

## Prevalence and factors associated with physical activity practice in people living with HIV/AIDS

*Prevalência e fatores associados à prática de atividade física em pessoas vivendo com HIV/AIDS*

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### ABSTRACT

**Background and Objectives:** physical activity practice (PAP) by people living with HIV (PLHIV) has been recommended in medical literature. This measure is shown to be effective in managing PLHIV. However, it is estimated that only 50.7% of PLHIV comply with recommended physical exercise guidelines. This study aimed to analyze the prevalence and factors associated with PAP in PLHIV using antiretroviral therapy. **Methods:** a cross-sectional observational study composed of 276 PLHIV on antiretroviral therapy (ART), treated at the Specialized Outpatient Service of a municipality in the countryside of the Northeast in 2018. The variables analyzed included biochemical, anthropometric and blood pressure data as well as the Framingham Risk Score (FRS). They were divided into two groups: physical activity practitioners (PAP); and physical activity non-practitioners (PANp). Data were correlated using Pearson's chi-square test, with statistical significance if  $p < 0.05$ , and through inferential statistics. **Results:** of the study participants, most were men, and of the total contingent, 67% ( $n=185$ ) were PANp and of these, 8.6% had cardiovascular event moderate and high risks (CVER) according to FRS. The PAP group had a lower median for the age variable [37 (41-48) years,  $p=0.004$ ] and a higher median for the weight variable [68 (60-77.5) kg,  $p=0.015$ ]. Among the PAP, there was a high prevalence of low risk. **Conclusion:** lack of PAP is highly prevalent among PLHIV and these are more associated with moderate and high CVER, in addition to the metabolic and bodily consequences of the viral condition and antiretroviral therapy.

**Keywords:** HIV. Exercise. Risk Factors. Cardiovascular Diseases.

### RESUMO

**Justificativa e Objetivos:** a prática de atividade física (PAF) por pessoas vivendo com HIV (PVHIV) tem sido recomendada na literatura médica. Tal medida mostra-se eficaz no manejo de PVHIV. Entretanto, estima-se que apenas 50,7% das PVHIV estão em conformidade com as diretrizes de exercício físico recomendadas. O objetivo

deste estudo foi analisar a prevalência e os fatores associados à PAF em PVHIV em uso de terapia antirretroviral. **Métodos:** estudo transversal, formado por 276 PVHIV em terapia antirretroviral (TARV), atendidos no Serviço Ambulatorial Especializado (SAE) de um município do interior do Nordeste em 2018. As variáveis analisadas incluíram dados bioquímicos, antropométricos e pressóricos e também o Escore de Risco de Framingham (ERF). Dividiram-se em dois grupos: praticantes de atividade física (pAF); e não praticantes de atividade física (NpAF). Os dados foram correlacionados por meio de Teste Qui-Quadrado de Pearson, com significância estatística se  $p < 0,05$ , e através da estatística inferencial. **Resultados:** dos participantes do estudo, a maioria era homem (55,4%). Do contingente total, 67% ( $n=185$ ) eram NpAF e, desses, 8,6% possuíam risco moderado e alto de eventos cardiovasculares (RECV) segundo ERF. O grupo pAF apresentou menor mediana na variável idade [37 (41-48) anos,  $p=0,004$ ] e maior na variável peso [68 (60-77,5) kg,  $p=0,015$ ]. Entre os pAF, houve uma alta prevalência de risco baixo. **Conclusão:** a falta de PAF é altamente prevalente entre PVHIV, e esses estão mais associados ao moderado e alto RECV, além das consequências metabólicas e corporais da condição viral e da terapia antirretroviral.

**Descritores:** HIV. Exercício Físico. Fatores de Risco. Doenças Cardiovasculares.

## RESUMEN

**Justificación y Objetivos:** la práctica de actividades físicas (PAF) por parte de las personas que viven con el VIH (PVVIH) ha sido recomendada en la literatura médica. Esta medida ha demostrado ser efectiva en el manejo de las PVVIH. Sin embargo, se estima que solo el 50,7% de las PVVIH cumplen con las pautas recomendadas de ejercicio físico. El objetivo de este estudio fue analizar la prevalencia y los factores asociados a PAF en PVVIH usuarias de tratamiento antirretroviral. **Métodos:** estudio observacional transversal, conformado por 276 PVVIH en terapia antirretroviral (TARV), atendidas en el Servicio Ambulatorio Especializado (SAE) de un municipio del interior del Nordeste en 2018. Las variables analizadas incluyeron datos bioquímicos, antropométricos y de presión arterial, así como el Puntuación de Riesgo de Framingham (PRF). Se dividieron en dos grupos: practicantes (pAF) de actividad física; y no practicantes de actividad física (NpAF). Los datos se correlacionaron mediante la Prueba de Chi-Cuadrado de Pearson, con significancia estadística si  $p < 0,05$ , y mediante estadística inferencial. **Resultados:** de los participantes del estudio, la mayoría eran hombres, y del total del contingente, el 67% ( $n=185$ ) eran NpAF y, de estos, el 8,6% tenían riesgo moderado y alto de eventos cardiovasculares (RECV) según PRF. El grupo de pAF tuvo una mediana menor para la variable edad [37 (41-48) años,  $p=0,004$ ] y una mediana mayor para la variable peso [68 (60-77,5) kg,  $p=0,015$ ]. Entre las pAF, hubo alta prevalencia de bajo riesgo. **Conclusión:** la falta de PAF es altamente prevalente entre las PVVIH, y estas están más asociadas a RECV moderado y alto, además de las consecuencias metabólicas y corporales de la condición viral y la terapia antirretroviral.

**Palabras clave:** VIH. Ejercicio Físico. Factores de Riesgo. Enfermedades Cardiovasculares.

## INTRODUCTION

Acquired Immunodeficiency Syndrome (AIDS) is caused by the Human Immunodeficiency Virus (HIV). In addition to causing various damages to the human body, this etiological agent also has the potential to reduce immune function and increase vulnerability to opportunistic diseases. Therefore, continuous administration of antiretroviral therapy (ART) is of fundamental importance to reduce morbidity and mortality caused by this pathogen and significantly increase HIV-positive patients' life expectancy.<sup>1</sup>

According to the epidemiological overview (in Brazil, from 2007 to 2021, 381,793 cases of HIV were reported in the Notifiable Diseases Information System), the large number of people affected is evident, which makes the search for therapeutic improvements, both pharmacological and non-pharmacological, a relevant point in health sciences.<sup>2</sup>

However, the chronicity of both HIV infection and ART use in people living with HIV (PLHIV) often has negative effects on body composition and lipid and car-

bohydrate metabolism. Among these possible metabolic and bodily consequences, dyslipidemia, lipodystrophy syndrome, generalized obesity and insulin resistance can be mentioned. Therefore, there is an increased risk of cardiovascular events (CVER), such as myocardial infarction, elevated systemic blood pressure and stroke.<sup>3,4</sup>

Given the higher cardiovascular risk in PLHIV, especially among ART users, physical activity practice (PAP) has been recommended. This non-pharmacological, effective, safe and relatively cheap measure is useful in the prevention and treatment of metabolic and bodily disorders resulting from HIV and ART activity in the human body.<sup>5</sup>

PAP has positive impacts on the physical health and well-being not only of the general population, but also of patients using ART. It is worth noting that physical exercise (PE) is conceptualized as an organized and planned bodily activity with the aim of strengthening physical conditioning or maintaining PAP musculoskeletal body homeostasis, different from physical activity, which does not have the same objective. It is possible to observe in physically active PLHIV undergoing antiretroviral (ARV) treatment the prevention of diseases and improvements

in glycemic regulation, control of systemic blood pressure, progress in the lipid profile, reduction of stress and improvement in quality of life. Therefore, patients who practice regular PE tend to have lower levels of triglycerides (TG), lipodystrophy and advanced glycation end product, in addition to smaller abdominal circumference when compared to sedentary PLHIV.<sup>6</sup>

Through aerobic physical activities, it was possible to notice a reduction in central and trunk fat as well as body perimeter, enabling a reduction in insulin resistance and an improvement in the lipid profile in PLHIV. Furthermore, strength exercises were responsible for increasing lean mass, weight gain and muscle strength.<sup>3,7</sup>

Infection chronicity and bodily changes caused by ART often have an impact on the psychological aspects of this group. In view of this, regular physical activity plays an important role as it is closely associated with reducing levels of anxiety and depression in PLHIV. This effect is due to the release of endogenous and hypothalamic opioids that act on the emotional state, promoting physical and mental well-being. According to studies, a significant reduction in symptoms of moderate to severe depression was observed in PLHIV undergoing intervention through regular PE.<sup>7,8</sup>

However, low adherence by PLHIV to interventions related to PAP still constitutes a challenge for improving physical health, mental health and well-being in this group of patients. It is estimated that 50.7% of HIV-positive individuals comply with the World Health Organization (WHO) recommendations, which indicates practicing at least 75 to 150 minutes of intense aerobic physical activity or 150-300 minutes of moderate physical activity.<sup>9</sup>

This data shows that, although PAP has beneficial potential for PLHIV and is indicated for reducing health problems, the percentage of physically active individuals in this group is still below what is desired.<sup>8-10</sup>

Therefore, the present study aims to analyze the prevalence and factors associated with PAP in PLHIV using ART.

## METHODS

This is a cross-sectional observational study, in which data obtained from a structured questionnaire used in the umbrella project "Development of a classifier algorithm to predict cardiovascular disease in patients using antiretroviral drugs using a computational model" were analyzed.

Sample participants were recruited between January and November 2018, the period in which the main project mentioned above was carried out, at the Department of Sexually Transmitted Infections in Imperatriz-MA (reference point for service to southern Maranhão and other geographically close municipalities, including some cities in the states of Tocantins and Goiás), which was made up of 276 people, gathered for convenience, of which 91 were practitioners and 185 were not physical activity practitioners, according to anamnesis collected in conjunction with WHO recommendations.

These recommendations advise that any body

movement produced by skeletal muscles that require energy expenditure should be considered as physical activity. This concept also includes physical activities carried out during work, games, household chores, travel and leisure activities.<sup>11</sup>

The inclusion criteria for this research were being PLHIV, aged between 20 and 55 years old and using ARV. At the same time, people with cognitive impairment, therapeutic failure or abandonment of ART were considered as exclusion criteria. Furthermore, the sample was divided into two groups: physical activity practitioner (PAP); and physical activity non-practitioner (PANp).

Using a semi-structured questionnaire, originating from the umbrella project, to which this research is linked, the values of the aspects to be analyzed were obtained. This questionnaire was applied to patients who wished to participate in the research at the end of their medical appointments, in a separate environment, where anthropometric measurements were taken, notes of laboratory tests relevant to the research and explanations about the reasons for the research and how the data would be used. The variables analyzed included: clinical-laboratory factors, such as systolic blood pressure (<140mmHg), diastolic blood pressure (<90mmHg), total cholesterol (<200mg/dl), high-density lipoprotein (HDL) (>40mg/dl), TG (<175 mg/dl), fasting blood glucose (<100mg/dl), urea (<20mg/dl) and creatinine (<1.2mg/dl) (analyzed using the Mann-Whitney U test); anthropometric factors, such as waist circumference, abdominal circumference (<102cm for men and <88cm for women) and waist-to-height ratio (<0.5) (analyzed using Student's t test), weight, Body Mass Index (<24.9), hip circumference and waist-hip ratio (analyzed using the Mann-Whitney U test); and social factors, such as PAP, sex and age (using the chi-square test).

For statistical analysis of the data obtained, the Statistical Package for the Social Sciences (SPSS®) software version 19.0 was used. Data were analyzed using Pearson's Chi-Square Test, with statistical significance if  $p < 0.05$ , and Mann-Whitney's U test, being a non-parametric test applied to two independent samples, and Student's t-test, which is a useful hypothesis test in statistics when it is necessary to compare means.

The Framingham Risk Score (FRS) is used as a calculation to predict the risk of cardiovascular diseases (CVD) of a given patient based on the analysis of gender, age, blood pressure, diabetes, smoking, LDL-cholesterol and HDL-cholesterol, classifying according to the score as low, moderate or high.<sup>3</sup>

The project that this study is part of was carried out in accordance with the required ethical standards (Resolutions 466/2012, 510/2016, 580/2018 of the Ministry of Health), and was approved by the *Universidade Federal do Maranhão* Research Ethics Committee, under Opinion 2,781,461 on July 23, 2018 (Certificate of Presentation for Ethical Consideration (CAAE - *Certificado de Apresentação para Apreciação Ética*): 84787918.0.0000.5087). All participants signed the Informed Consent Form, and their data was tabulated in a protected Google spreadsheet, available for viewing only after request and acceptance.

## RESULTS

Regarding the research sample space, a total of 276 participants were obtained, of which 55.4% (n=153) were male. Furthermore, it is also noteworthy that a large sample size of 185 (67%) individuals did not practice physical activity while only 91 (33%) practiced physical activity.

Furthermore, it was possible to observe a contrast in CVER according to FRS, given that, among those included in the PANp group, 91.4% (n=169) had low CVER and 8.6% (n=16) had moderate and high risk, whereas in the PAp group, there was a high prevalence of low risk, in which 98.9% (n=90) were included in this risk range and only 1.1% (n=1) were in the moderate and high risk range (p-value = 0.014).

Table 1 brings together the variables that were analyzed by the study, with only age and weight showing a statistically significant difference (p<0.05). Therefore, it was found that the PAp group had a lower median age [37 (31-45) years; p=0.004] and higher median weight [68 (60-77.5) kg; p=0.015] in relation to the PANp group, with a median age of 41 (34.5-48) years and weight of 63.00 (55.25-73.75) kg.

Other risk factors (RF) were also analyzed, however p>0.05 in all, not showing statistical significance, namely waist-hip ratio (WHR), waist-height ratio (WHtR), total cholesterol (TC), HDL, TG, fasting blood glucose (FBG), Body Mass Index (BMI), waist circumference (WC), abdominal circumference (Abdc), hip circumference (HC), urea and creatinine. The investigation of these data in the PANp group showed higher medians in WHR [0.88 (0.83-0.88)], WHtR [0.526±0.76], TC, [170 (142-192)], HDL [40.11 (33.90-47.00)], TG [147.5 (109 -190.3)] and FBG [94 (86-102)].

Furthermore, the PAp group had a higher prevalence of BMI [24.80 (22.71-28.11) kg/m<sup>2</sup>], WC [85.45±9.59 cm], Abdc [89.91±9.61], HC [98 (94-102)], urea [25.64

(21.88-31)] and creatinine [0.82 (0.64-1.01)].

The data analyzed showed similar median systolic blood pressure (SBP) and diastolic blood pressure (DBP) between the PAp and PANp groups. For PAp, SBP [120 (113-130) mmHg] had a median equal to PANp [120 (110-133) mmHg]. Regarding DBP, the medians were 81 (71-90) mmHg for PANp and 80 (74.5-89.5) mmHg for PAp.

## DISCUSSION

According to the analysis of study results, it was found that the number of PLHIV who practice physical activities is still lower than expected, given the beneficial potential that could be provided to them, such as reducing aggregate cardiovascular risk, reducing irregular fat deposits throughout the body (lipodystrophy) and reducing laboratory components that are harmful if in excess, such as TG.

This study consisted of 276 patients with HIV using ART. The majority were male (55.4%), which is similar to another study in which the predominant population with HIV were men (57.9%).<sup>10</sup>

This higher incidence can be explained by the fact that these individuals, when younger, have poor knowledge about the forms of HIV transmission and prevention, the large number of sexual partners, in the case of men who have sex with men, and conception misconception by heterosexual men that they have immunity to HIV. Furthermore, the latter are not highlighted in virus prevention policies or actions, which makes them vulnerable to infection.<sup>11-13</sup>

Not performing PE corresponded to 67% of the total individuals in the sample. A study in the United States on physical activity in PLHIV showed that the majority of patients (68%) had low adherence.<sup>14</sup> In agreement, research carried out in Malawi also reported that the majority (40%)

**Table 1.** Prevalence of risk factors associated with physical activity.

	PANp	PAp	p-value
Age*	41 (34.5-48)	37 (41-48)	0.004
Weight*	63.00 (55.25-73.75)	68 (60-77.5)	0.015
BMI*	24.38(21.40-27.38)	24.80 (22.71-28.11)	0.262
WC**	85.00±12.32	85.45±9.59	0.761
Abdc**	89.41±11.91	89.91±9.61	0.730
HC*	96 (91-102)	98 (94-102)	0.077
WHR*	0.88 (0.83-0.88)	0.86 (0.82-0.93)	0.293
WHtR**	0.526±0.76	0.522±0.71	0.674
SBP*	120 (110-133)	120 (113-130)	0.648
DBP*	81(71-90)	80 (74.5-89.5)	0.48
Total cholesterol*	170 (142-192)	166 (143-200)	0.832
HDL*	40.11 (33.90-47.00)	38.95 (31.70-47.82)	0.525
Triglycerides*	147.5 (109 -190.3)	131 (97-191)	0.224
Fasting blood glucose*	94 (86-102)	92 (84.93-99)	0.216
Urea*	25.23 (20.67-29.51)	25.64 (21.88-31)	0.404
Creatinine*	0.80 (0.66-0.95)	0.82(0.64-1.01)	0.58

Abbreviations: BMI - Body Mass Index; WC - waist circumference; Abdc - abdominal circumference; HC - hip circumference; WHR - waist-hip ratio; WHtR - waist-to-height ratio; SBP - systolic blood pressure; DBP - diastolic blood pressure; HDL - high-density lipoproteins; \*Mann-Whitney U test - values described as median and interquartile range;

\*\*Student's t test - values described as mean and standard deviation.

of PLHIV on ART had low levels of physical activity.<sup>15</sup>

To elucidate this behavior, according to the referenced literature, PLHIV reported barriers that made it difficult to perform physical activities, such as physical fatigue, gastric disorders, muscle pain, low weight, negative self-perception about lack of physical capacity, fear of contaminating training partners when injured, lack of social support and financial and time restrictions.<sup>16</sup>

PE is conceptualized as an organized and planned bodily activity with the aim of strengthening physical conditioning or maintaining musculoskeletal body homeostasis. However, evidence indicates that PAP has beneficial effects, such as improvements in balance and strength. In this context, the use of PAP as a non-pharmacological therapy in patients with the HIV virus was suggested, since the comorbidities caused by the virological condition are aggravated by a sedentary lifestyle.<sup>17</sup>

Furthermore, studies demonstrate that this portion of the population suffers accelerated aging in relation to the uninfected and, consequently, has an increased risk for age-dependent pathologies and, mainly, for CVD.<sup>18-20</sup>

As determined by the analysis of data from the sample space, it is clear that older individuals tend to practice less physical activity, which contrasts with the benefit exposed in the literature, given that the cardiovascular risk in PLHIV increases with aging and that moderate to vigorous physical activities would be indicated to reduce mortality in adults between 50-79 years old.<sup>21</sup>

Regarding the body changes provided by PAP for PLHIV, the literature shows that this intervention has the capacity to provide an increase in lean mass along with an increase in individuals' weight.<sup>3</sup> Therefore, the data obtained in the present study are consistent with those found by other authors, as a higher median was observed in the weight variable in the PAP group when compared to the PANp group.

At the same time, analyzes based on the FRS indicate that CVER is exponentially higher in PLHIV when compared to the public without the disease, possibly due to the effect of endothelial and inflammatory damage that the pathology and ART cause in the human body, such as accumulation of visceral fat.<sup>22, 23</sup>

Additionally, the relationship between physical activity and CVD risk is linked to the cardiorespiratory fitness of these patients. This physical aspect is considerably diminished in PLHIV and is associated with an increase in plasma inflammatory markers which, through PAP, can be reduced.<sup>18, 20</sup>

Therefore, scientific data confirms an improvement in cardiorespiratory capacity with high-intensity PAP as a therapeutic measure in female patients, with no improvements in males. This data is potentially explained by the imbalance and hormonal instability of women with HIV in periods adjacent to menopause, which leads to other cardiovascular RF, imposing the need for more intense training than traditional training.<sup>24</sup> Such perspectives were corroborated by the sample survey of the present study, since the PANp group has a greater number of individuals at moderate and high risk of CVD, according

to FRS, and also a smaller number classified at low risk in relation to the PAP group.

Comparing the data from the study in question with others found in the literature, it is identified that, among individuals affected by the virus, males, in addition to being those with the highest prevalence of HIV, have a higher risk of CVD than women.<sup>22-24</sup>

Therefore, it appears that health actions and policies on HIV prevention must be developed for the general public, but with a focus on men, since this study and the literature prove that this portion of the population has organic responses, mainly cardiac, distinct to HIV.

Furthermore, physiotherapy and PAP, together with ART, obtained significant positive results, as the grouping of these interventions helped to reduce body fat and its harmful metabolic components, in addition to also reducing glucose values.<sup>24</sup>

Accordingly, it is pointed out that regular and active PAP individuals present, compared to the PANp group, a better distribution of body fat and, therefore, are less prone to lipodystrophy.<sup>24</sup>

Regarding glucose and body fat levels, there is literature with results similar to those of the present study, indicating that a planned and individualized physical intervention is capable of promoting changes in these variables. Furthermore, the findings regarding total cholesterol and TG were similar in both studies, with reduced values among the PAP group.<sup>25</sup>

However, there was contradiction in the literature regarding data relating to BMI and HC, given that, in the literature, a reduction in these variables is indicated among physically active patients, which was not corroborated by the data analysis of this study.<sup>25</sup>

According to data evidenced by the study and together with the referenced literature, it appears that there is the possibility of a metabolic benefit with PAP in the organic response of PLHIV to the misfortunes caused by the combination between the current pathology and ART and, mainly, improve the hemodynamic profile by reducing the risk of future CVD. But the lack of PAP is still highly prevalent in this population. In this sense, it is important that the Specialized Outpatient Service team prioritizes actions that influence PAP by PLHIV, thus strengthening healthy lifestyle habits, in order to avoid early death from CVD. It is also important that healthcare professionals are trained to understand and prescribe PAP appropriately for their patients, given the benefits that can be brought about in clinical practice.

As limitations of this study, it can be noted that chronic HIV infection and the use of ART associated with patients' individual characteristics make people living with HIV a heterogeneous population that is difficult to parameterize. Furthermore, the lack of some potentially important variables that could modify the parameters found was not included in the present analysis, such as time spent practicing physical activity, time since diagnosis, degree of intensity of physical activity, CD4+ cell count, chronic diseases, among others.

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