] Muscle strength was considered reduced under the following conditions for men: BMI ≤ 24 and strength ≤ 29 kg; BMI from 24.1 to 28 and strength ≤ 30 kg; BMI > 28 and strength ≤ 32 kg. The parameters for women were: BMI ≤ 23 and strength ≤ 17 kg; BMI from 23.1 to 26 and strength ≤ 17.3; BMI from 26.1 to 29 and strength ≤ 18 kg, and BMI > 29 and strength ≤ 21 kg.[11] These parameters were previously defined and validated by the European working group on sarcopenia in older people.[12]

Physical performance was evaluated according to the gait speed test in which the patient is asked to walk a distance of 4 m in a maximum time of 5 s, with performance being considered impaired when speed is less than 0.8 m/s[3].

In accordance with the EWGSOP definitions, low SMI as an isolated finding characterized *presarcopenia*. The association of low SMI with either low muscle strength or poor physical performance was considered *sarcopenia*, while a reduction in all three criteria was classified as *severe sarcopenia*.[3]

The continuous variables were described as means and standard deviations, while the dichotomous variables were described as percentages. Student's *t*-test for independent samples and chi-square test or Fisher's exact test were used for group comparison. Binary logistic regression, either unadjusted or adjusted for age and BMI, was used to predict the likelihood of association with sarcopenia. The statistical significance of the contribution of the predictors in the regression model was determined using the Wald test. p-values < 0.05 were considered statistically significant. The SPSS statistical software program, version 22.0 was used throughout the analysis.

The study was conducted over a 6-month period and included 93 individuals. Of these, 33 were HIV-infected patients on ART. In 30 (90.9%) of those patients, viral load was undetectable. In relation to gender, 42.42% were women and 57.58% men. Mean age was 59 ± 7 years (range 50–78 years) and mean BMI was 25 ± 6 kg/m^2 (range 17.7–52.4 kg/m^2). Of the 60 HIV-uninfected controls, 71.7% were women and 28.3% men. Mean age was 70 ± 7 years (range 60–87 years) and mean BMI was 28 ± 6 kg/m^2 (range 15.3–41.6 kg/m^2).

Based on the EWGSOP diagnostic criteria for sarcopenia, 52 individuals in the HIV-uninfected control group (86.7%) were normal, 4 (6.7%) had presarcopenia and 4 (6.7%) had sarcopenia. In the HIV-infected group, 21 (63.6%) were normal, while 4 (12.1%) had presarcopenia, and 8 (24.2%) had sarcopenia (Table 1). Presarcopenia was 3.71 (95% CI: 1.32–10.38) times more common in the HIV-infected group in relation to the control group. After adjusting for age and BMI, this risk ratio increased to 3.90 (95% CI: 1.38–10.95). The risk of sarcopenia was 4.95 (95% CI: 1.34–18.23) times higher for HIV-infected individuals compared to the HIV-uninfected controls. Following adjustment for age and BMI, this risk ratio increased to 5.20 (95% CI: 1.40–19.20), as shown in Table 2.

The study group was younger and mostly male reflecting the composition of the HIV outpatient clinic whereas the control group was older and mostly female reflecting the composition of the outpatient geriatric clinic, as those

Table 1 – Frequency of presarcopenia and sarcopenia in the study sample.

	Normal	Presarcopenia	Sarcopenia	Total
HIV-uninfected*n* (%)	52 (86.7%)	4 (6.7%)	4 (6.7%)	60 (100%)
HIV-infected *n* (%)	21 (63.6%)	4 (12.1%)	8 (24.2%)	33 (100%)
Total *n* (%)	73 (78.5%)	8 (8.6%)	12 (12.9%)	93 (100%)