DOI: https://doi.org/10.17921/2447-8938.2022v24n4p277-282

Health Condition of HIV Patients: Evaluation of Metabolic Syndrome and Cardiovascular Risk

Condição de Saúde do Paciente com HIV: Avaliação da Síndrome Metabólica e Risco Cardiovascular

Beatriz Toyama Watanabe[a]; Izabella Bernardes Araújo[a]; Hélio Ranes de Menezes Filho[b]; David Michel de Oliveira[b]; Eduardo Vignoto Fernandes*[c]; Luiz Fernando Gouvêa-e-Silva[c]

[a]Universidade Federal de Jataí, Scientific, Technological and Innovation Initiation Program. GO, Brazil.
[b]Universidade Federal de Jataí, Special Academic Unit of Health Sciences. GO, Brazil.
[c]Universidade Federal de Jataí, Laboratory of Human and Comparative Anatomy. GO, Brazil.
*E-mails: eduardovignoto@ufj.edu.br.

Abstract

The evolution of antiretroviral therapy having improved the life expectancy of people infected with human immunodeficiency virus (HIV). On the other hand, the collaterals drugs effects have increased the development of metabolic syndrome (MS) and the cardiovascular disease risk (CDR), enhance the mortality in that population. Therefore, the aim of this study was to analyze MS and CDR in people living with HIV (PLHIV), as well as their relationship with the clinical and sociodemographic profile. The study evaluated 52 medical records of patients newly diagnosed with HIV infection. Sociodemographic, clinical information and data for the evaluation of the MS and CDR information were collected. In the results the prevalence of male patients (69.2%), single (67.3%), with employment link (73.1%) was observed. Regarding clinical variables, patients who had not started antiretroviral therapy prevailed (84.6%), with CD4+ T lymphocytes >200 cells/mm³ (67.3%), with detectable viral load (82.7%), in addition to 38.5% already having Aids. Low CDR was more frequent (92.3%), as well as 11.5% had MS, having a positive relationship with high abdominal circumference (p=0.001). Furthermore, low HDL-c low was recognized as the most changed factor (42.4%) and patients with up to a factor for MS evaluation predominated (63.5%). The data allow us to conclude that the PLHIV evaluated in the present study have a low CDR and considerable presence of MS, however, an association between MS and abdominal obesity was observed, with low HDL-c values being the main altered factor among the patients.

Keywords: Acquired Immunodeficiency Syndrome. Heart Disease Risk Factors. Dyslipidemias. HDL Colesterol. Abdominal Obesity.

Resumo

A evolução dos antirretrovirais tem melhorado a expectativa de vida das pessoas infectadas pelo human immunodeficiency virus (HIV). Por outro lado, os efeitos colaterais dos medicamentos têm elevado o surgimento da síndrome metabólica (SM) e o risco cardiovascular (RCV), aumentando a mortalidade nessa população. Assim, o objetivo do presente estudo foi analisar a SM e o RCV em pessoas vivendo com HIV (PVHIV), bem como, sua relação com o perfil clínico e sociodemográfico. O estudo avaliou 52 prontuários de pacientes recém diagnosticados pelo HIV. Foram coletadas informações sociodemográficas, clínicas e dados para a avaliação da SM e do RCV. Nos resultados foi observado um predomínio de pacientes do sexo masculino (69,2%), solteiros (67,3%) e com vínculo empregatício (73,1%). Sobre as variáveis clínicas, prevaleceram pacientes que não iniciaram o uso de terapia antirretroviral (84,6%), com linfócitos T CD4+ >200 células/mm³ (67,3%), com carga viral detectável (82,7%), além de 38,5% já estarem com Aids. Teve-se com maior frequência o RCV baixo (92,3%), bem como 11,5% apresentaram SM, tendo uma relação positiva com a circunferência abdominal elevada (p=0,001). Ademais, identifica-se que o HDL-c baixo foi o fator mais alterado (42,4%) e predominaram pacientes com até um fator para a avaliação da SM (63,5%). Os dados permitem concluir que as PVHIV avaliadas no presente estudo possuem um baixo RCV e considerável presença de SM, no entanto, foi observada associação entre a SM com a obesidade abdominal, sendo os baixos valores de HDL-c o principal fator alterado entre os pacientes.

Palavras-chave: *Síndrome da Imunodeficiência Adquirida. Fatores de Risco de Doenças Cardíacas. Dislipidemias. Colesterol HDL. Obesidade Abdominal.*

1 Introduction

In Brazil, in 2021, more than 32 thousand people infected with *human immunodeficiency virus* (HIV) were diagnosed, with more than 3.2 thousand in the central-western region of the country alone, in addition to almost 30 thousand cases of *acquired immunodeficiency syndrome* (AIDS). this represents a detection rate of 14.1 people per 100 inhabitants. In addition, it was identified that in the same year there was a record of more than 10 thousand deaths in Brazil, and of these, 662 only in the central-west region. Therefore, it is worth noting that the state of Goiás has a detection rate of 13.1 per 100 thousand inhabitants, close to the national average, and the highest number of deaths due to HIV in its demographic region, of which 257 deaths in 2021, which is equivalent to 4.8 deaths per 100 thousand inhabitants[1,2].

In general, studies show that HIV-infected patients have a high number of risk factors for cardiovascular diseases[3-5]. Even with early diagnosis and prevention of AIDS evolution, antiretroviral therapy (ART) has side effects, which are related to cardiovascular diseases and metabolic syndrome, which are one of the main causes of death of these patients[6,7]. Therefore, with the increase in population aging and the

reduction of AIDS deaths, it was noticed that the number of global deaths due to cardiovascular diseases associated with HIV tripled between 1990 and 2015[5].

According to Touloumi et al.[8] when compared to cardiovascular risk (CVR) among people not infected with HIV with PVHIV, there is an increased risk of PVHIV developing cardiovascular diseases. In addition, patients using ART have higher levels of total cholesterol, abdomen circumference [3] and low HDL-c[9]; conditions directly related to a higher RCV and to the development of metabolic syndrome (MS) when compared to patients who are virgins of ART[10].

In this sense, it is worth noting that changes in abdominal circumference (> 94 cm in men and > 90 cm in women), triglycerides (> 150 mg/dl), HDL-c (< 40 mg/dl), blood pressure (> 140 / 90 mmHg) and blood glucose (> 100 mg/dl fasting) are factors that predispose the development of MS[11]. As well as the above-mentioned factors for MS, smoking[4] and family history for cardiovascular diseases are associated factors for CVR[12] that, when not controlled, can cause acute myocardial infarction, stroke, heart failure[5], pulmonary hypertension, venous thrombosis and coronary atherosclerosis[13]. Therefore, it is extremely important to control the factors that lead to MS and consequently the CVR, since both are closely linked and one causes the aggravation of the other[14].

Therefore, the aim of this study was to analyze MS and CDR in people living PLHIV, as well as their relationship with the clinical and sociodemographic profile.

2 Material and Methods

This study is characterized as descriptive, cross-sectional and quantitative[15]. Data collection was carried out in the medical records of patients followed up at the Center for Testing and Counseling and Specialized Assistance Service (CTA/SAE), in the city of Jataí, Goiás, Brazil.

The study population consisted of 81 medical records of HIV-infected patients, linked to the CTA/SAE of Jatai. For this purpose, the following inclusion criteria were respected: started (by diagnosis) or resumed his or her follow-up (by transfer or abandonment) in the CTA/SAE of Jataí in the year 2018; have diagnosis for HIV infection; the medical record should contain at least information such as the date of diagnosis, date of birth and gender. On the other hand, exclusion criteria were adopted: minors under 18 years of age (1 excluded); medical records with compromised information (1 excluded); medical records with no data for the evaluation of metabolic syndrome or cardiovascular risk (27 excluded). Thus, the sample consisted of 52 patient records.

It is noteworthy that this study was approved by the Research Ethics Committee involving Human Beings of the Federal University of Jataí, under CAAE: 09715419.3.0000.8155.

A spreadsheet was prepared in the Excel® program to perform data collection, which contained sociodemographic information (date of entry to the CTA/SAE, gender, age, skin color, marital status, and gender, sexual choice, city of residence, education, alcoholism, smoking and illicit drug use), clinics (date of diagnosis for HIV infection, type of CTA/SAE care, type of HIV exposure, immunodeficiency situation, T CD4+ - LTCD4+ lymphocyte count, viral load and treatment with ART) and the data necessary for the evaluation of metabolic syndrome and CVR (abdominal circumference, blood pressure, triglycerides, high-density lipoprotein - HDL-c, glycemia and total cholesterol).

The Framingham risk score was adopted for the classification of patients regarding CVR, following the guidelines of Sposito et al.[16]. The classification of patients regarding the presence of MS occurred confirming the criteria recommended by NCEP-ATP III[17]. In addition, the Segatto et al[18] cut-offs were used to count LTCD4+ (< ou ≥ 200 cells/mm^3) and viral load (≥ 50 copies – detectable or < 50 copies – undetectable).

Finally, for the classification as to the AIDS situation, the patient should present or have presented a history of opportunistic infection or a LTCD4+ count of less than 200 cells/mm^3 or cancer[19].

Data were organized and analyzed using descriptive statistics (minimum, maximum, median, interquartile interval (IIQ), absolute and relative frequency). In addition, Shapiro-Wilk normality test was applied for age and a non-parametric distribution was observed. Thus, the Mann-Whitney Test was used to compare age between sexes. The associations were performed by Fisher's Exact Test and by simple logistic regression. The tests were carried out with the support of the BioEstat 5.3 program, adopting the value of $p < 0.05$.

3 Results and Discussion

The sample presented a median age of 31 years (minimum = 18 years; maximum = 69 years; IIQ = 25 - 40 years). In males, the age was 31 years (minimum = 19 years; maximum = 57 years; IIQ = 25 - 40 years) and in females 32 years (minimum= 18 years; maximum= 69 years; IIQ = 28 - 39 years), with no difference among them (p = 0.713).

Males predominated with 69.2% (n = 36), as well as all sociodemographic characteristics are presented in Table 1. It was identified that brown skin color prevailed (40.4%; n = 21), single (67.3%; n = 35) and heterosexual (48.1%; n = 25) patients. In addition, 48.1% (n = 25) declared to be a resident of Jataí and 73.1% (n = 38) had employment bond.

Table 1 - Distribution of people living with HIV regarding sociodemographic characteristics

Variables	All	Male	Female
	n(%)	n(%)	n(%)
Skin Color			
White	27(51.9)	20(55.6)	7(43.8)
Black	4(7.7)	3(8.3)	1(6.3)
Brown	21(40.4)	13(36.1)	8(50.0)
Marital Status			
Married	16(30.8)	8(22.2)	8(50.0)
Single	35(67.3)	28(77.8)	7(43.8)
NI	1(1.9)	0(0)	1(6.3)
Sexual Preference			
Bisexual	2(3.8)	2(5.6)	0(0)
Heterosexual	25(48.1)	12(33.3)	13(81.3)
Homosexual	26(30.8)	15(41.7)	1(6.3)
Transsexual	1(1.9)	1(2.8)	0(0)
NI	8(15.4)	6(16.7)	2(12.5)
Residence			
Aporé	1(1.9)	0(0)	1(6.3)
Caiapônia	5(9.6)	3(8.3)	2(12.5)
Chapadão do Céu	1(1.9)	1(2.8)	0(0)
Jataí	25(48.1)	17(47.2)	8(50.0)
Mineiros	16(30.8)	13(36.1)	3(18.8)
Santa Rita do Araguaia	4(7.7)	2(5.6)	2(12.5)
Schooling			
Complete Elementary School	0(0)	0(0)	0(0)
Incomplete Elementary School	7(13.5)	4(11.1)	3(18.8)
Complete High School	10(19.2)	8(22.2)	2(12.5)
Incomplete High School	1(1.9)	1(2.8)	0(0)
Complete Higher Education	6(11.5)	5(13.9)	1(6.3)
Incomplete Higher Education	293.8)	2(5.6)	0(0)
NI	26(50.0)	16(44.4)	10(62.5)
Employment Bond			
Yes	38(73.1)	29(80.6)	9(56.3)
No	13(25.0)	7(19.4)	6(37.5)
Retired	1(1.9)	0(0)	1(6.3)
Alcoholism			
Yes	17(32.7)	12(33.3)	5(31.3)
No	35(67.3)	24(66.7)	11(68.7)
Smoking			
Yes	15(28.8)	10(27.8)	5(31.3)
No	37(71.2)	26(72.2)	11(68.7)
Use of Illicit Drugs			
Yes	11(21.2)	8(22.2)	3(18.8)
No	41(78.8)	28(77.8)	13(81.2)

Legend: NI - Not informed.
Source: the authors

This study highlights the characterization of MS and CVR in PLHIV, as well as their relationship with the sociodemographic and clinical profile. Given the above, it is possible to identify that the present study was composed of 52 medical records of patients treated at CTA/SAE of Jataí, with the predominance of males composing more than two thirds of the sample, which is in accordance with data from the literature[8,20,21]. This is due to the sense of superiority of the male sex, which according to Philbin et al.[22] represent their masculinity by increasing the number of sexual partners, and most do not use condoms[23,20], which favors the risk of HIV contamination.

Table 2 presents the distribution of PLHIV regarding the clinical profile. A higher frequency was found for diagnostic care (84.6%; n = 44), for sexual intercourse as a type of exposure (96.2%; n = 50), for non-use of ART (84.6%; n = 44), for the count of LTCD4+ ≥ 200 cells/mm^3 (67.3%; n = 35) and detectable viral load (82.7%; n = 43). In addition, 38.5% (n = 20) of PLHIV presented Aids as an immunodeficiency situation.

Table 2 - Distribution of people living with HIV regarding clinical characteristics

Variables	All	Male	Female
	n(%)	n(%)	n(%)
Type of care at CTA/ SAE			
Through diagnosis	44(84.6)	33(91.7)	11(68.8)
Start of referral	8(15.4)	3(8.3)	5(31.2)
Type of exposure			
Accident with biological material	1(1.9)	1(2.8)	0(0)
Sexual intercourse	50(96.2)	35(97.2)	15(93.8)
Vertical transmission	1(1.9)	0(0)	1(6.3)
Use of ART			
Yes	8(15.4)	3(8.3)	5(31.2)
No	44(84.6)	33(91.7)	11(68.8)
Immunodeficiency situation			
HIV	32(61.5)	21(58.3)	11(68.7)
Aids	20(38.5)	15(41.7)	5(31.3)
T CD4+ lymphocytes			
<200 cells/mm^3	12(23.1)	9(25.0)	3(18.8)
≥200 cells/mm^3	35(67.3)	23(63.9)	12(75.0)
NI	5(9.6)	4(11.1)	1(6.3)
Viral load			
Undetectable	8(15.4)	4(11.1)	4(25.0)
Detectable	43(82.7)	32(88.9)	11(68.8)
NI	1(1.9)	0(0)	1(6.3)

Legend: CTA/SAE, Testing and Counseling Center and Specialized Assistance Service; ART, antiretroviral therapy; NI, not informed.
Source: Resource data.

Regarding the clinical characteristics, more than 80% of the patients were treated at CTA/SAE because of the diagnosis of HIV infection. As well, 96.2% of the sample was exposed to the virus through sexual intercourse and 38.5% of the PLHIV already had AIDS, as well as in the studies by Watanabe et al.[21]. These data represent a late diagnosis, due to the fact that society maintains a mistaken thought of HIV and Aids as a serious, dangerous and deadly disease that affects only "the other"[24]. This generates a feeling of invulnerability, leading to non-prevention during sexual intercourse, as well as the late diagnosis of the virus, since these people do not identify the risk

they are exposed to. Consequently, they only seek health services in more severe stages of the disease, when symptoms arise [24].

Because they were recently diagnosed, 84.6% of PLHIV did not use ART. However, two-thirds of the patients had LTCD4+ a above 200 cells/mm³, and 80% of the sample had the viral load detectable. According to Oliveira et al.[25] and Rossi et al.[26], this is due to PLHIV being at the beginning of the infection, in the acute phase of the disease. Thus, with a late diagnosis and consequently before the inclusion of ART, it is observed that the vasoactive cardiovascular hormones, N-terminal pro-hormone of the natriuretic peptide, present a significant correlation with the absolute count of LTCD4+ , as well as with the viral load. Therefore, there is a subclinical impact of HIV on myocardial function, favoring the development of cardiovascular diseases and can be reversed with the beginning of ART and with viral suppression [27].

Table 3 presents the distribution of PLHIV for MS and CVR and their associated factors. In general, there was a higher frequency for low CVR (92.3%; n = 48) and low frequency for the presence of MS (11.5%; n = 6), besides this presence being only in men. It is noticed that the low HDL-c was the most changed factor (42.4%; n=28) and the PVHIV with up to a factor for the MS evaluation were also the most frequent (63.5%, n=33). In addition, the logistic regression performed to verify the association between MS and CVR with the variables presented in Table 3 did not show significance, except for PVHIV who have high abdominal circumference, since they have 23.7 times more chance of presenting metabolic syndrome (p = 0.006; CI95% = 2.43 - 231.83).

Table 3 - Distribution of people living with HIV regarding metabolic syndrome and cardiovascular risk

Variables	All	Male	Female
	n(%)	n(%)	n(%)
Cardiovascular Risk			
Low	48(92.3)	34(94.4)	14(87.6)
Mild	3(5.8)	2(5.6)	1(6.2)
High	1(1.9)	0(0)	1(6.2)
Metabolic Syndrome			
Yes	6(11.5)	6(16.7)	0(0)
No	46(88.5)	30(83.3)	16(100)
Factors of metabolic syndrome			
High abdominal circumference	14(21.2)	8(17.8)	6(28.6)
High triglycerides	14(21.2)	9(20.0)	5(23.8)
Low HDL-c	28(42.4)	20(44.4)	8(38.1)
High blood pressure	6(9.1)	4(8.9)	2(9.5)
High blood glucose	4(9.1)	4(8.9)	0(0)
Number Factors for metabolic syndrome			
0	12(23.1)	10(27.8)	2(12.4)
1	21(40.4)	14(38.8)	7(43.8)
2	13(25.0)	6(16.7)	7(43.8)
3	6(11.5)	6(16.7)	0(0)

Legend: HDL-c, high density lipoprotein.
Source: Resource data.

When analyzing MS and CVR, it is identified in this study a predominance for low CVR and absence of MS in PLHIV. Therefore, according to Appiah et al.[3] and Lu et al.[28], this is explained, because 52% of patients at the beginning or virgins of ART present two or more risk factors for developing cardiovascular diseases; whereas, 61% of the patients using ART have the same CVR[3], in addition to a significant increase in the prevalence of MS[28].

In the present study, of the five factors that predispose to the development of MS, it was observed that almost half of the sample had up to one factor for the evaluation of MS, and low HDL-c was the most found. Followed by high abdominal circumference and elevated triglyceride levels, which is also identified in other studies[14,28]. These factors favor the increase in abdominal fat and the reduction of peripheral fat, which characterizes lipodystrophy syndrome in PVHIV, favoring metabolic disorders and may be associated with an increase in CVR[9].

Table 4 shows the association of MS and CVR with sociodemographic and clinical characteristics. It is noteworthy that low or moderate/high cardiovascular risk was not associated with any of the analyzed variables. Whereas the presence of MS was positively associated with elevated abdominal circumference (p = 0.001).

Table 4 - Association of cardiovascular risk with the clinical and sociodemographic variables of people living with HIV

Variables	Cardiovascular risk			Metabolic syndrome		
	Low	Mild/ High	p	Yes	No	p
	n(%)	n(%)		n(%)	n(%)	
Sex						
Male	34(70.8)	2(50.0)	0.578	6(100)	30(65.2)	0.160
Female	14(29.2)	2(50.0)		0(0)	16(34.8)	
Age						
≤30 years	25(52.1)	0(0)	0.111	3(50.0)	20(43.5)	1.000
>30 years	23(47.9)	4(100)		3(50.0)	26(56.5)	
Skin Color						
White	24(50.0)	3(75.0)	0.611	5(83.3)	22(47.8)	0.192
Brown + Black	24(50.0)	1(25.0)		1(16.7)	24(52.2)	
Marital Status						
Married	16(34.0)	0(0.0)	0.295	2(33.3)	14(31.1)	0.991
Single	31(66.0)	4(100)		4(66.7)	3(68.9)	
Sexual Preference						
Heterosexual	23(54.8)	2(100)	0.497	3(75.0)	22(55.0)	0.622
Homo/Bi/ Transsexual	19(45.2)	0(0)		1(25.0)	18(45.0)	
Employment Bond						
Yes	35(72.9)	3(75.0)	1.000	6(100)	32(69.6)	0.174
No/Retired	13(27.1)	1(25.0)		0(0)	14(30.4)	
Alcoholism						
Yes	16(33.3)	1(25.0)	1.000	2(33.3)	15(32.6)	0.988
No	32(66.7)	3(75.0)		4(66.7)	31(67.4)	
Smoking						
Yes	13(27.1)	2(50.0)	0.569	0(0)	15(32.6)	1.000
No	35(72.9)	2(50.0)		6(100)	31(67.4)	

Continue...

...continued.

Variables	Cardiovascular risk			Metabolic syndrome		
	Low	Mild/ High	p	Yes	No	p
Use of illicit drugs						
Yes	11(22.9)	0(0)	0.566	2(33.3)	9(19.6)	0.594
No	37(77.1)	4(100)		4(66.7)	37(80.4)	
Care at CTA/SAE						
Through diagnosis	41(85.4)	3(75.0)	0.489	5(83.3)	39(84.8)	0.960
Transfer/ Drop-out	7(14.6)	1925.0)		1(16.7)	7(15.2)	
Immunodeficiency situation						
HIV	31(65.6)	1(25.0)	0.285	3(50.0)	29(63.0)	0.664
Aids	17(35.4)	3(75.0)		3(50.0)	17(37.0)	
Abdominal circumference						
Adequate	36(75.0)	3(75.0)	1.000	1(16.7)	38(82.6)	0.001
High	12(25.0)	1(25.0)		5(83.3)	8(17.4)	
T CD4+ lymphocytes						
<200 cell/ mm^3	11(25.6)	2(50.0)	0,634	2(33.3)	10(24.4)	0.634
≥200 cell/ mm^3	32(74.4)	2(50.0)		4(66.7)	31(75.6)	
Viral load						
Undetectable	7(14.9)	1(25.0)	0.990	2(33.3)	6(13.3)	0.233
Detectable	40(85.1)	3(75.0)		4(66.7)	39(86.7)	
Metabolic syndrome						
Yes	5(10.4)	1(25.0)	0.393	-	-	-
No	43(89.6)	3(75.0)		-	-	

Legend: CTA/SAE, Testing and Counseling Center and Specialized Assistance Service. HIV, *human immunodeficiency virus;* Aids, *acquired immunodeficiency syndrome*
Source: Resource data.

According to Nix and Tien[11], MS is an extremely relevant factor in the predisposition of CVR. However, when it comes to the relationship of CVR with clinical and sociodemographic variables, no positive association was obtained. However, it is worth noting that, over time, there will be a significant increase in the average age of people with HIV using ART, and this will increase the chances of PLHIV being diagnosed with some cardiovascular disease[5].

In addition, the LTCD4+ count above 350 cell/mm^3 indicates a 2.3 times higher risk of developing more than one CVR factor[3]. This is because patients undergoing treatment have a good immune contribution, since it decreases the viral load, to the point of being undetectable, leading to metabolic changes such as cholesterol and HDL-c, since the virus was controlled and consequently there is a lower waste and catabolism related to HIV. On the other hand, the non-use of ART, even though does not have the metabolic effects, is also not favorable. This is because there is an increase in viral load and consequent depletion of defense cells, which allows the individual to develop AIDS, implying for his or her death. Therefore, this is explained since with weakened immunity, the organism is subject to opportunistic infections that can lead to infamous responses and consequently to cardiovascular diseases such as infectious myocarditis, acute myocardial infarction, heart failure and ischemic stroke[5].

For this study, the use of electronic and manual medical records was limited as a means of data collection. Therefore, the lack or errors of data filling regarding the clinical and sociodemographic parts caused the absence of some information from all patients of the study, a condition that was responsible for the exclusion of patients (medical records) from the sample or generated the uninformed data.

4 Conclusion

Based on the above data, it can be concluded that the PVHIV of the present study has a low frequency for MS and a low RCV. In addition, there was almost no association of MS and CVR with clinical and sociodemographic profiles, and abdominal circumference was the only one to have a positive relationship with metabolic syndrome. Moreover, the study points out that among the five factors that favor the manifestation of MS, low HDL-c was the factor that most presented alterations by the patients.

Thus, it is recommended that the PVHIV of CTA/SAE of Jataí, because they are newly diagnosed, seek the appropriate and continuous clinical treatment, to avoid the development of cardiovascular diseases and MS. Therefore, they may have a longer life and with a higher quality of life, even in coexistence with the virus.

References

1. Goiás. Secretaria do Estado da Saúde de Goiás. Bol Epidemiol 2019.
2. Brasil. Ministério da Saúde. Boletim Epidemiológico 2021. Brasília: MS; 2021.
3. Appiah LT, Sarfo FS, Huffman MD, Stiles JK. Cardiovascular risk factors among Ghanaian patients with HIV: a cross-sectional study. Clin Cardiol 2019:1-7. doi: https://doi.org/10.1002/clc.23273
4. Hyle EP, Bekker LG, Martey EB, Huang M, Xu A, Parker RA, et al. Cardiovascular risk factors among ART-experienced people with HIV in South Africa. J Int AIDS Soc 2019,22:e25274. doi: https://doi.org/10.1002/jia2.25274
5. So-Armah K, Benjamin LA, Bloomfileld GS, Feinstein MJ, Hsue P, Njuguna B, Freiberg MS. HIV and cardiovascular disease. Lancet 2020,7:e279-293. doi: https://doi.org/10.1016/S2352
6. Farahani M, Mulinder H, Farahani A, Marlink R. Prevalence and distribution of non-AIDS causes of death among HIV-infected individuas receiving antiretroviral therapy: a systematic review and meta-analysis. Int J STD AIDS 2016,0(0):1-15. doi: https://doi.org/10.1177/0956462416632428
7. Bhatta DN, Adhikari, R, Karki S, Koirala AK, Wasti SP. Life expectancy and disparities in survival among HIV-infected people receiving antiretroviral therapy: an observational cohort study in Kathmandu, Nepal. BMJ Global Health 2019,4:e001319. doi: http://doi.org/10.1136/bmjgh-2018-001319
8. Touloumi G, Kalpourtzi N, Papastamopoulos V, Adamis G, Antoniadou A, et al. Cardiovascular risk factors in HIV

infected individuals: Comparison with general adults control population in Greece. Plos One 2020,15(3):e02330730. doi: https://doi.org/10.1371/journal.pone.0230730 M

9. Pao V, Lee GA, Grunfeld C. HIV therapy, metabolic syndrome, and cardiovascular risk. Current Atherosclerosis Reports 2008,10(1):61-70.

10. Policarpo S, Rodrigues T, Moreira AC, Valadas E. Cardiovascular risk in HIV-infected individuals: A comparison of three risk prediction algorithms. Rev Port Cardiol 2019,38(7):463-70. doi: https://doi.org/10.1016/j.repce.2018.10.012

11. Nix LM, Tien PC. Metabolic syndrome, diabetes, and cardiovascular risk in HIV. Curr HIV/AIDS Rep 2014,1:271-718. doi: http://doi.org/10.1007/s11904-014-0219-7

12. Roozen GVT, Vos AG, Tempelman HA, Venter, WDF, Grobbee DE, Scheuermaier K, Klipstein-Grobusch K. cardiovascular disease risk and its determinants in people living with HIV across diferente settings in South Africa. HIV Med 2019. doi: https://doi.org/10.1111/hiv.12831

13. Feinstein MJ, Hsue, OY, Benjamin LA, Bloomfield GS, Currier JS, Freiberg MS, Grinspoon SK, Longenecker CT, Post, WS. Characteristics, prevention, and management of cardiovascular disease in people living with HIV. Circulation 2019;140:e98–e124. doi: http://doi.org/10.1161/CIR.0000000000000695

14. Masyuko SJ, Page ST, Kinuthia J, Osoti AO, Polyak SJ, Otieno FC. Metabolic syndrome and 10-year cardiovascular risk among HIV-positive and HIV-negative adults: a cross-sectional study. Medicine 2020,99(27). doi: http://doi.org/10.1097/MD.0000000000020845

15. Vieira JGS. Metodologia de pesquisa científica na prática. Curitiba: Fael 2010:152. [acesso em 20 jan 2022]. Disponível em <https://aedmoodle.ufpa.br/pluginfile.php/248784/mod_resource/content/1/LIVRO-Metodologia%20de%20Pesquisa%20Cient%C3%ADfica%20na%20pr%C3%A1tica.pdf>.

16. Sposito AC. IV Diretriz Brasileira para Prevenção de Dislipidemia e Aterosclerose. Arq Bras Cardiol 2007,88:2-19.

17. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome. An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation 2005,112(17):2735-2752. doi: https://doi.org/10.1161/CIRCULATIONAHA.105.169404

18. Segatto AFM, Freitas Junior IF, Santos VR, Aalves KCP, Barbosa DA, Portelinha Filho AM, Monteiro HL. Lipodytrophy in HIV/Aids patients with different levels of physical activity while on antiretroviral therapy. Rev Soc Bras Med Tro 2011,44(4):420-4. doi: https://doi.org/10.1590/S0037-86822011000400004

19. Scherzer R, Heymsfield SB, Lee D, Powderly WG, Tien PC, Bacchetti P, et al. Decreased limb muscle and increased central adiposity are associated with 5 year all cause mortality in HIV infection. AIDS 2011,25:1405-14. doi: http://doi.org/10.1097/QAD.0b013e32834884e6

20. Serra MAAO, Milhomen AB, Oliveira SB, Santos, FAAS, Silva RA, Costa ACPJ, et al. Sociodemographic and behavioral factors associated with HIV vulnerability according to sexual orientation. Hindawi AIDS Research and Treatment 2020,2020:1-7. doi: https://doi.org/10.1155/2020/5619315

21. Watanabe BT, Beretta OCP, Silva EF, Assy JGPL, Fernandes EV, Gouvêa-e-Silva LF. Evaluation of the biochemical, hematological and immunological profile in patients with a recent diagnosis of HIV in Santarém Reference Center, Pará, Brasil. Rev Med 2022,10(3):e189140. doi: http://dx.doi.org/10.11606/issn.1679-9836.v101i3e-189140

22. Philbin MM, Parker CM, Parker RG, Wilson PA, Garcia J, Hirsch JS. Gendered social institutions and preventive healthcare seeking for black men who have sex with men: The promise of biomedical HIV prevention. Arch Sexual Behavior 2018,47:2091-2100. doi: https://doi.org/10.1007/s10508-018-1211-x

23. Rios LF, Paiva V, Brignol S. Passivos, ativos and versáteis: men who have sex with men, sexual positions and vulnerability to HIV infection in the northeast of Brasil. Culture Health Sexuality 2018. doi: http://doi.org/10.1080/13691058.2018.1491063

24. Ribeiro LCS, Giami A, Freitas MIF. Representation of people living with HIV: influences on the late diagnosis of infection. Rev Esc Enferm USP 2019,53:e03439. doi: https://doi.org/10.1590/S1980-220X2018009703439

25. Oliveira LS, Caixeta, LM, Martins, JLR, Segati KS, Moura RS, Daher MC, Pinto EMH. Adherence to antirretroviral therapy and correlation with adverse effects and coinfections in people living with HIV/AIDS in the municipality of Goiás State. Rev Soc Bras Med Trop 2018,51(4):436-44. doi: https://doi.org/10.1590/0037-8682-0467-2017

26. Rossi AM, Albanese SPR, Vogler, IH, Pieri FM, Lentine EC, Birolim, MM, et al. HIV care continuum from diagnosis in a counseling and testing center. Rev Bras Enferm 2020,73(6):e20190680. doi: https://doi.org/10.1590/0034-7167-2019-0680

27. Schuster C, Binder C, Strassl R, Aichelburg MC, Blackwell E, Pavo N, et al. Impact of HIV infection and antiretroviral treatment on N-terminal prohormone of brain natriuretic peptide as surrogate of myocardial function. AIDS, 2017,31(3). doi: https://doi.org/10.1097/QAD.0000000000001350

28. Lu WL, Lee YT, Sheu GT. Metabolic syndrome prevalence and cardiovascular risk assessment in HIV-positive men with and without antiretroviral therapy. Medicina 2021,57(578). doi: https://doi.org/10.3390/medicina57060578