



## RETROSPECTIVE COHORT

# Epidemiological and Metabolic Profile of Women Living With HIV/AIDS in Campos Gerais: 2008-2017

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## Abstract

The aim of this study was to characterize the sociodemographic profile and changes in the metabolic profile of women living with HIV/AIDS. A cross-sectional study of a retrospective cohort was conducted in women with HIV/AIDS treated at the Specialized Care Service (SCS) in Ponta Grossa, Paraná. Between January/2008 and December/2017, data from 111 women were included. The variables of interest in the study were: Sociodemographic, such as gender, age at the date of diagnosis, color, education, marital status, sexual behavior and mode of transmission of HIV; and metabolic, collected in 2008 and 2017, such as metabolic profile, CD4 counting, viral load and treatment followed. The comparison between periods was evaluated with the tests paired T, Wilcoxon or McNemar depending on the characteristic of the variable. The highest prevalence was in the age group of 30-39 years, in which 80.2% declared themselves white, 60.4% with incomplete elementary school and 61.3% were housewives, 42.3% were married, 91% reported that the mode of transmission was sexual and 90.1% declared themselves heterosexual. Weight increased by 4.9% ( $p < 0.001$ ), cholesterol, HDL and glycemia increased slightly ( $p = 0.126$ ,  $p = 0.180$  and  $p = 0.108$ ), respectively, triglycerides had a slight decrease ( $p = 0.866$ ) and blood pressure did not change significantly. Cd4 increased, on average, 41.1% in patients ( $p < 0.001$ ). Viral load decreased, on average, 93.4% ( $p < 0.001$ ). These results show that there was an increase in weight and other factors considered at risk for the development of metabolic syndrome and cardiovascular events.

## Keywords

HIV/AIDS, Epidemiology, Metabolic profile, ART

## Introduction

Infection with the human immunodeficiency virus (HIV) and the follow-up of people living with HIV/AIDS have been, since its discovery in 1983, a major challenge for Brazilian and global public health [1]. According to WHO, since the beginning of the epidemic, 76 million people have been infected with the HIV virus worldwide and about 33 million people have died of HIV. Globally, 38 million [31.6-44.5 million] people lived with HIV at the end of 2019 [2].

According to official data, 966,058 cases of AIDS were reported in Brazil. The country has registered an average of 39,000 new AIDS cases annually in the last five years [3,4]. In the verification of the gender ratio per year of diagnosis, there were important regional differences in Brazil, and in the Southern region there was a higher proportion of women in the total number of AIDS cases: the gender ratio was 18 men for every ten women. Among women in Brazil, in 2008, the highest AIDS detection rate was observed among women aged 30 to 34 years (37.2 cases/100,000 inhabitants); in 2018, the ranges with the highest detection were those of women between 40 and 44-years-old (20.5 cases/100,000 inhabitants) [3].

There are reports of significant associations between the risk of HIV infection and underlying factors, including demographic (e.g., gender, age, marital status, mobility

and residence), socioeconomic (e.g., income, education, and occupation), and sociocultural characteristics (e.g., religion and ethnicity) of individuals. Thus, the number and type of sexual contacts, lack of condom use or the presence of simultaneous STDs are also considered important risk factors [5].

According to [6], in the HIV epidemic, it became much more apparent, especially to women, the role of psychosocial determinants of health, such as poverty, food insecurity, stigma, discrimination, low social support, gender violence and mental health (e.g., depression, alcohol dependence and neurocognitive disorders).

Describing the epidemiological profile of women living with HIV/AIDS is important to develop transformative interventions that fit into a specific population in order to reduce risk behaviors that contribute to the control of HIV transmission and improve quality of life. Targeted interventions should address social, structural, mental and emotional needs in HIV prevention and treatment programs [7].

Accompanying these women is also important, because it is known that the prognostic implications of the evolution of the disease are unfavorable due to the possibility of developing opportunistic infections [6], and that antiretroviral therapy improves the quality of life of people living with HIV/AIDS because they suppress viral activity and increase longevity, thus, leading to a considerable decline in opportunistic infections and a reduction in associated deaths [8].

It is recognized that ART changed the natural history of the disease, starting to present characteristics of chronic disease [9]. However, its use is associated with the development of metabolic syndrome leading to an increase in cardiovascular disease (CVD) [10].

Hence, the aim of this study was to characterize the sociodemographic and metabolic profile of women living with HIV/AIDS in ART in the municipality of Ponta Grossa between the years of 2008 and 2017.

## Methodology

A cross-sectional study of a retrospective cohort was carried out in people living with HIV/AIDS, from the Specialized Care Service (SCS) of the municipality of Ponta Grossa - PR, a reference in the South-Central Region of Paraná, which serves 12 municipalities in the third Regional Health (3RS) of the state of Paraná, covering a total population of 576,758 in 2008, of which 291,425 are women [11].

Among the 924 patients seen, women who were diagnosed with HIV and attended follow-up for at least 10 years were selected, with the period chosen from January 2008 to December 2017, which totalized 111 women. Women who had incomplete records were excluded. Data were obtained through medical records, examinations and follow-up.

The variables studied were: gender (female, male), age group at the date of diagnosis (10 to 19 years, 20 to 29 years, 30 to 39 years, 40 to 49 years, 50 to 59 years and 60 to 69 years), color (white, black, brown and indigenous), education (illiterate, complete and incomplete elementary school, complete and incomplete high school and higher education), marital status (single, married, separated, divorced and widowed), sexual behavior (heterosexual, bisexual or homosexual) and mode of transmission of HIV (sexual or vertical).

The follow-up variables were collected in two moments, 2008 and 2017, in order to analyze the progression of the disease, namely: Metabolic profile (weight, lipid profile, blood glucose, blood pressure, CD4 counting, viral load and therapeutic regimen: Protease inhibitor (PI), Nucleoside analogue reverse transcriptase inhibitor (NRTI), Non-nucleoside reverse transcriptase inhibitor (NNRTI) and Integrase inhibitor (INI).

Population counts were used for women according to total and age groups of the municipalities of interest through DATASUS (Ministry of Health).

Prevalence values were performed at the beginning and at the end of the period in order to perform comparisons. In addition, a descriptive analysis of sociodemographic characteristics was performed by calculating simple (n) and relative (%) frequencies.

The change in metabolic profile in the 10 years was submitted to analysis, by calculating the mean and standard deviation of the values of metabolic patterns, CD4 and viral load, and also, through the comparison between the years with paired test (paired T or Wilcoxon or McNemar). The Software SPSS 20.0 (IBM, 2011) was used for data analysis and interpretation.

This research is part of the project "Epidemiological and quality of life contexts of individuals living with HIV and AIDS" and was approved by COEP UEPG with the number 2,631,445.

## Findings

Table 1 shows the prevalence of women with HIV/AIDS per municipality, compared to the total population of women living in the municipality. The prevalence of the 3rd regional health was 5.1 per 10,000 inhabitants and among the municipalities ranged from 1.1 to 6.5 per 10,000 inhabitants. The highest prevalence occurred in Ponta Grossa (6.5 per 10,000), followed by Porto Amazonas (5.6 per 10,000).

When analyzing the prevalence by age group of women with HIV/AIDS included in the study, there is a higher prevalence in the age group from 30 to 39 years, which totals 10.2 cases per 10,000 women (Table 2).

Based on the sociodemographic data of the 111 women living with HIV/AIDS evaluated in this study, it was possible to describe skin color, education and occupation, as shown in Table 3.

**Table 1:** General and by municipality prevalence of women living with HIV/AIDS: 2008.

PREVALENCE	N'	TOTAL**	CASES PER 10,000 INHABITANTS	IC 95%	
				INFERIOR	SUPERIOR
<b>3RD REGIONAL HEALTH</b>	<b>111</b>	<b>218916</b>	<b>5.1</b>	<b>4.1</b>	<b>6.0</b>
ARAPOTI	3	10163	3.0	0.0	6.3
CARAMBEI	3	7181	4.2	0.0	8.9
CASTRO	10	26269	3.8	1.4	6.2
IPIRANGA	1	5375	1.9	0.0	5.5
JAGUARIAIVA	6	13122	4.6	0.9	8.2
PALMEIRA	3	12838	2.3	0.0	5.0
PIRAÍ DO SUL	1	9150	1.1	0.0	3.2
PONTA GROSSA	82	126043	6.5	5.1	7.9
PORTO AMAZONAS	1	1785	5.6	0.0	16.6
SANGÉS	1	6990	1.4	0.0	4.2

\*Source: Female population with HIV/AIDS by municipality accompanied by specialized assistance service (SAE) of the municipality of Ponta Grossa - Paraná - 2008.

\*\*Source: Female population resident by municipality in 2008 - DATA-SUS.

**Table 2:** Prevalence by age group of women with HIV/AIDS in 2008.

PREVALENCE	N'	TOTAL**	CASES PER 10,000	95% LOWER CI	95% HIGHER CI
10-19	7	51186	1.4	0.4	2.4
20-29	30	47289	6.3	4.1	8.6
30-39	43	42358	10.2	7.1	13.2
40-49	20	36394	5.5	3.1	7.9
50-59	9	25821	3.5	1.2	5.8
60-69	2	15868	1.3	0.0	3.0

\*Source: Female population with HIV/AIDS per municipality accompanied by specialized assistance service (SAE) of the municipality of Ponta Grossa- Paraná (2008).

\*\*Source: General female population of the municipalities mentioned, divided into age group - DATASUS-2008.

**Table 3:** Socio-demographic characteristics of women living with HIV/AIDS in 2008.

	AGE GROUP AT THE DATE OF DIAGNOSIS*													
	10-19		20-29		30-39		40-49		50-59		60-69		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
<b>COLOR</b>														
WHITE	5	71.4%	23	76.7%	35	81.4%	17	85.0%	7	77.8%	2	100.0%	89	80.2%
INDIGENOUS	0	0.0%	1	3.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
BROWN	2	28.6%	6	20.0%	7	16.3%	3	15.0%	2	22.2%	0	0.0%	20	18.0%
BLACK	0	0.0%	0	0.0%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
<b>EDUCATION</b>														
ILLITERATE	0	0.0%	0	0.0%	2	4.7%	0	0.0%	0	0.0%	0	0.0%	2	1.8%
INCOMPLETE ELEMENTARY SCHOOL	2	28.6%	16	53.3%	24	55.8%	17	85.0%	6	66.7%	2	100.0%	67	60.4%
COMPLETE ELEMENTARY SCHOOL	2	28.6%	5	16.7%	11	25.6%	1	5.0%	1	11.1%	0	0.0%	20	18.0%
INCOMPLETE HIGH SCHOOL	1	14.3%	3	10.0%	3	7.0%	0	0.0%	1	11.1%	0	0.0%	8	7.2%
COMPLETE HIGH SCHOOL	2	28.6%	3	10.0%	1	2.3%	2	10.0%	1	11.1%	0	0.0%	9	8.1%

COMPLETE HIGHER EDUCATION	0	0.0%	0	0.0%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
IGNORED	0	0.0%	3	10.0%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	4	3.6%
<b>OCCUPATION</b>														
KITCHEN ASSISTANT	0	0.0%	1	3.3%	1	2.3%	1	5.0%	0	0.0%	0	0.0%	3	2.7%
NURSING ASSISTANT	1	14.3%	1	3.3%	0	0.0%	0	0.0%	1	11.1%	1	50.0%	4	3.6%
HOUSE CLEANER	0	0.0%	4	13.3%	2	4.7%	0	0.0%	0	0.0%	0	0.0%	6	5.4%
HOUSEWIFE	5	71.4%	17	56.7%	23	53.5%	14	70.0%	8	88.9%	1	50.0%	68	61.3%
OTHER	1	14.3%	7	23.3%	17	39.5%	5	25.0%	0	0.0%	0	0.0%	30	27.0%

\*Percentages calculated in each age group.

**Table 4:** Mode of transmission, marital status and sexual orientation of women living with HIV/AIDS in 2008.

	AGE GROUP AT THE DATE OF DIAGNOSIS													
	10-19		20-29		30-39		40-49		50-59		60-69		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
<b>MARITAL STATUS</b>														
SINGLE	3	42.9%	13	43.3%	8	18.6%	2	10.0%	1	11.1%	0	0.0%	27	24.3%
MARRIED	0	0.0%	13	43.3%	20	46.5%	9	45.0%	5	55.6%	0	0.0%	47	42.3%
DIVORCED	0	0.0%	0	0.0%	2	4.7%	1	5.0%	2	22.2%	1	50.0%	6	5.4%
SEPARATE	0	0.0%	0	0.0%	3	7.0%	2	10.0%	0	0.0%	0	0.0%	5	4.5%
WIDOWED	0	0.0%	1	3.3%	5	11.6%	2	10.0%	1	11.1%	1	50.0%	10	9.0%
IGNORED	4	57.1%	3	10.0%	5	11.6%	4	20.0%	0	0.0%	0	0.0%	16	14.4%
<b>TRANSMISSION MODE</b>														
SEXUAL	6	85.7%	28	93.3%	38	88.4%	19	95.0%	9	100.0%	1	50.0%	101	91.0%
VERTICAL	1	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
IGNORED	0	0.0%	2	6.7%	5	11.6%	1	5.0%	0	0.0%	1	50.0%	9	8.1%
<b>SEXUAL ORIENTATION</b>														
BISEXUAL	0	0.0%	0	0.0%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	1	0.9%
HETEROSEXUAL	6	85.7%	28	93.3%	37	86.0%	19	95.0%	9	100.0%	1	50.0%	100	90.1%
IGNORED	1	14.3%	2	6.7%	5	11.6%	1	5.0%	0	0.0%	1	50.0%	10	9.0%

\*Percentages calculated according to age group.

Regarding skin color, 80.2% of women declare themselves white, with the highest proportion in the age group from 40 to 49 years (85.0% white) and 18% considered themselves brown, with a higher proportion in the age group from 10 to 19 years (28.6% brown).

Regarding education, it was verified that 60.4% of women had incomplete elementary school, with the highest proportion in the age groups from 60 to 69 years (100%), followed by 40 to 49 years (85%).

Regarding occupation, 61.3% of the women reported being housewives and the highest proportion remained in the age group from 50 to 59 years (88.9%).

When analyzing marital status, mode of transmission and sexual orientation according to the age group at the date of diagnosis, shown in Table 4, it was verified that 42.3% of the women were married, and the highest

proportion, 55.6%, was women between 50 and 59 years.

Regarding the mode of transmission, 91% reported that they contracted the virus sexually and regarding sexual orientation, 90.1% declared themselves heterosexual.

In order to verify if there was a change in the metabolic profile of these women when they started follow-up in 2008, without any treatment or with early-stage treatment immediately after diagnosis, and in 2017, possibly following some therapeutic regimen, the following variables are described in Table 5: weight, blood pressure, cholesterol, HDL, LDL, triglycerides and glycemia, as well as markers of control and progression of the disease: CD4 and viral load.

Weight increased by 4.9% on average and was

**Table 5:** Comparison of 10-year tests of women with HIV/AIDS in 2008 and 2017.

EXAMS	2008		2017		PERCENTAGE DIFFERENCE	P-VALUE (PAIRED T TEST OR WILCOXOM)
	AVERAGE	DP	AVERAGE	DP		
WEIGHT	61	13	64	12	4.9%	< 0.001
SYSTOLIC BLOOD PRESSURE	115	13	116	15	0.9%	0.997
DIASTOLIC BLOOD PRESSURE	76	11	75	11	-0.6%	0.700
CHOLESTEROL	179	31	211	54	17.6%	0.126
HDL	46	14	55	20	21.3%	0.180
LDL	121	35	106	47	-12.2%	*
TRIGLYCERIDES	191	112	173	99	-9.3%	0.866
GLYCEMIA	89	14	102	49	14.2%	0.108
CD4	478	249	674	324	41.1%	< 0.001
VIRAL LOAD	20384	62953	1337	8789	-93.4%	< 0.001

\*1 patient contained data from this examination at both times and it was not possible to perform statistical test.

**Table 6:** CD4 comparisons. viral load and art utilization of women living with HIV/AIDS in 2008 and 2017.

EXAMS	N 2008	N % 2008	N 2017	N % 2017	PERCENTAGE DIFFERENCE	P-VALUE (MCNEMAR)
<b>CD4*</b>						< 0.001
< 350	24	21.62%	14	12.61%	-41.67%	
> 350	51	45.95%	72	64.86%	41.15%	
<b>VIRAL LOAD*</b>						< 0.001
DETECTABLE	45	40.54%	14	12.61%	-68.89%	
UNDETECTABLE	42	37.84%	74	66.67%	76.19%	
<b>ART*</b>						< 0.001
DOES NOT USE	29	26.13%	5	4.50%	-82.78%	
USES	82	73.87%	106	95.50%	29.28%	
<b>PI</b>						< 0.001
NO	78	70.27%	52	46.85%	-33.33%	
YES	33	29.73%	59	53.15%	78.78%	
<b>NRTI</b>						< 0.001
NO	31	27.93%	5	4.50%	-83.89%	
YES	80	72.07%	106	95.50%	32.51%	
<b>NNRTI</b>						0.999
NO	64	57.66%	65	58.56%	1.56%	
YES	47	42.34%	46	41.44%	-2.13%	
<b>INI</b>						**
NO	111	100.00%	109	98.20%	-1.80%	
YES	0	0.00%	2	1.80%	-	

\*Ignored values were omitted; \*\*there was not enough n to perform the statistical test.

statistically significant ( $p < 0.001$ ). Blood pressure has not changed significantly. Cholesterol increased, on average, 17.6% between 2008 and 2017, but there was no statistical significance ( $p = 0.126$ ). HDL and glycemia had a non-statistically significant increase ( $p = 0.180$  and  $p = 0.108$ , respectively) and triglycerides had a non-statistically significant decrease ( $p = 0.866$ ). LDL could not be calculated by p-value, because only 1 patient contained the data of this test in the two moments analyzed (2008 and 2017).

CD4 increased, on average, 41.1% in patients and was statistically significant ( $p < 0.001$ ). Viral load decreased, on average, 93.4% and was also statistically significant ( $p < 0.001$ ).

Table 6 shows that in 2008 and 2017, 21.62% and 12.61% of patients with CD4 below 350, respectively, in 2008 and 2017. In 2008, there were 45.95% of patients with CD4 higher than 350, and in 2017 this value increased, 64.85%.

**Table 7:** Ratio of use/non-use of art with improvement/worsening of the chart of women with HIV/AIDS in 2008 and 2017.

EXAMS 2017	TAR 2008		ART 2017		PERCENTAGE DIFFERENCE	P-VALUE (WILCOXOM)
	AVERAGE	DP	AVERAGE	DP		
WEIGHT	63	12	64	12	1.59%	< 0.001
SYSTOLIC BLOOD PRESSURE	116	15	115	15	-0.86%	0.34
DIASTOLIC BLOOD PRESSURE	75	11	75	11	0.00%	0.569
CHOLESTEROL	208	51	211	54	1.44%	0.075
HDL	56	21	55	20	-1.79%	0.18
LDL	106	47	106	47	0.00%	*
TRIGLYCERIDES	160	97	173	99	8.13%	0.866
GLYCEMIA	103	56	102	49	-0.97%	0.126
CD4	679	326	680	324	0.15%	< 0.001
VIRAL LOAD	16231	58258	11613	90972	-28.45%	< 0.001

\*There was not enough n to perform the statistical test.

The detectable viral load decreased from 2008 to 2017, from 40.54% of people to 12.61%, and the undetectable viral load went from 37.84% to 66.67% in those years.

The women studied had the HIV-positive result in 2008, and 73.87% started ART in the same year, and in 2017 the percentage of ART adhering was 95.5%. And the most used classes for treatment in 2008 were NRTI, followed by NNRTI, and in 2017, NRTI, followed by PI.

It was verified that the differences in frequency in the parameters of CD4, viral load and use of ART were statistically significant, as well as the difference in the therapeutic regimen PI, NRTI. The NNRTI class had no significant change.

Table 7 shows the metabolic profile of women in ART use between 2008 and 2017, in order to verify its influence on the changes that occurred.

The tests that underwent statistically significant alterations were weight, CD4 and viral load. Cholesterol and triglycerides increased significantly, about 1.44% in cholesterol and 8.13% in triglycerides.

## Discussion

In 2008, the year the study began, Brazil had a female population of 97,310,184 and 16,209 cases of women with AIDS reported by SINAN (*Sistema de Informação de Agravos de Notificação*), a prevalence of 1.6 per 10,000 inhabitants [12]. On the other hand, the prevalence of the Third Regional Health was 5.1 per 10,000 inhabitants, being higher than the national prevalence. This may indicate the occurrence of the internalization of the HIV/AIDS epidemic for this region.

The process of internalization of aids comprises the expansion of the epidemic from the largest urban centers to medium and small municipalities in the countryside. A study conducted in Divinópolis - MG characterized

the epidemiological profile of the population living with HIV/AIDS in the region and found the occurrence of the internalization of the epidemic, which became more frequent over the years [13]. Corroborating the data observed in the present study.

Between 2008 and 2018 there was a higher predominance of HIV/AIDS cases among men than among women in Brazil, and the gender ratio (male/female) increased from 1.5 in 2008 to 2.3 in 2018. In 2008, in the Southern region, the gender ratio (male/female) was 1.3, and in 2018 it became 1.8, it means, the proportion of women infected with the virus decreased both in the national and southern regions [3]. Therefore, it can be seen that, although the process of feminization of the HIV/AIDS epidemic, reported by several studies [7,14] is a fact, it is better visualized in follow-up studies. The increase in the ratio between the sexes in this period can be verified due to the dynamicity of the epidemic.

The age group with the highest frequency of HIV/AIDS detection observed in the present study was 30 to 39 years. According to [3], in 2008 the highest detection rate among women was also in this age group. In 2018, the highest detection was in the age group of 35 to 44 years. They are young, sexually active women who are contaminated mainly due to the non-use of sexual condoms and too much confidence in their partners.

It was verified that 90.1% of the women living with HIV/AIDS in this study declared themselves heterosexual, 42.3% were married, and most of them reported that they contracted the virus sexually. One of the hypotheses that may explain the findings would be the non-use of condoms as prevention of sexually transmitted infections (STIs) when there is a stable relationship. A study conducted with women in a university hospital in São Paulo, with the objective of characterizing the sociodemographic and clinical profile,

revealed that almost all the patients studied did not use protection in their sexual relations, because they kept them with a steady partner in which they trusted and, consequently, did not care about the need to use protection [7].

Gender norms favor men's control over women and instill women's ability to practice safe sex and make reproductive decisions based on their own fertility preferences [15]. In addition, intimate partner violence is one of the main contributors to HIV vulnerability in heterosexual women and, in turn, is driven by poverty and gender inequality [6].

Moreover, women who are already diagnosed with HIV need to deal daily with social stigmas and gender inequalities that harm their mental and sexual health, as well as quality of life. Women living with HIV/AIDS often cannot make decisions about condom use, or when they want to become pregnant, and are also guilty, then, of bringing HIV into the family, since they are often tested before men [15].

Another factor that is present and increases the social stigma of people living with HIV/AIDS is low education, which leads to pauperization. According to [14], the AIDS epidemic in Brazil began in the social strata with higher education, and spread over the years to those with lower education, due to the issue of social vulnerability. For people with lower levels of formal education and restricted access to health care and other policies of social and community promotion were more exposed to HIV infection.

According to the 2018 epidemiological HIV/AIDS bulletin, in 2008 and 2018, the highest proportion of women living with HIV/AIDS had incomplete elementary school. This was also observed in the present study in which 60.4% of the women had incomplete elementary school, reinforcing the tendency of HIV/AIDS pauperization, since there is a large proportion of individuals with low education.

In addition, pauperization leads to a worsening of the socioeconomic situation [7], and this is verified, since 61.3% of the women living with HIV/AIDS in this study do not have an employment relationship, being housewives. Although the treatment is free and provided by the Unified Health System (SUS), the socioeconomic dimensions interfere directly in the life of the person with HIV/AIDS, because it is necessary to have food security, quality of life and good social support to perform a quality treatment [6].

In this study, the metabolic analysis of the women was performed when they started the follow-up in 2008, without any treatment or with early-stage treatment soon after diagnosis, and in 2017, possibly following some therapeutic regimen. Weight, in general, increased by 4.9% ( $p < 0.001$ ). A study conducted in women with HIV/AIDS found that increased **Body Mass**

**Index (BMI)** is associated with an increase in CD4 cell counting and lower rates of events that characterize the progression of HIV disease, because women with higher weight are able to maintain their CD4 cell counting to a higher degree, since the hormone leptin (found in the fat cell) tends to increase as an acute phase reagent in the case of infection [16].

We also analyzed the metabolic profile of the patients in the years 2008 and 2017, in order to verify its influence on the changes occurred and weight, and women who were using ART in both moments had an increase of 1.59% ( $p < 0.0001$ ). A 2019 publication of *Clinical Infectious Diseases* evaluated the combined data from eight studies involving HIV-infected individuals in the beginning of ART use. In all studies, participants were periodically evaluated for weight, BMI, HIV viral load, CD4 cell counting and glycemia. The use of ART was associated with significant weight gain in the first 96 weeks in more than 10% of participants starting HIV treatment and, also, low CD4 cell values and higher HIV viral load values were also factors associated with higher weight gains in the studies evaluated [17].

The number of CD4 T lymphocytes in peripheral blood is currently considered the main marker of immune damage caused by HIV infection and is an important progression factor for AIDS [7]. After transmission, HIV settles in the mucosal tissues and, in a few days, spreads to the lymphoid organs, mainly affecting CD4+ T cells. Around the 30<sup>th</sup> day, the immune system then reaches some degree of control, in which the level of HIV replication remains stable, often for years. However, soon after, there is an advanced phase of marked depletion of CD4+ T cells that lead to AIDS [18]. This study states that from 2008 to 2017 there was a reduction in CD4 < 350 cases and an increase in CD4 > 350 cases, as well as, there was a reduction in cases of detectable viral load and an increase in cases of undetectable viral load, this is mainly due to the treatment being done correctly by most women, in general.

When analyzing only women who were undergoing treatment at both moments, it is possible to notice an increase in CD4 by 0.15% and a decrease in viral load in 28.45% ( $p < 0.001$ ). It is noticed that the values did not have a sudden change, because, with the treatment being done correctly from the moment of diagnosis, the CD4 remained high and the viral load was low in both moments.

Brazil was one of the first developing countries to guarantee universal and free access to antiretroviral drugs in the SUS from 1996 [19] and from 2013 treatment began to be offered soon after the diagnosis of infection. When treatment is used appropriately, it is highly effective, completely or almost completely suppressing HIV replication, improving immune function and reducing significantly the risk of developing AIDS [20].

Viral suppression brings many benefits to its users, such as prolonged survival, improved quality of life, decreased morbid episodes and the number and frequency of hospitalizations; however, it requires perfect support [21]. If the drugs are discontinued, the virus will almost invariably recover in the coming weeks [22].

Some factors identified as limiting or impeding adherence to consultation and therapy are related to the characteristics of the individual, the disease and its treatment; the relationship between the health team and the individual; social insertion; and also to factors such as geographical distance from the health service, difficulties in accessing the consultation (insufficiency of physicians, large number of individuals attended, several waiting lists) and a large time interval between consultations [21].

ART is not always fully effective, as the development and transmission of drug resistance remains a major concern. Even if durable viral suppression is achieved, many individuals cannot restore optimal immune function, even after several years of treatment [20].

The patients in this study had a percentage difference of 14.2% in glycemia and 17.6% in cholesterol between 2008 and 2017, in this case, it is verified that ART is associated with adverse complications, of which some are serious, such as metabolic disorders of glucose intolerance and diabetes, as well as lipid disorders, leading to an increase in Metabolic Syndrome (MS) and cardiovascular disease (CVD) [10,23]. However, a descriptive study on cardiovascular risk factors in HIV/AIDS patients according to the therapeutic regimen used concluded that preventive measures as well as early treatment can contribute to minimize the risks of developing cardiovascular diseases caused by HIV infection [24].

According to the Protocol of the Ministry of Health (2017) antiretroviral drugs are distributed in six classes: Nucleoside Analogue Reverse Transcriptase Inhibitor (NRTI), Nucleoside Non-Analogue Transcriptase Inhibitor (NNRTI), Protease Inhibitors (PI), Fusion Inhibitors (FI), Integrase Inhibitors (INI) and Inhibitor Incoming (II) according to the Protocol of the Ministry of Health (MH) the initial ART should always include combinations of three ARV, two NRTI/NRTIt - (lamivudine-3TC) and (tenofovir-TDF) associated with another class of ARV: preferably INI - (dolutegravir -DTG), or NNRTI, or PI with Ritonavir (PI/r) reinforcement. This research shows the low use of integrase inhibitor, which prevents the HIV genome from being integrated into the host genome. No woman in this study used it in 2008 and 1.8% used it in 2017. As a class, these drugs are potent, well tolerated and safe, however, they are not used as the first line of treatment [20].

## Limitations

This study has limitations regarding the reduced

sample space, due to the criteria imposed for the selection of patients and also due to the issue of the Covid-19 Pandemic, which limited data collection. Besides, regarding treatment, due to the fact that it does not specifically have the moment of initiation, end or resumption of treatment, which hinders the analysis of the possible effect on metabolic alteration, however, this subject will be addressed in the article published by Muller and Gimeno. In counterpoint, the strength of the study is in the sociodemographic analysis presented and in the comparison between metabolic profiles of women living for ten years with HIV/AIDS.

## Conclusion

The results of this study, conducted with women with HIV/AIDS assisted at the Specialized Care Service (SCS) of Ponta Grossa-PR, allowed us to conclude that they were young women (30-39 years on average); were mostly married; had low education and lack of employment, or exercised low-skilled occupations; most of them used antiretroviral drugs; and the main form of acquisition of the infection was heterosexual intercourse.

It is known that the treatment is difficult to be performed, because it involves discipline and, often, dealing with side effects. However, the women followed in this study had a high rate of participation and monitor CD4 and viral load routinely. What proved flawed was the monitoring of metabolic tests that not all patients performed every year, although they are crucial in monitoring the evolution of HIV and/or in the use of ART.

It was clear that, from 2008 to 2017, in general, there was an increase in weight and other risk factors for metabolic syndrome and cardiovascular events. This requires health professionals to routinely reinforce the importance of patients adhering to healthy habits along with ART.

## Authors Contribution

All authors contributed in all stages of the article, conception, data collection and analysis, writing and revision of the manuscript.

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