

## Systemic Arterial Hypertension in people living with HIV/AIDS: integrative review

*Hipertensão arterial sistêmica em pessoas vivendo com HIV/aids: revisão integrativa*  
*Hipertensión arterial sistémica en personas que viven con VIH/Sida: revisión integradora*

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### How to cite this article:

Lima, MAC, Cunha GH, Galvão MTG, Rocha RP, Franco KB, Fontenele MSM. Systemic Arterial Hypertension in people living with HIV/AIDS: integrative review. Rev Bras Enferm [Internet]. 2017;70(6):1309-17. DOI: <http://dx.doi.org/10.1590/0034-7167-2016-0416>

**Submission:** 12-01-2016

**Approval:** 01-04-2017

### ABSTRACT

**Objective:** To analyze scientific productions about the relationship between HIV and Systemic Arterial Hypertension (SAH) in people living with HIV/AIDS (PLWHA). **Method:** Integrative literature review in six databases, held in March 2016. "AIDS" and "hypertension" were the keywords used in Portuguese, English and Spanish languages. We found 248 articles and selected 17. The categories formulated were "prevalence of SAH in PLWHA," "risk factors for SAH in PLWHA" and "adverse events of antiretroviral therapy (ART) that contribute to HAS." **Results:** There is no consensus whether HIV and ART influence the SAH development, but there are several risk factors for SAH among PLWHA. It was observed that protease inhibitors medicines influence SAH the most. **Conclusion:** Guidelines for SAH prevention must be performed in all individuals, however, in PLWHA, they must focus on characteristic risk factors of this population.

**Descriptors:** Acquired Immunodeficiency Syndrome; HIV; Hypertension; Nursing; Health Promotion.

### RESUMO

**Objetivo:** Analisar as produções científicas sobre a relação entre o HIV e Hipertensão Arterial Sistêmica (HAS) em Pessoas Vivendo com HIV/aids (PVHA). **Método:** Revisão integrativa da literatura em seis bases de dados, realizada no mês de março de 2016. Utilizaram-se os descritores "aids" e "hipertensão", nos idiomas português, inglês e espanhol. Foram encontrados 248 artigos e selecionados 17. As categorias formuladas foram "prevalência de HAS em PVHA", "fatores de risco para HAS em PVHA" e "eventos adversos da terapia antirretroviral (TARV) que contribuem para HAS". **Resultados:** Não há consenso se o HIV e TARV influenciam no desenvolvimento da HAS, mas existem diversos fatores de risco para HAS entre PVHA. Constata-se que os fármacos inibidores de protease são os que mais influenciam na HAS. **Conclusão:** As orientações para prevenção da HAS devem ser realizadas em todos os indivíduos, porém, nas PVHAs, devem focar nos fatores de risco característicos dessa população.

**Descritores:** Síndrome da Imunodeficiência Adquirida; HIV; Hipertensão; Enfermagem; Promoção da Saúde.

### RESUMEN

**Objetivo:** Analizar la producción científica sobre la relación entre el VIH y la Hipertensión Arterial (HTA) en Personas que Viven con el VIH/sida (PVVS). **Método:** Revisión integradora de la literatura en seis bases de datos, realizada en marzo de 2016. Se utilizaron los descriptores "sida" y "hipertensión" en portugués, inglés y español. Se encontraron 248 artículos, entre los cuales se seleccionaron 17. Las categorías formuladas fueron "prevalencia de la HTA en PVVS", "factores de riesgo de HTA en PVVS" y "eventos adversos de la terapia antirretroviral (TAR) que contribuyen con la HTA". **Resultados:** No hay consenso si el VIH y la TAR

influyen en el desarrollo de la HTA, pero hay varios factores de riesgo de HTA entre PVVS. Se constató que los fármacos inhibidores de la proteasa son los que más influyen en la HTA. **Conclusión:** Las directrices para la prevención de la HTA deben ser puestas en práctica en todos los individuos. Sin embargo, en PVVS, deberían centrarse en factores de riesgo propios de esta población.

**Descriptores:** Síndrome de Inmunodeficiencia Adquirida; VIH; Hipertensión; Enfermería; Promoción de la Salud.

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## INTRODUCTION

The global AIDS epidemic started in 1981, in the United States<sup>(2)</sup>. Currently, around 34 million people live with HIV/AIDS (PLWHA), representing a growing pandemic, which is a challenge to many social sectors regarding control measures of vulnerabilities involved in individual and contextual aspects of exposure to the virus<sup>(3)</sup>.

In Brazil, over the decades, HIV infection has gone through changes in its epidemiological profile, which changed the disease natural history. This is mainly due to the introduction of antiretroviral therapy (ART), initiated in the country in 1996. As a result, there was a reduction in mortality and improvement of quality of life of people treating HIV/AIDS<sup>(1)</sup>. The ART initiation, along with prevention and control actions of HIV infection, has been generating changes in the epidemic characteristics. The natural history of the disease changed, it no longer leads to a fast lethal end with standardized attributes, it has become a controllable disease with chronic characteristics and a prolonged evolution<sup>(4)</sup>.

Since PLWHA have a higher survival rate, there is currently a concern with other chronic conditions, one being the systemic arterial hypertension (SAH), which is also a public health problem, due to the economic impact on the social and health systems, reflecting on the quality of life and life expectancy of individuals. Prevention of irreversible changes in the body requires its continued control, in addition to individual and collective actions<sup>(5)</sup>.

SAH is a multifactorial clinical condition, characterized by high and sustained arterial pressure levels. It is a condition hard to control and among its main risk factors, the following can be highlighted: age, sex, ethnicity, overweight, obesity, hypersodic diet, alcohol abuse, sedentary lifestyle, unfavorable socioeconomic factors, genetic influence, and other cardiovascular risk factors presented connected to one another<sup>(6)</sup>.

Modifiable factors related to lifestyle have often been associated with SAH and, although they have been studied, percentages of knowledge, treatment and control of the disease are still low, both in developed countries as in developing countries. To control SAH, individuals must have knowledge about the disease, since the lack of it stands out as a barrier in the search for orientation for the proper management of the disease<sup>(7)</sup>.

This study is justified by the information gap about etiology and development of SAH on PLWHA and the influence of ART, the HIV itself and the risk factors for SAH appearance in these individuals. Therefore, we notice the importance of a bigger understanding about the relationship between HIV and SAH in professional practice, so measures can be taken, minimizing chances of PLWHA to develop SAH. Hence, the

objective of this study was to analyze scientific productions about the relationship between HIV/AIDS and SAH.

## METHOD

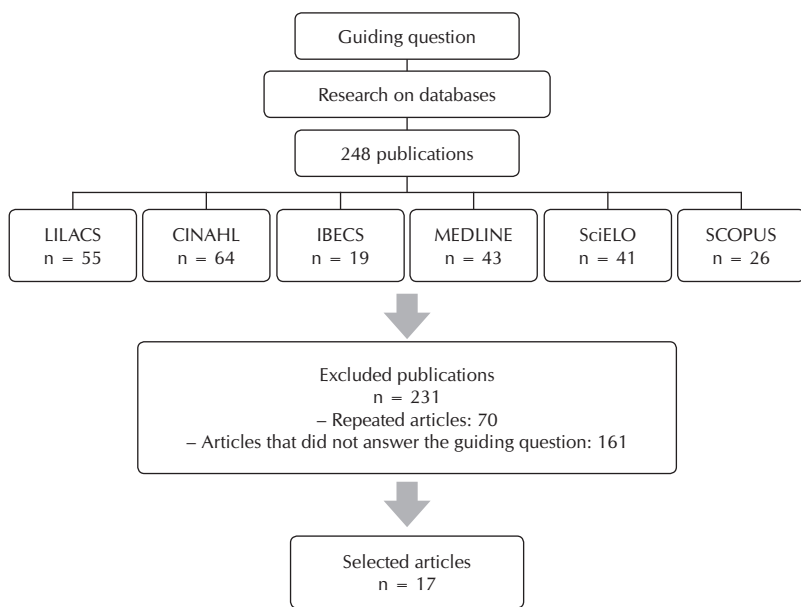
This integrative review of the literature was prepared in six steps: 1. Elaboration of the guiding question; 2. Research the literature; 3. Data collection; 4. Critical analysis of the studies; 5. Discussion of results; 6. Presentation of the integrative review<sup>(8)</sup>. The guiding question was: What is the relationship between HIV/AIDS and SAH?

The articles were selected in six databases: Medical Literature Analysis and Retrieval System Online (MEDLINE), Cumulative Index to Nursing and Allied Health Literature (CINAHL); Índice Bibliográfico Español de Ciencias de la Salud (IBECS); Latin American and Caribbean Literature in Health Sciences (LILACS); Scientific Electronic Library Online (SciELO) and SCOPUS. The survey of articles was carried out in March 2016, using AIDS and Hypertension as descriptors, from the Health Sciences Descriptors (DeCS) of the Virtual Health Library and the Medical Subject Headings (MeSH) of the National Library of Medicine, in Portuguese, English and Spanish languages.

Inclusion criteria were: complete articles available electronically, in Portuguese, English or Spanish languages, involving the topic about HIV/AIDS and SAH, regardless of the year of publication. Exclusion criteria were: letters to editors and repeated articles. Evidence levels were determined as it follows: I: Evidence originating from systematic review or meta-analysis of controlled randomized clinical trials or from clinical guidelines based on systematic reviews of controlled randomized clinical trials; II: Evidence derived from at least one controlled randomized clinical trials; III: Evidence obtained from clinical trials without randomization; IV: Evidence from cohort and case-control studies; V: Evidence originating from systematic review of descriptive and qualitative studies; VI: Evidence derived from a descriptive or qualitative study; VII: Evidence from opinion of authorities or reports of committees of specialists<sup>(9)</sup>.

Figure 1 shows the quantity of articles selected from the databases. Articles that did not answer the guiding question of the study or were repeated have been excluded.

The 17 articles selected were analyzed through an organized approach to consider accuracy and characteristics of each study, observing methodological development, intervention or care proposed, results, conclusion and evidence level. The studies were gathered into three categories, considering their characteristics: Prevalence of SAH in PLWHA; Risk factors for SAH in PLWHA; and Adverse events of ART that contribute to SAH. The findings were discussed based on scientific literature.



**Figure 1** – Distribution of articles found and selected

Regarding ethical aspects, texts and copyrights of the articles were respected, thus, no changes were performed on the content found to favor the study proposed by the authors.

**RESULTS**

The characterization of the 17 articles showed the year of publication varied between 2001 and 2016, with six articles published in Brazil<sup>(10-15)</sup>, five in the United States<sup>(16-20)</sup>, four in European countries<sup>(21-24)</sup>, one article in Cameroon<sup>(25)</sup> and one in Chile<sup>(26)</sup>. Regarding the evidence levels, the following distribution was observed: four on level IV<sup>(10,16,20,23)</sup>; three on level V<sup>(21-22,24)</sup>; and ten on level VI<sup>(11-19,25-26)</sup>.

Considering the three categories of the study — Prevalence of SAH in PLWHA; Risk factors for SAH in PLWHA; and Adverse events of ART that contribute to SAH. —, we found that most articles belonged to the first category mentioned. We observed the percentage of PLWHA that have SAH in diverse groups of individuals and in different contexts, such as age, race and using ART or not.

Prevalence of SAH in PLWHA considering the general population is something still under discussion and there is no consensus, which provokes new studies. Something similar happens to PLWHA using ART and, thus, there is the need for more deepening about the subject, since there is no defined position whether ART stimulates development of SAH or not. Chart 1 shows information regarding prevalence of SAH in PLWHA, emphasizing in which groups of people with HIV/AIDS or situations the SAH is more frequent.

In the risk factors category for SAH in PLWHA, we observed there is no consensus whether HIV influences, in fact, the emergence of SAH or it emerges due to causes unrelated to HIV, resulting from time and individual predisposing factors, such as old age, sex, high weight and family history. It is clear the importance of modifying changeable factors for reduction of SAH and improvement of quality of life in this population. (Chart 2).

The third category describes the adverse events of ART that contribute to SAH. The protease inhibitors were highlighted when dealing with side effects of ART including medicamental interaction with some antihypertensive medicines. We see there is no definition whether ART influences the SAH development, which opens space for new studies on the subject (Chart 3).

**Chart 1** – Prevalence of Systemic Arterial Hypertension in people living with HIV/AIDS, 2016

Title	Year/Country	Study outline/number of patients	Intervention	Outcome
Prevalence and patient awareness of medical comorbidities in an urban AIDS clinic <sup>(18)</sup>	United States 2010	Cross-sectional n = 200	Interview with use of a form	Prevalence of SAH on 27.5% black people.
Chronic illness burden and quality of life in an aging HIV population <sup>(19)</sup>	United States 2013	Cross-sectional n = 452	Interview on the phone	Prevalence of SAH on 46% people aged 50 or older.
Risk factors related to hypertension among patients in a cohort living with HIV/AIDS <sup>(10)</sup>	Brazil 2010	Case control n = 958	Observing groups Case: patients with AP (Arterial Pressure) > 140/90 mmHg, at least on two occasions, or previous diagnosis of hypertension. Control: patients with normal AP	Prevalence of SAH in 25.6% people followed up in the clinic.
Risco cardiovascular: marcadores antropométricos, clínicos e dietéticos em indivíduos infectados pelo vírus HIV <sup>(11)</sup>	Brazil 2011	Cross-sectional n = 100	Interview and physical examination	Prevalence of SAH in 35% people followed up in the clinic.

To be continued

Chart 1 (concluded)

Title	Year/ Country	Study outline/ number of patients	Intervention	Outcome
What should we know about metabolic syndrome and lipodystrophy in AIDS <sup>(12)</sup>	Brazil 2011	Cross-sectional n = 819	Interview and physical examination	Prevalence of SAH in 16.7% people followed up in the clinic.
Aging with HIV: an overview of an urban cohort in Rio de Janeiro (Brazil) across decades of life <sup>(14)</sup>	Brazil 2013	Cross-sectional n = 2.307	Medical Record	Prevalence of SAH in 11.9% people followed up in the clinic.
Risk of coronary artery disease in individuals infected with human immunodeficiency virus <sup>(15)</sup>	Brazil 2011	Cross-sectional n = 40		Prevalence of SAH in 55% people followed up in the clinic.
Correlates of hypertension in patients with AIDS in the era of highly-active antiretroviral therapy <sup>(20)</sup>	United States 2013	Prospective cohort n = 2390	Interview, medical record and examinations	Prevalence of SAH on 22% and incidence in 64.1/1000.
Impact of highly active antiretroviral therapy on blood pressure in HIV-infected patients. A prospective study in a cohort of naive patients <sup>(23)</sup>	Spain 2006	Prospective cohort n = 95	Interview and physical examination	Before ART+, 7% patients had SAH; After 48 weeks of ART, 26% were with high AP±.
Lipid profile, cardiovascular risk factors and metabolic syndrome in a group of AIDS patients <sup>(13)</sup>	Brazil 2008	Cross-sectional n = 252	Interview and physical examination	In use of ART: 19.9% patients had SAH; No use of ART: 13.3% had SAH.
Prevalence of hypertension in HIV/AIDS patients on highly active antiretroviral therapy (haart) compared with haart naïve patients at the limbe regional hospital, Cameroon <sup>(25)</sup>	Cameroon 2016	Cross-sectional n = 200	Interview and physical examination	In use of ART: 38% patients had SAH; No use of ART: 19% had SAH.

Nota: \*HAS: Hipertensão arterial sistêmica; †TARV: Terapia antirretroviral; ‡PA: Pressão arterial.

Chart 2 – Risk factors for Systemic Arterial Hypertension in people living with HIV/AIDS, 2016

Title	Year/ Country	Study outline/ number of patients	Intervention	Outcome
Risk factors related to hypertension among patients in a cohort living with HIV/AIDS <sup>(10)</sup>	Brazil 2010	Case control n = 958	Observing groups Case: patients with AP > 140/90 mmHg, at least on two occasions, or previous diagnosis of hypertension. Control: patients with normal AP	<ul style="list-style-type: none"> <li>– Advanced age</li> <li>– Longest time of anti-HIV positive serology</li> <li>– Use of ART:</li> <li>– SAH± family history</li> <li>– Low CD4+ T lymphocytes</li> <li>– Sedentariness:</li> <li>– BMI± &gt; 25 kg/m</li> <li>– High Waist Circumference</li> <li>– Triglycerides &gt; 150 mg/dL</li> <li>– Blood Glucose &gt; 100 mg/dL</li> <li>– Cholesterol &gt; 200 mg/dL</li> </ul>
What should we know about metabolic syndrome and lipodystrophy in AIDS? <sup>(12)</sup>	Brazil 2011	Cross-sectional n = 819	Interview and physical examination	<ul style="list-style-type: none"> <li>– Advanced age</li> <li>– Longest time of anti-HIV positive serology</li> <li>– Use of ART:</li> <li>– High CD4+ T lymphocytes</li> <li>– BMI± &gt; 25 kg/m</li> </ul>
Aging with HIV: an overview of an urban cohort in Rio de Janeiro (Brazil) across decades of life <sup>(14)</sup>	Brazil 2013	Cross-sectional n = 2307	Analysis on medical records	– Advanced age
Hospitalizations for cardiovascular disease in african americans and whites with HIV/AIDS <sup>(16)</sup>	United States 2013	Retrospective cohort n = 288	Medical records analysis	<ul style="list-style-type: none"> <li>– Advanced age</li> <li>– Black</li> <li>– Women</li> <li>– Chronic Kidney Disease</li> </ul>

To be continued

Chart 2

Title	Year/ Country	Study outline/ number of patients	Intervention	Outcome
Chronic illness burden and quality of life in an aging HIV population <sup>(19)</sup>	United States 2013	Cross-sectional n = 452	Interview on the phone	– Advanced age – Stress and depression – Low social and mental activity
Correlates of hypertension in patients with AIDS in the era of highly-active antiretroviral therapy <sup>(20)</sup>	United States 2013	Retrospective cohort n = 2390	Interview, medical records analysis and examinations	– Advanced age – Black – Diabetes Mellitus – Low educational level – High weight – Triglycerides > 150 mg/dL
Hipertensión arterial, infección por el virus de la inmunodeficiencia humana y tratamiento antirretrovírico de gran actividad <sup>(21)</sup>	Spain 2010	Integrative review	Search on MEDLINE database	– Advanced age – Men – Low pre-treatment systolic pressure with ART – Low CD4+ T lymphocytes – Chronic kidney disease – Lipodystrophy – High Waist Circumference – Triglycerides > 150 mg/dL – Cholesterol > 200 mg/dL
Impact of highly active antiretroviral therapy on blood pressure in HIV-infected patients. A prospective study in a cohort of naive patients <sup>(23)</sup>	Spain 2006	Retrospective cohort n = 95	Interview and physical examination	– Advanced age – Low CD4+ T lymphocytes – BMI‡ > 25 kg/m – Triglycerides > 150 mg/dL – Cholesterol > 200 mg/dL
Prevalence of hypertension in HIV/AIDS Patients on highly active antiretroviral therapy (HAART) compared with HAART naive patients at the limbe regional hospital, Cameroon <sup>(25)</sup>	Cameroon 2016	Cross-sectional n = 200	Interview and physical examination	– Advanced age – Men – Use of ART:
Prevalence and patient awareness of medical comorbidities in an urban AIDS clinic <sup>(18)</sup>	United States 2010	Cross-sectional n = 200	Filling out cards, interview and medical records	– Women – Longest time of anti-HIV positive serology – Use of ART:
Cardiovascular profile and events of US adults 20-49 years with HIV: results from the NHANES 1999-2008 <sup>(17)</sup>	United States 2013	Cross-sectional n = 12.339	Data analysis of the National Center for Health Statistics.	– Longest time of anti-HIV positive serology
Lipid profile, cardiovascular risk factors and metabolic syndrome in a group of AIDS patients <sup>(13)</sup>	Brazil 2008	Cross-sectional n = 252	Interview and physical examination	– Diabetes Mellitus – Arteriosclerosis – Smoking
Risco cardiovascular: marcadores antropométricos, clínicos e dietéticos em indivíduos infectados pelo vírus HIV <sup>(11)</sup>	Brazil 2011	Cross-sectional n = 100	Interview and physical examination	– Smoking – Blood Glucose > 100 mg/dL – Cholesterol > 200 mg/dL – Low values of high density lipoproteins

Note: \*ART: Antiretroviral Therapy; †SAH: Systemic Arterial Hypertension; ‡BMI: Body Mass Index

Chart 3 – Antiretroviral therapy adverse events that contribute to systemic arterial hypertension, 2016

Title	Year/ Country	Study outline/ number of patients	Intervention	Outcome
Hipertensión arterial en pacientes infectados por el virus de la inmunodeficiencia humana <sup>(22)</sup>	Spain 2013	Integrative review	Search in database	– Protease inhibitors (ritonavir, indinavir, saquinavir, lopinavir, nelfinavir and amprenavir): Increase of AP* and potentialization or decrease of the effect of calcium channel blockers. – Nevirapine: Interaction with calcium channel blockers – Delavirdine: Increases plasmatic levels of antihypertensive medicines

To be continued

Chart 3

Title	Year/ Country	Study outline/ number of patients	Intervention	Outcome
Cardiovascular manifestations of HIV infection <sup>(24)</sup>	Italy 2001	Integrative review	Search in database	– Protease inhibitors (ritonavir, indinavir, saquinavir, lopinavir, nelfinavir and amprenavir): Coronary artery disease, lipodystrophy, insulin resistance, high cholesterol, high triglycerides and infarction.
Una década de terapia anti-retroviral: perfil de pacientes con 10 años de triterapia de alta efectividad <sup>(26)</sup>	Chile 2012	Retrospective cohort	Medical records analysis	– Lipodystrophy – High triglycerides

Note: \*AP: Arterial Pressure

## DISCUSSION

The incidence and prevalence of SAH in PLWHA is growing and there is no consensus whether HIV and ART are associated with this growth, or individual factors influence more dramatically the appearance of this comorbidity. The high prevalence rates of medical comorbidities unrelated to HIV found in this population are alarming, and we can claim that people with HIV/AIDS are living longer and dying due to health problems that are not connected to HIV/AIDS<sup>(18,27)</sup>.

This study found a higher prevalence of SAH in black PLWHA. Physiologically speaking, one of the reasons that may explain this finding is that black people tend to have lower rates of CD4+ T lymphocytes, which is a risk factor for development of SAH<sup>(21,25)</sup>. In addition, a study showed that these individuals have less access to healthcare services, which can contribute to this disparity<sup>(16)</sup>. Regarding sex, there is no consensus about what would be a risk factor, although males are more prevalent in studies as a risk factor for SAH<sup>(10,21,25)</sup>.

Advanced age, especially over 50, becomes a key factor for the development of SAH in this population. Other studies show that SAH is the most important comorbidity among the elderly<sup>(28-29)</sup>. Therefore, elders with HIV/AIDS are more vulnerable, so we noticed they have more chronic conditions than elders who do not live with HIV/AIDS. This leads to a need that is achieved with patient-centered care, overcoming barriers of medical fragmentation and understanding patients as a whole, since PLWHA are also susceptible to other chronic comorbidities, and SAH is one of the main ones<sup>(19)</sup>.

Our study and the literature indicate that individuals with low educational background have a higher number of chronic diseases, thus, we can observe the great impact that the educational level can generate to conditions and quality of life of people, which reflects on their health<sup>(30)</sup>.

High weight stands out as one of the main risk factors for development of SAH. Before starting the treatment, the PLWHA usually suffers a severe weight loss, which after finding out, leads to carelessness with diet and healthy living habits, for fear of appearing to be sick. As a result, many patients get fat, not worrying about their health and the consequences, which leads to development of chronic diseases as SAH. On the other hand, the medicines can cause weight gain, usually

in a specific area, which causes lipodystrophy, another strong risk factor for SAH<sup>(10)</sup>.

In addition, the excessive body mass may be responsible for 20% to 30% of cases of SAH, especially when fat deposition concentrates on the abdominal area. Thus, it is suggested that such factors must be worked through practice of physical exercise and nutritional guidance, which contribute to prevention and a better control of SAH<sup>(31)</sup>. It is important to note that central obesity is involved in the metabolic syndrome genesis, and is responsible for emergence of resistance to insulin, SAH and dyslipidemia, therefore increasing cardiovascular risk of individuals<sup>(32)</sup>.

The infection treatment can lead to appearance of some associated conditions, such as high levels of triglycerides, total cholesterol and LDL cholesterol increase, in addition to decrease in HDL cholesterol<sup>(33)</sup>. The association between dyslipidemia and SAH may also be a result of hypercholesterolemia contribution to raise arterial pressure through activation of the renin-angiotensin-aldosterone system, reduction of nitric oxide availability, endothelial dysfunction, among other factors involved<sup>(32)</sup>. However, we observed that diet of PLWHA, in general, is rich in fats and cholesterol and poor in fiber, combined with a low ingestion of vegetables, fruits and dairy products, which leads to dyslipidemia<sup>(11)</sup>.

Diabetes is another factor directly related to SAH. Diabetes and SAH share common pathways, such as sympathetic nervous system, renin-angiotensin-aldosterone system, oxidative stress, adipokine and resistance to insulin. These pathways interact, influence each other and can even cause a vicious cycle. SAH and diabetes are the two final results of the metabolic syndrome and as a consequence, may develop one after another in the same individual<sup>(34)</sup>. The increased survival rate resulting from ART has been achieved at the expense of high incidence of unforeseen adverse metabolic effects, including insulin resistance, diabetes, dyslipidemia and lipodystrophy<sup>(35)</sup>.

Besides, we verified that the smoking habit is highly prevalent among the PLWHA and is strongly associated to increase of prevalence of chronic diseases related to tobacco use disorder, especially cardiovascular diseases. Patients who are not following rigorously the therapy or did not start ART are more likely to smoke, since a study showed that these individuals have more difficulty to have healthy lifestyle habits. However, it is necessary to pay attention to other factors involved, such as sociodemographic

and clinical ones, which affect medication adherence and may also represent barriers to tobacco use cessation<sup>(36)</sup>.

PLWHA are susceptible to higher rates of depression over the years than the general population, which may affect negatively tobacco use cessation<sup>(19)</sup>, as well as demonstrated in the results of this integrative review. In addition, a meta-analysis study concluded that the influence of depression on hypertension is time-dependent, and these are the main reasons: depression symptoms lead to unhealthy lifestyles; depression may be associated with deregulation in the hypothalamic-pituitary-adrenal axis; depression is associated to dysfunction of the autonomic nervous system, which contributes to arterial pressure elevation<sup>(37)</sup>.

The ART can be associated with an adverse profile of cardiovascular risk factors<sup>(38)</sup>. Such adverse events are more likely to happen in the first six months of ART, thus, the monitoring of patients by healthcare professionals is essential at the beginning of therapy<sup>(39)</sup>. There is the possibility that PLWHA might be more susceptible to SAH, probably not only related to the virus, but also to ART, as well as to treatments containing protease inhibitors, which are related to the development of SAH and lipodystrophy. In addition, other medications, such as nevirapine and delavirdine may have medicament interaction with antihypertensive medicines<sup>(29)</sup>. Protease inhibitors cause metabolic effects, including insulin resistance, which can cause diabetes<sup>(35)</sup>.

Therefore, considering all the aforementioned aspects, PLWHA must no longer be educated only about their health condition regarding HIV; it is also necessary care and guidance about other health conditions, as SAH, in order to offer a full and effective assistance to those patients<sup>(18)</sup>.

#### Study limitations and contributions to the healthcare field

One limitation of this study is that there was no controlled randomized clinical trials to test many factors and observe the

relationship between HIV/AIDS and SAH, since most studies found were merely descriptive. With this in mind, we believe new and more deep research about the topic is necessary. The contribution of this study is the collection and organization of existing data on the HIV influence on the development of SAH, making visible the points that need to be examined more carefully, and to raise the importance of the topic for PLWHA.

#### CONCLUSION

This study reviewed the scientific literature on the relationship between HIV/AIDS and SAH. We verified that the studies covered the following topics: prevalence of SAH in PLWHA; risk factors for SAH in PLWHA; and adverse events of ART that contribute to SAH. In addition, guidelines and interventions for the prevention of SAH must be performed in all individuals; however, in PLWHA, they must be carried out in a special way and focusing on the characteristic risk factors of this population, since it is not consistently known whether ART or HIV increase SAH predisposition in PLWHA, or it occurs only due to increase of survival rate provided by ART.

Moreover, it is necessary for healthcare professionals to have an integrative look over PLWHA, beyond the HIV infection, observing that these individuals are vulnerable to other chronic conditions as well. As influencing factors for the development of SAH, we noticed predisposing and individual risk factors, such as advanced age, black race, low educational background and SAH family history, as well as risk factors probably resulting from HIV and ART, such as lipodystrophy, insulin resistance, high cholesterol and triglycerides. With this in mind, these patients must be guided about the modification of the changeable risk factors and search for a healthier lifestyle.

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