ORIGINAL ARTICLE

Metabolic syndrome and its components in HIV-infected individuals

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Summary

Objective: To assess the prevalence of metabolic syndrome and its components in HIV infected individuals assisted in a specialized health center in a municipality in the state of Santa Catarina, Brazil. **Methods:** Cross-sectional study comprising 249 individuals (130 men and 119 women), aged 18 to 73 years. Metabolic syndrome was defined according to the National Cholesterol Education Program, as recommended by the Brazilian Society of Cardiology. **Results:** Among the individuals who participated in the study, 20.9% had metabolic syndrome - 18.5% of the men and 23.5% of the women, with no statistical association between genders. Twenty seven percent of the individuals had two components of the syndrome. Components most frequently found were those related to lipid profile (low HDL-cholesterol and high triglycerides), followed by elevated waist-circumference, altered blood pressure and altered fasting blood glucose. There was a significant association between gender and elevated waist-circumference. **Conclusion:** The prevalence of metabolic syndrome found in this study possibly reflects the quality of the health services delivered. We highlight the importance of investigating the presence of metabolic syndrome among HIV-infected populations, thus contributing for their survival.

Keywords: Acquired immunodeficiency syndrome; metabolic syndrome x nutritional status.

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Introduction

Metabolic changes, such as peripheral insulin resistance, *diabetes mellitus*, changes in lipid metabolism and body fat distribution, lactic acidosis, osteopenia, and others can often be observed in HIV-infected individuals and they are reported to be associated with antiretroviral therapy[1-5]. Since these abnormalities include mostly glucose metabolism disorders and dyslipidemias, they often meet metabolic syndrome (MS) criteria[6-8].

MS can be defined as a disorder characterized by the presence of cardiovascular risk factors related to central fat accumulation and to increased insulin resistance, as well as an increased intimal media thickness with atheroma formation and a consequent occurrence of cardiovascular disease-related morbidity and mortality[7,9].

MS has been reported as more prevalent among HIV-infected individuals than in general population[7,10,11,17]. The higher frequency of metabolic changes increases *diabetes mellitus* and atherosclerotic disease risk among HIV-infected patients, and the presence of MS is related to increased mortality from coronary artery disease, regardless of factors such as age, gender, blood cholesterol, physical activity and smoking[12].

These facts are of great importance, especially considering the increased life expectancy and the reduced mortality from AIDS achieved by the antiretroviral therapy currently used and the distribution of free medication[13]. Furthermore, MS diagnosis can be useful for decision-making in primary health care concerning cardiovascular disease prevention[7].

Thus, the objective of this study was to assess the prevalence of MS and its components in HIV-infected patients assisted in an infectious disease-specialized health care center in a municipality in the state of Santa Catarina, Brazil.

Methods

All patients evaluated in a specialized health care center in a municipality in the state of Santa Catarina, Brazil, from August 2007 to January 2008, were invited to participate in the study. All HIV-infected patients aged 18 and older were included in the sample regardless of being on highly active antiretroviral therapy (HAART) or not, as long as they accepted to participate in the study. Those who had any physical disabilities precluding the anthropometric assessment (waist circumference) or did not have the results of blood biochemical tests were excluded. The study protocol was approved by the Ethics in Research Committee of *Universidade do Vale do Itajaí* (Univali) and all subjects gave written informed consent.

The cut-off values proposed by the NCEP-ATPIII (National Cholesterol Education Program – Adult Treatment Panel III) were used to diagnose MS. They advocate combining at least three of the following components: waist circumference >102 cm for males and 88 cm for females; fasting blood glucose ≥ 110 mg/dL; triglycerides ≥ 150 mg/dL; HDL-cholesterol ≤ 40 mg/dL for males and ≤ 50 mg/dL for females; systolic blood pressure ≥ 130 mmHg; diastolic blood pressure ≥ 80 mmHg[9]. Thus, the variables waist circumference, serum HDL-cholesterol and triglycerides level, fasting blood glucose, and blood pressure (systolic and diastolic) were collected. Waist circumference was measured with an inelastic tape measure before medical appointments.

As the patients seen at that health center usually undergo routine biochemical tests assessing their lipid profile in a frequency ranging from two to six months, the HDL-cholesterol and triglyceride levels recorded on the closest date to the anthropometric assessment were collected. Systolic and diastolic blood pressure levels were checked by a skilled nursing professional before medical appointments as well. Data regarding HAART use were further collected from medical records[3].

Descriptive statistics was used according to the distribuition of the variable: for variables with a normal distribution, occurrence measures and mean and standard deviation values were shown; for non-parametric variables, lowest, highest and median values were shown. Student's *t* test and Mann-Whitney test were used to compare means, according to the distribuition of variables. The association between MS components and gender was tested by Pearson's chi-square test, and the association between HAART use and the presence of MS was tested by multivariate logistic regression analysis using the software Statistica (version 6.0)[14]. Differences were considered significant at the level of $p < 0.05$.

Results

This study included 249 patients, 52.2% being males (n = 130) and 47.8% females (n = 119); ages ranged from 17 to 73 years. Mean age was 42.03 ± 9.56 years for males and 40.12 ± 9.75 for females. In the study population, 86.7% were on HAART (n = 216) and 6.8% were on statins (n = 17). See Table 1 for the main characteristics of patients regarding the MS components. Males had significantly higher values for waist circumference, triglycerides, fasting blood glucose and diastolic blood pressure compared with females.

Among the assessed individuals, 20.9% had MS (n = 52), with 18.5% being males (n = 24) and 23.5% females (n = 28), with no association between genders (chi-square^{+} = 0.96; p = 0.32). Patient distribution according to the number of MS components is shown in Box 1, whereas the frequencies, according to gender and each syndrome component are found in Table 2. A statistically significant association was found only for gender and elevated waist circumference. The components with the highest frequencies were related to the lipid profile (low HDL-cholesterol and high triglycerides), followed by elevated waist circumference

Table 1 – Characteristics of HIV-infected patients. Santa Catarina, Brazil, 2007-2008

Characteristics	Gender		Total	p
	Male	Female		
Waist circumference (cm)	85 (65-110)	82 (61-117)	84 (61-117)	< 0.01
HDL-cholesterol (mg/dL)	41 (13-90)	49 (22-79)	45 (13-90)	< 0.001
Triglycerides (mg/dL)	146 (56-1266)	120 (55-590)	137 (55-1266)	< 0.01
Fasting blood glucose (mg/dL)	90 (53-298)	86 (55-128)	88 (53-298)	< 0.01
Systolic blood pressure (mmHg)	120 (80-200)	120 (88-190)	120 (80-200)	ns
Diastolic blood pressure (mmHg)	80 (40-110)	80 (40-140)	80 (40-140)	< 0.05

* Values expressed in medians (lowest-highest).

and altered blood pressure and fasting blood glucose. Highly active antiretroviral therapy was not associated with MS, even after adjustments for age and gender (odds ratio = 0.64; p = 0.41; confidence interval = 0.22-1.86).

Box 1 – Distribution of HIV-infected patients according to the number of metabolic syndrome components. Santa Catarina, Brazil, 2007-2008

Number of components	% (n)
0	15.3 (38)
1	36.9 (92)
2	26.9 (67)
3	13.3 (33)
4	6.8 (17)
5	0.8 (2)

Discussion

Although there is evidence of higher MS prevalence in HIV-infected patients and consequent increased risk for cardiovascular diseases, Brazilian studies assessing this syndrome magnitude in this population are only a few.

A number of international studies point out prevalences ranging from 7.4% to 27%[7,8,15,16]. Few Brazilian studies on this subject have been reported. Silva *et al.*[17] assessed HIV-infected patients in São Paulo, SP, and found a 13% prevalence of MS in patients on HAART and 12% among treatment-naïve patients. Diehl *et al.*[18] found a 36% MS prevalence in HIV-infected patients from Londrina, PR, whereas Troian *et al.*[19] observed 38.2% in HIV-infected individuals from Santa Maria, RS. In the current study, a prevalence of 20.9% of MS was found in HIV-infected adults seen at the only specialized health center in the municipality.

Despite the importance of MS, most Brazilian studies have assessed specific populations, with those assessing this problem at a population level being sparse. Thus, it is difficult to evaluate the relevance of MS prevalence found in the current study compared to healthy populations. The only population-based study of which we know indicated a 29.8% MS prevalence in Vitória (ES) residents, with no gender difference, this being a superior result compared to the current study[20].

In addition, although the prevalence of MS found in our population is similar to that found in a Brazilian study with a healthy population and higher than that found in a study with HIV-infected Brazilian individuals, we must stress that 26.9% of the study subjects had two components of the syndrome, being at risk for developing it.

In this study, the main components responsible for MS diagnosis were those related to the subjects' lipid profile (low HDL-cholesterol and high triglycerides) and elevated waist circumference. Population studies assessing MS in HIV-infected individuals indicate a different participation of its components in the diagnosis of the syndrome. Mondy *et al.*[15] observed the major contributors to MS in French patients were altered fasting blood glucose and high blood pressure. In a Danish cohort of HIV-infected patients, elevated blood pressure was found in 51% of the subjects, high blood triglycerides in 44%, reduced HDL-cholesterol levels in 39%, abdominal obesity in 21%, and altered blood fasting glucose in 16%[8].

Table 2 – Frequency of metabolic syndrome components among HIV-infected patients. Santa Catarina, Brazil, 2007-2008

Components	Gender		Total % (n)	p
	Male % (n)	Female % (n)		
Elevated waist circumference	27.7 (36)	57.1 (68)	41.8 (104)	< 0.001
Low HDL-cholesterol	46.9 (61)	53.8 (64)	50.2 (125)	ns
High triglycerides	49.2 (64)	37.8 (45)	43.8 (109)	ns
Altered blood glucose	9.2 (12)	5.0 (6)	7.2 (18)	ns
Altered blood pressure	17.0 (22)	18.5 (22)	17.7 (44)	ns

In a Brazilian study conducted by Diehl *et al.*[18], prevalences of 68% of reduced HDL-cholesterol, 55% of high blood triglycerides, 32% of high blood pressure, 23% of altered fasting blood glucose, and 17% of elevated waist circumference were found; the prevalence of elevated waist circumference was significantly higher in females, as we found in our study. Leite and Sampaio[5], by assessing patients who were on antiretroviral therapy in a university hospital in Rio de Janeiro, found a 70% prevalence of reduced HDL-cholesterol and 48.1% of altered triglycerides. In a study by Silva *et al.*[17], the MS component most frequently found in patients on HAART was high triglycerides, followed by reduced HDL-cholesterol, whereas treatment-naïve patients had reduced HDL-cholesterol more frequently, followed by high triglycerides.

Although there are many reports about an increase in metabolic changes in HIV-positive patients on antiretroviral therapy, this association is somewhat controversial[4,5,7,15-17,21] In our study, this association could not be demonstrated. We must consider that as the majority of patients was on HAART, this might have contributed to the outcome. Our sample might not have had enough power to indicate statistically significant differences, considering the confidence interval found. In addition, we can mention as a limitation to our study its cross-sectional design, not allowing us to know how long the subjects with the diagnosis of MS really have had the syndrome and whether it results from drug therapy or have already existed previously to the diagnosis. Higher body mass index, waist-hip ratio, diastolic blood pressure and triglycerides, as well as reduced HDL-cholesterol early in HAART treatment are reported to be significantly associated with the development of MS[16].

Despite the reduced number of Latin-American and Brazilian studies about MS in HIV-infected individuals, the lower prevalences of the syndrome and its components found in the current study might reflect the quality of health services locally delivered. Further studies are required to define the role metabolic complications can play in the course and prognosis of the disease, stressing their role as cardiovascular risk factors.

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