● **Original article**

ASSOCIATION BETWEEN LIFE HABITS AND CARDIOVASCULAR RISK IN PEOPLE LIVING WITH HIV/AIDS

Marcela Antonini[1], Elizabete Santos Melo[2], Christefany Régia Braz Costa[3], Giselle Juliana de Jesus[3], Elucir Gir[4], Renata Karina Reis[5]

Objective: To analyze the life habits and cardiovascular risk of people living with the human immunodeficiency virus, through sociodemographic, clinical and behavioral factors. **Method:** Cross-sectional quantitative study carried out in specialized services in the care of people living with the human immunodeficiency virus, from 2014 to 2016, in a municipality in the inland of the state of São Paulo – Brazil. The Framingham Risk Score was used to stratify cardiovascular risks. **Results:** Three hundred forty (340) individuals participated in the study. There was an association between cardiovascular risk and the variables gender (p = 0.003), age (p <0.001), education (p = 0.006), family history of hypertension (p = 0.026), diabetes (p = 0.003), myocardial infarction (p = 0.004) and stroke (p=0,003), time elapsed since HIV diagnosis (p <0.001) and time elapsed since the beginning of use of antiretrovirals **(p = 0.003). Conclusion:** The results revealed associations between cardiovascular risk and modifiable and non-modifiable risk factors for the occurrence of cardiovascular diseases in people living with HIV.
KEYWORDS: HIV infections; Acquired immunodeficiency syndrome; Cardiovascular diseases; Health promotion.

ASSOCIAÇÃO ENTRE HÁBITOS DE VIDA E RISCO CARDIOVASCULAR EM PESSOAS VIVENDO COM HIV/AIDS

Objetivo: analisar os hábitos de vida e o risco cardiovascular de pessoas vivendo com o vírus da imunodeficiência humana, por meio de fatores sociodemográficos, clínicos e comportamentais. **M**étodo**:** trata-se de estudo transversal, quantitativo, realizado em serviços especializados no atendimento de pessoas vivendo com o vírus da imunodeficiência humana, no período de 2014 a 2016, num município no interior do estado de São Paulo – Brasil. Utilizou-se Escore de Risco de Framingham para estratificação do risco cardiovascular. **Resultados:** participaram 340 pessoas. Houve associação entre o risco cardiovascular e as variáveis sexo (p=0,003), idade (p<0,001), escolaridade (p=0,006), antecedentes familiares para Hipertensão (p=0,026), Diabetes (p=0,003), Infarto do Miocárdio (p=0,004) e Acidente Vascular Encefálico (p=0,003), o tempo de diagnóstico pelo HIV (p<0,001) e uso de antirretrovirais (p=0,003). **Conclusão:** os resultados apontaram associações entre o risco cardiovascular e os fatores de risco modificáveis e não modificáveis para ocorrência de doenças cardiovasculares em pessoas vivendo com HIV.
DESCRITORES: Infecções por HIV; Síndrome da imunodeficiência adquirida; Doenças cardiovasculares; Promoção da saúde.

ASOCIACIÓN ENTRE HÁBITOS DE VIDA Y RIESGO CARDIOVASCULAR EN PERSONAS AFECTADAS POR HIV/SIDA

Objetivo: Analizar hábitos de vida y riesgo cardiovascular en personas afectadas por el virus de inmunodeficiencia humana, aplicando factores sociodemográficos, clínicos y conductuales. **Método:** Estudio transversal, cuantitativo, realizado en servicios especializados en atención de personas afectadas por el virus de la inmunodeficiencia humana, entre 2014 y 2016, en un municipio del interior del estado de São Paulo – Brasil. Se utilizó Puntuación de Riesgo de Framingham para estratificación del riesgo cardiovascular. **Resultados:** Participaron 340 personas. Existió asociación entre riesgo cardiovascular y variables: sexo (p=0,003), edad (p<0,001), escolarización (p=0,006), antecedentes familiares de Hipertensión (p=0,026), Diabetes (p=0,003), Infarto de Miocardio (p=0,004) y Accidente Cerebrovascular (p=0,003), tiempo de diagnóstico del VIH (p<0,001) y uso de antirretrovirales (p=0,003). **Conclusión:** Los resultados expresaron asociaciones entre el riesgo cardiovascular los y factores de riesgo modificables y no modificables para el surgimiento de enfermedades cardiovasculares en personas afectadas por el VIH.
DESCRIPTORES: Infecciones por VIH; Síndrome de Inmunodeficiencia Adquirida; Enfermedades Cardiovasculares; Promoción de la Salud.

[1]Undergraduate nursing student. Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo. Ribeirão Preto, SP, Brazil.
[2]Nurse. PhD student of the Graduate Program Enfermagem Fundamental da Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo Ribeirão Preto, SP, Brazil.
[3]Nurse. Master Student or the Graduate Program Enfermagem Fundamental of Escola de Enfermagem de Ribeirão Preto da Universidade de São Paulo. Ribeirão Preto, SP, Brazil.
[4]Nurse. PhD in Nursing. Professor, Escola de Enfermagem de Ribeirão Preto of Universidade de São Paulo. Ribeirão Preto, SP, Brazil.
[5]Nurse. PhD in Nursing. Professor, Escola de Enfermagem de Ribeirão Preto of Universidade de São Paulo. Ribeirão Preto, SP, Brazil.

Corresponding Author:
Renata Karina Reis.
Escola de Enfermagem de Ribeirão Preto.
Av. dos Bandeirantes, 3900, CEP 14040-902. Ribeirão Preto, SP, Brazil.
E-mail: rkreis@eerp.usp.br

● INTRODUCTION

More than 30 years after the beginning of the AIDS epidemic, and despite advances in treatment and preventive actions, human immunodeficiency virus (HIV) infection still persists on the world scenery as a serious and challenging public health problem.[1]

One of these new proposals, the antiretroviral therapy (ART), increased the life expectancy of people living with HIV/AIDS (PLHA) and hence had a positive impact on their daily lives. In many regions of the world, HIV infection, once considered an acute condition, has been redefined as a chronic disease. [2] Thus, comorbidities associated with the ART treatment itself or occurring as a consequence of greater survival rates have emerged in this population. [3] These individuals are more vulnerable to comorbidities depending on their lifestyle and risk behaviors like smoking, alcoholism, use of licit drugs and even obesity. [4]

According to the Joint United Nations Program on HIV/AIDS (UNAIDS-2016), up to December 2015 there were in average 36.7 million people living with HIV worldwide. Of these, 17 million had access to treatment by the end of the year. [5]

In Brazil, the Department of Sexually Transmitted Diseases (STDs), AIDS and Viral Hepatitis reported that the country had an average of 41,100 cases of AIDS in the past five years. From 1980 to June 2016, 842,710 cases were reported in Brazil, and despite the increased widespread of the disease across the country, the Southeastern and Southern regions concentrate most cases, with respectively 53.0% and 20.1% of the total cases identified.[6]

Concomitantly, the literature reports that HIV infection and the use of HAART trigger inflammatory responses and metabolic disorders, such as diabetes, due to insulin resistance; dyslipidemia, due to changes in circulating lipoproteins; lipodystrophy and chemokine production, indicating disorders in the vascular endothelium that contribute to the occurrence of atherosclerotic processes and, consequently, undesirable cardiovascular events such as hypertension and coronary diseases. [4,7-9]

Moreover, there have been significant changes over the past decades in the living conditions and health status of a fast growing elderly population that has changed their eating habits, and is more exposed to risk factors related to chronic non-communicable diseases, particularly cardiovascular diseases (CVD). [10]

The World Health Organization (WHO - 2003) classifies the risk factors associated with the etiology of noncommunicable diseases into two groups, one related to the individual, and the other to the community. The individual risk factors, in turn, are classified into three groups: general, those associated with lifestyle, and intermediate or biological. Age, gender, education and genetics are included in the first group. Smoking, poor diet and sedentary lifestyle are included in the second group. Hypertension, obesity and hypercholesterolemia are included in the third group. Socioeconomic, cultural, environmental and urbanization conditions are community risk factors. [11]

Socioeconomic conditions are important modifiable risk factors, since they influence behaviors and access to services and goods, which may contribute to the onset of cardiovascular complications. [12-13]

In 2013, the Brazilian Society of Cardiology revealed an alarming picture of the country: cardiovascular diseases cause almost 30% of deaths in Brazil. Although CVD reporting is not mandatory, their alarming rates indicate the need to address life habits, such as food, smoking, alcohol consumption and sedentary lifestyle, in order to prevent and guide the population to exercise more control over their own health.[14]

Regarding cardiovascular diseases in PLWHA, the traditional paradigm to explain increased risk includes the effect of HIV infection, as it has persistent immune and inflammatory activation, associated with the effects of ART, which causes dyslipidemia, ectopic accumulation of fat, diabetes or insulin resistance. Factors such as smoking, coinfection and drug use also deserve mention. [8] These effects and risk factors contribute to the formation of calcified coronary plaques, which will lead to future cardiac events. [3]

In view of the aforementioned, it is necessary to expand and improve knowledge about modifiable cardiovascular risk factors in PLHA on antiretroviral (ART) therapy, so that health professionals can provide advice and develop more effective care strategies to improve the quality of life of this population

more focused on health promotion and disease prevention of its clients.

Thus, the present study aimed to analyze the life habits and cardiovascular risk of people living with HIV/AIDS through sociodemographic, clinical and behavioral factors of this population.

● METHODOLOGY

Cross-sectional quantitative study carried out in specialized services targeted to PLHA, from 2014 to 2016, in a city in the inland of the state of São Paulo, Brazil, from 2014 to 2016.

Individuals living with HIV/AIDS, of both genders, who met the following inclusion criteria were invited to participate in the study: be aware of their serologic status, regardless of the stage of infection; aged 18 years or older; using ART for more than six months; individual in clinical-ambulatory follow-up in the hospital selected for the study and attending follow-up appointments during the study period.

Exclusion criteria were: individuals in confinement situations, such as incarcerated and institutionalized individuals, residents of nursing homes, pregnant women, and individuals who had already had symptoms of cardiovascular disease.

Data was collected through individual interviews in rooms of the outpatient clinic, before or after the medical and/or nursing appointment. Anthropometric (weight, height) measurements, blood pressure measurement and BMI calculation were performed after the interviews. Subsequently, clinical and laboratory data, such as TCD4 cell count, viral load, time elapsed since the diagnosis of the infection and treatment, and other biochemical tests was obtained from the patients' medical records.

Tools for cardiovascular risk assessment and sociodemographic, clinical and behavioral characterization were used to assess the variables of interest, as well as a tool for assessment of healthy eating, created by the Ministry of Health, through the National Food and Nutrition Policy. The content and format of the tool for sociodemographic, clinical and behavioral characterization was validated by four experts for determining its suitability to meeting the objectives of the study. After the assessment, adjustments were made in the tool to meet the experts' suggestions.

The "How is your diet?" test evaluates portions of the group of fruits, vegetables and grains, meat, legumes and milk, foods high in fats and sugars; type of fat used for cooking; intake of saturated fat and cholesterol level, and added salt; number of meals; water and alcoholic beverages intake; use of nutritional information from food labels as a guide to healthy eating; and practice of physical activity.

It is a self-administered tool with 18 items that assess the quality of the diet. The total score is obtained by the sum of all the questions, and each question has a different weight (minimum possible value 1, maximum possible value 58). The scores for healthy eating are as follows: below 28 points (low); 29-42 points (intermediate) and above 43 points, (satisfactory) for healthy eating.

The Framingham Risk Score (FRS) was used in the analysis of cardiovascular risk. The total score considers the following variables: gender, age, smoking, diabetes mellitus, total cholesterol, systolic blood pressure and diastolic blood pressure. The score obtained indicates a person's chance or probability of having a cardiovascular event in the next ten years and are classified in the following categories: low risk - probability of less than 10% of cardiovascular events in ten years; medium risk, probability of 10-20%; and high risk, more than 20%.

For data analysis, a database was built in a spreadsheet of Excel for Windows. After validation of the corrected spreadsheet, data was entered in the database using SPSS software, version 17.0.

Descriptive statistics and Chi-square and Fisher's exact tests were performed to analyze the association of life-related variables with risk for cardiovascular events. A p value <0.05 was obtained.

The project was approved by the Municipal Health Department of Ribeirão Preto and by the Research Ethics Committee of the Nursing School of Ribeirão Preto – Universidade de São Paulo, according to CAAE protocol no. 34497414.0.0000.5393.

Anonymity and confidentiality were ensured to all the participants. Prior to data collection, in a secluded room, they signed the free Informed Consent Form, according to the precepts of the National Health Council, through Resolution 466/2012.

● **RESULTS**

Three hundred forty (340) people living with HIV/AIDS participated in the study, 193 (57.9%) were men, 158 (46.5%) white and 228 (67%) were over 39 years of age. Of these 340 individuals, 280 (82.4%) earned a monthly income of less than three minimum wages, 147 (43.2%) were single and 239 (70.3%) reported heterosexual practice, according to data presented in Table 1.

Table 1 - Distribution of people living with HIV/aids, according to sociodemographic variables, Ribeirão Preto, SP, Brazil, 2014 – 2016

Variables	Category	n	%
Gender	Male	197	57.9
	Female	143	42.1
Age (in years)	< 39	112	32.9
	40 – 59	197	57.9
	> 60	31	9.1
Skin color	White	158	46.5
	Black	46	13.5
	Yellow	14	4.1
	Brown	121	35.6
	Indigenous	01	0.3
Education (years of schooling)	Less than 8 years	167	49.1
	More than 8 years	173	50.9
Marital Status	Single	147	43.2
	Married	120	35.3
	Separated	39	11.5
	Widowed	34	10
Income (minimum wage)	<3 wages	280	82.4
	>3 wages	60	17.6
Occupation	Active	193	56.8
	Inactive	147	43.2
Sexual orientation	Heterosexual	239	70.3
	Homosexual	82	24.1
	Bisexual	19	5.6
Total		**340**	**100**

Regarding sociodemographic variables and cardiovascular risk, there was a significant association with gender (p = 0.003), age (p = 0.000), education (p = 0.006) and employment status (p = 0.007), as shown in Table 2

Table 2 – Association between demographic variables, life habits and Framingham Risk Score of PLHA in the city of Ribeirão Preto, SP, Brazil, 2014 – 2016

	Variables	Framingham Risk Score (FRS)			P
		Low n (%)	Medium/ High n (%)	Total n (%)	
Sociodemographic	**Gender**				
	Male	139 (70.6)	58 (29.4)	197 (100)	**0.003†**
	Female	121 (84.6)	22 (15.4)	143 (100)	
	Age (years)				
	≤ 39	111 (70.6)	01 (0.9)	112 (100)	**< 0.001†**
	40 ⊢ 59	141 (71.6)	56 (28.4)	197 (100)	
	≥ 60	08 (25.8)	23 (74.2)	31 (100)	
	Education (in years of schooling)				
	<eight	117 (70.1)	50 (29.9)	167 (100)	**0.006***
	≥ eight	143 (82.7)	30 (17,3)	173 (100)	
	Income (minimum wages)				
	Up to three	211 (75.4)	69 (24.6)	280 (100)	**0.296**
	More than three	49 (81.7)	11 (18.3)	60 (100)	
	Employment status				
	Active	158 (81.9)	35 (18.1)	193 (100)	**0.007***
	Inactive	102 (69.4)	45 (30.6)	147 (100)	
Life habits	**Sedentary lifestyle**				
	Yes	167 (76.6)	51 (23.4)	218 (100)	**0.938**
	No	93 (76.2)	29 (23.8)	122 (100)	
	Smoking				
	Yes	77 (70.6)	32 (29.4)	109 (100)	**0.082**
	No	183 (79.2)	48 (20.8)	231 (100)	
	Alcohol				
	Yes	104 (76.5)	32 (23.5)	136 (100)	**1.000**
	No	156 (76.5)	48 (23.5)	204 (100)	
	Healthy Eating Score				
	Low	49 (80.3)	12 (19.7)	61 (100)	**0.154**
	Intermediate	183 (77.5)	53 (22,5)	236 (100)	
	Satisfactory	28 (65.1)	15 (34.9)	43 (100)	

* Chi-square test   † Fisher's exact test

Regarding cardiovascular risks and family history, there was a significant association between family history variables and Systemic Arterial Hypertension (SAH) (p = 0.026), Diabetes Mellitus (p = 0.003), Acute Myocardial Infarction 0.004) and Stroke (AVC) (p = 0.003).

Likewise, regarding HIV-related clinical variables, there was a significant association with the time elapsed since diagnosis (p = 0.000) and the time elapsed since the beginning of ART use (p = 0.003), as indicated in Table 3.

Table 3 - Association between general and HIV-related clinical variables and the Framingham Risk Score of PLHA in the city of Ribeirão Preto, SP, Brazil, 2014 – 2016

	Variables	Framingham Risk Score			p*
		Low n (%)	Medium/ High n (%)	Total n (%)	
General Clinical variables	**Family history for SAH**				
	No	79 (82.3)	17 (17.7)	96 (100)	
	Parents, siblings	135 (70.7)	56 (29.3)	191 (100)	
	aunts and uncles, grandparents, cousins	23 (95.8)	01 (4.2)	24 (100)	0.026†
	Other relatives	02 (100)	0 (0)	02 (100)	
	Unable to answer	21 (77.8)	06 (22.2)	27 (100)	
	Family history for DM				
	No	130 (79.8)	33 (20.2)	163 (100)	
	Parents, siblings	82 (68.3)	38 (31.7)	120 (100)	0.003*
	aunts and uncles, grandparents, cousins	36 (94.7)	02 (5.3)	38 (100)	
	Other relatives	12 (63.2)	07 (36.8)	19 (100)	
	Family history for IAM				
	No	175 (79.9)	44 (20.1)	219 (100)	
	Parents, siblings	45 (63.4)	26 (36.6)	71 (100)	
	aunts and uncles, grandparents, cousins	24 (85.7)	04 (14.3)	28 (100)	0.004*
	Other relatives	02 (66,7)	01 (33.3)	03 (100)	
	Unable to answer	14 (73.7)	05 (26.3)	19 (100)	
	Family history for stroke				
	No	165 (83.3)	33 (16.7)	198 (100)	
	Parents, siblings	57 (64)	32 (36)	89 (100)	
	aunts and uncles, grandparents, cousins	28 (77.8)	08 (22.2)	36 (100)	0.003*
	Other relatives	01 (50)	01 (50)	02 (100)	
	Unable to answer	09 (60)	06 (40)	15 (100)	
Clinical variables related to HIV	**Time elapsed since diagnosis of HIV** (years)				
	≤ 10	154 (84.2)	29 (15.8)	183 (100)	0.000†
	> 10	106 (67.5)	51 (32.5)	157 (100)	
	Time elapsed since the beginning of use of ART (years)				
	≤ 10	180 (81.4)	41 (18.6)	221 (100)	0.003*
	> 10	80 (67.5)	39 (32.8)	119 (100)	
	TCD4+ cells (cells/mm³)				
	< 200	241 (75.8)	77 (24.2)	318 (100)	0.258
	> 200	19 (86.4)	03 (13.6)	22 (100)	
	Viral load (copies/ml)				
	≤ 40	209 (76)	66 (24)	275 (100)	0.674
	> 40	51 (78.5)	14 (21.5)	65 (100)	

* Chi-square test† Fisher's exact test

● DISCUSSION

The profile of the epidemic changed over the years, imposing new challenges regarding HIV/aids-related preventive actions. [1] The study sample was predominantly composed of men over the age of 39, single and heterosexual. These data corroborate the findings of another study conducted in the city of Ribeirão Preto, in which the sample had similar sociodemographic characteristics. [15] Thus, the HIV epidemic occurs in the midst of processes of heterosexualization, internalization and pauperization, with emphasis on the expansion of the epidemics in smaller cities and in populations with lower purchasing power, respectively.

In addition, 56.8% of the participants were active in the labor market. However, 82.4% of the total number of participants reported living with a monthly income below three minimum wages and 49.1% had less than eight years of study. Likewise, there was a significant association between the variables education (p = 0.006) and occupation (p = 0.007) with the FRS. Thus, it is essential to discuss modifiable risk factors for CVD, taking into account the socioeconomic conditions of an individual.

The pauperization of the epidemic has aroused debate about the association of family income with cardiovascular diseases. Poverty-related factors may lead to adverse behaviors that influence risk factors, since economic inequality favors the deterioration of the quality of life, limiting access to services and goods, contributing to the onset of cardiovascular complications. [12-13]

Thus, the economic status of these clients and their access to resources and goods that promote health well-being must be considered. Therefore, the health care team must be aware of the importance of promoting more effective and integral care that considers cultural and socioeconomic aspects of each individual. Moreover, care should be targeted to health prevention, and not only to the treatment of a diagnosed condition.

It should also be stressed that he older individuals (≥ 60 years of age) had higher risk scores than the younger (p = 0.003). This fact deserves particular attention, as it concerns a non-modifiable variable. It is noteworthy that 57.9% of these individuals are men, since it is known that men often take longer than women to seek basic or preventive care services and end up needing specialized care due to worsening or complications of their illnesses. [15]

Therefore, it is necessary to develop educational and preventive strategies that attract these individuals to health services, and the clinical and outpatient follow-up of this population could be used for preventive interventions. Therefore, educational interventions should be targeted to the referred population.

Table 2 shows the association between (p <0.001) age and the Framingham Score Risk (FRS). This was corroborated by another study that showed increase in the incidence of acute myocardial infarction (AMI) in HIV/AIDS patients on antiretroviral therapy (ART)[16] from 0.3% to 1.07%.[16]· In this same study, it was also identified that individuals aged between 60 and 75 years had a more significant cardiovascular risk elevation, when compared with younger ones.[16]

It is known that aging alone increases the risk for chronic non-communicable diseases, including cardiovascular diseases. This reinforces the importance of actions targeted to modifiable factors in order to reduce risks and improve the quality of life of this population. . [17]

Association of family history of SAH (p = 0.026), DM (p = 0.003), AMI (p = 0.004) and stroke (p = 0.003) with cardiovascular risk was found in this study, confirming the relationship between heredity and CVD. These data corroborate a study carried out in China that found an association between the variables old age, excess weight and family history of cardiovascular diseases with higher cardiovascular risk in the PLHA group.[18] Therefore, health data from first degree relatives of any patient with CAD at an early age must be investigated..

Regarding the specific clinical variables of PLHA, in order to assess the risk factors for CVD in this population, it is necessary to include HIV infection among the other variables.[8] The association of the time elapsed since diagnosis of HIV with the Framingham Risk score (p <0.001) is consistent with data in the literature that report the time elapsed since the onset of HIV infection as a risk factor for CVD,

since it is known that the infection itself triggers constant immune activation and persistent inflammatory response in the vascular endothelium, activated by the production of chemokines, adhesion molecules, monocytes and T lymphocytes, which initiate processes that contribute substantially to an atherogenic process and/or metabolic disorders such as type 2 diabetes and dyslipidemia. [7-9]

Thus, cytokines such as Interleukin-6 (IL-6), Tumor Necrosis Factor Alpha (TNF-□) and C-reactive protein (CRP) have been reported to occur at higher levels in PLHIV and in individuals with severe immunosuppression, and are related to the development of atherosclerosis, CVD, immunosenescence and mortality caused by HIV-related non-comorbidities.[4]

The association between the time spent in ART and CVD risk was also statistically significant (p = 0.003). However, the combination treatment/virus produces effects on the patient's body. The effects of HAART, alterations in lipid metabolism can lead to metabolic alterations such as hypertriglyceridemia and hypercholesterolemia that are risk factors for cardiovascular disease.[19] In addition, endothelial dysfunction is rather a consequence of metabolic disorders that can cause deleterious effects on the heart.[9]

In the present study, around 23% of the participants had medium/high risk of developing CVD according to the FRS, which is similar to the findings of another study where one third of the sample had more than 10% risk of developing CVD over the next 10 years. [3] It is understood that this population has a potential risk for CVD.

Thus, the FRS is a low-cost, practical tool that can be easily used during the consultation. So, it should be implemented in systematized and integral care, [21], with the purpose of reducing, preventing and detecting on a timely basis the onset of CVD.

Therefore, all persons living with HIV/AIDS should be screened for cardiovascular risk factors, such as hypertension and dyslipidemia, and receive advice about healthy eating habits, physical exercise, and smoking cessation. [22]

Therefore, training and awareness raising of general practitioners is needed, because although Specialized Care Services (SAE) for people living with HIV count on a multidisciplinary team, there are no reports that their actions are implemented in an interdisciplinary way .[23]

Thus, the most effective care strategies should be discussed in an attempt to improve the quality of life of this population, with focus not only on problem solving, but also on the health promotion and prevention of its clients.

Moreover, although variables such as sedentary lifestyle, smoking, alcohol, healthy eating, TCD4 cell counts and viral load were not significantly associated with CVD in this study, according to the FRS, we reaffirm the need to include them in the integral and routine assessment of people living with HIV/AIDS, for the implementation of preventive measures, as these variables are considered classic risk factors for the development of cardiovascular diseases.

● **CONCLUSION**

Assessment of sociodemographic, clinical, behavioral and cardiovascular risk factors revealed that gender, age, education, employment status, family history for SAH, DM, AMI, stroke, time elapsed since HIV diagnosis and time elapsed since the beginning of antiretroviral therapy (ART) showed statistically significant association with CVD, according to the FRS.

In view of the aforementioned, the present study contributes to the development of a new perspective on integral care for people living with HIV/AIDS. It is also evident that PLHA need interventions that address their lifestyles as risk factors for the development of CVD. Health professionals should encourage changes in eating habits, promotion of physical activity, encourage cessation of smoking and alcohol use and make follow-up visits, address the importance of weight, blood glucose and blood pressure control, as well as of the control of blood cholesterol levels, among other aspects, to encourage the individuals to exercise more control over their health-disease process.

One limitation of this study was its cross-sectional design that did not allow the establishment of causal relationships and monitoring of patients over time. In addition, the findings comprise the identification of risk factors for cardiovascular diseases in people living with HIV on antiretroviral therapy.

● **ACKNOWLEDGMENTS**

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