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Evaluation of clinical parameters in people living with HIV undergoing pharmacotherapeutic monitoring: Viral load, CD4+ T lymphocytes and adherence to antiretrovirals

Henry Pablo L. C. Reis[1,2]*, Darlan da S. Cândido[1], Catarine V. Loureiro[1,2], Juliana de O.Carlos[1], Ana Maria S. de Araújo[3], Maria Jacqueline Batista[3] and Marta Maria de F. Fonteles[1,2]

[1]Department of Pharmacy, Center for Studies in Pharmaceutical Care (CEATENF), Federal University of Ceará, Fortaleza, Ceará, Brazil.
[2]Post-graduate Program in Pharmaceutical Sciences, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Fortaleza, Ceará, Brazil.
[3]Department of Statistics and Applied Mathematics, Federal University of Ceará, Fortaleza, Ceará, Brazil.

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The aim of this study was to evaluate the clinical indicators (viral load- VL, CD4 lymphocytes and adherence) of HIV+ patients, at the beginning of treatment with antiretrovirals (ARV), during pharmacotherapeutic monitoring (PTM) in a specialized center in Fortaleza, Ceará. The longitudinal study, according to the Dáder method, was used for patients with HIV (n = 100) from 2008 to 2012, beginning at the time of dispensation of the antiretroviral therapy. The data were analyzed using SPSS®. To evaluate the VL and CD4 levels, the Wilcoxon's test was carried out and the patients were used as temporal controls for themselves regarding the outcomes assessed at the beginning and end of the PTM. Adherence was determined by self-report and pharmacy dispensing records (PDR) of antiretrovirals. There was a mean reduction of 89.45% (SD = 0.28986) in total VL ($p < 0.001$). For CD4+ lymphocytes, a mean increase of 124.14% (SD = 1.31756) was detected ($p <0.001$) during the PTM. Most treated patients showed high rates of adherence by self-report (95.0%, n = 100) and (76.0%) PDR methods. The findings of the present work demonstrated the potential benefits of PTM on treatment adherence, which may have been decisive for the successful improvement of the assessed clinical indicators. The inclusion of PTM for people living with HIV/AIDS (PLHIV/AIDS) in clinical services should be encouraged at the level of secondary health care.

Key words: HIV, AIDS, viral load, adherence, pharmaceutical care.

INTRODUCTION

The highly active antiretroviral therapy (HAART) has resulted in increased patient survival rates. Thus, continuing clinical assessment by objective indicators is important. CD4+ T-cell and viral load (VL) measurements are fundamental parameters for deciding when to the start and evaluate effectiveness of the antiretroviral therapy (Brito, 2012).

Adherence to antiretroviral drugs is a fundamental and

decisive factor for successful virological suppression and immune function preservation in people living with HIV/AIDS (PLHIV/AIDS). To achieve an optimal therapeutic result in the long term, more than 95% of antiretroviral doses must actually be taken (Chen et al., 2007) and that represents one of the major challenges for patients and professionals dealing with HIV (Felix and Ceolim, 2012). This is one of the reasons why the pharmacist must effectively participate in the specialized care team treating HIV patients around the country, since these professionals are one of the most important links in the chain of logistics regarding drug use. Strengthening the patient-pharmacist relationship can lead to the best therapeutic results and quality of life (Vieira, 2007).

The Brazilian government offers support to HIV patients, so they can have access to antiretroviral drugs (Gomes et al., 2009). In general, Brazilian HIV+ patients are first seen by a physician (when they receive the diagnosis) and are later treated by other members of the multidisciplinary team, especially in specialized care centers (Brasil, 2010). However, studies on adherence show that the process of understanding health and disease, and especially the importance of correct administration of medication are still incipient in this model of care and require the implementation of new strategies for improving care in the complex field, which is, the treatment of PLHIV.

The monitoring of PLHIV involves a broad dimension of closely-associated knowledge, skills and interfaces and the detailed understanding is crucial for the decision-making process of the best strategies for a successful therapy (Silveira et al., 2010). Thus, the analysis of several indicators, such as the clinical (virological and immunological count) and the therapeutic ones (adherence rate), combined with the socioeconomic profile of each patient, becomes an important tool for the monitoring of these patients and the pharmacist can strategically collaborate with the process (Okoye et al., 2014).

Therefore, pharmaceutical care through pharmaco-therapeutic monitoring (PTM) can have a positive role, aiming at achieving rational pharmacotherapy, as well as defined and measurable clinical outcomes (Opas, 2002). During PTM, the provided pharmaceutical care helps HIV-positive patients address the factors that lead to poor adherence; improves their knowledge on the disease and the treatment plan, and especially, helps them to understand and accept the need for high therapy compliance (Dader et al., 2008).

Based on this context, the aim of this study was to demonstrate the evolution pattern of the clinical indicators, viral load and CD4+ T- lymphocytes, in a sample of HIV-positive patients monitored in a pharmaceutical care program since the start of antiretroviral treatment, and also to disclose their sociodemographic and adherence profile.

MATERIALS AND METHODS

This was a longitudinal, follow-up study, carried out between November, 2008 and January, 2012 in a secondary care reference unit with a specialized service for PLHIV, the José de Alencar Center of Medical Specialties (CEMJA). Patients were selected according to the following inclusion criteria: adult outpatient patients aged ≥ 18 years, using antiretroviral therapy (treatment-naive), who had not participated in any pharmaceutical intervention study and agreed to participate by signing a term of consent. Each patient served as his or her own control. The pharmacotherapeutic monitoring (PTM) was the main intervention and lasted for nine (9) months, being developed according to the Dáder et al. (2008) method, which involves the following steps: 1. Service provision; 2. initial interview, 3. situation status; 4. study phase 5. global assessment, 6. pharmaceutical intervention and 7. evaluation of the outcomes. Periodic evaluations were made to assess the effectiveness of the performed pharmaceutical interventions, which were continually documented in a PTM form designed by a group of experts. The form included data on the sociodemographic profile, habits and lifestyle of the PLHIV; pharmacotherapeutic and pharmaceutical care data, adherence and other information related to medication use. Table 1 shows the established parameters, tools and frequency of measurements according to the follow-up period. The study was designed according to the guidelines and norms for research involving human subjects and was approved by the Ethics Committee in Research of the Federal University of Ceará (Protocol 191/08). To ensure confidentiality of the obtained information, the data were analyzed in aggregate form.

Regarding adherence evaluation, the literature (Polejack and Seidl, 2010) recommends using at least two assessments to increase result accuracy. In this study, the self-report (Delgado and Lima, 2001) and the Pharmacy Dispensing Records (Brasil, 2010) methods were chosen. The assessment by self-report was carried out through direct interviews using a semi-structured questionnaire consisting of seven questions and answers graded according to Likert scale. After obtaining the results, the answers to each question were summed and divided by the total number of questions and the value obtained was converted into a dichotomous scale used to define 'adherent' and 'non-adherent' to treatment. All the monthly records of antiretroviral (ARV) dispensation were analyzed through the pharmacy dispensing record method in the Pharmaceutical Care Unit (PCU) of CEMJA until the 9th month of PTM. Thus, ARV dispensations were expressed by their prevalence during a nine-month period, regardless of the time of occurrence of the same, and categorized into three groups according to the recommended protocol of Pharmaceutical Services, Ministry of Health (Brasil, 2010): a) Regular (adherent): When there was no irregularity, either in time or in the quantity dispensed until the 9th month of follow-up; b) Irregular (non-adherent): when the time between the dispensations was at least one day longer than the average time, or when the number of dispensed tablets was less than 95% of the total number of tablets expected for each ARV scheme prescribed until the 9th

*Corresponding author. E-mail: henrypabloreis@yahoo.com.br or ufc.ceatenf@yahoo.com.br.

Table 1. Parameters, tools and frequency of measurements according to the PTM period of HIV-positive patients.

Clinical parameters	Tools, data sources, laboratory tests, location of analysis of indicators	Frequency of measurement
Measurement of CD4+ T lymphocytes	Tool: Recording in an individualized form of pharmacotherapy monitoring of PLHIV/AIDS Data source: Results of laboratory tests in Medical Record Form Laboratory test: Flow Cytometry Method Place of analysis of the test: Central Laboratory of Ceará State	Start (1st month) and End (9th month) of PTM
Measurement of Viral Load	Tool:Recordingin an individualized form of pharmacotherapy monitoring of PLHIV/AIDS Data source: Results of laboratory tests in Medical Record Form Laboratory test: bDna Method Place of analysis of the test: Central Laboratory Of Ceará State	Start (1st month) and End (9th month) of PTM
Measures of Adherence	Tool:Recordingin an individualized form of pharmacotherapy monitoring of PLHIV/AIDS Data source: Drug Control Logistics System (SICLOM – Ministry of Health) Method of Adherence Assessment 1: dispensing pharmacy records of antiretroviral drugs Method of Adherence Measuring 2: Self-report Place of analysis of the indicator: outpatient pharmacy services (SAE/CEMJA) - Unit of Pharmaceutical Care for HIV Patients	- Monthly (during 09 months of PTM – To assess the adherence profile).

month of PTM. The number of times that an irregular dispensation occurred for each patient was computed, regardless of when it occurred; c) Treatment dropout: when the patient remained for more than 90 days without taking ARVs after the coverage period for the last dispensation and did not return until the 9th month of PTM to restart treatment. For a complete evaluation of each case, it was necessary to associate this situation with other monitoring factors, for instance, "no shows" to scheduled medical appointments and no return in six months, in addition to those previously mentioned. Viral load was determined through DNA method and the CD4+ T cells through flow cytometry.

Statistical analysis

Data were entered into a structured database using the Statistical Package for Social Sciences (SPSS) software, version 11.0 and analyzed with the support of statisticians of the Federal University of Ceará. For the information regarding the socioeconomic profile (age, weight, sex, marital status, ethnicity, educational level, occupation and income) and pharmacotherapeutic indicators (adherence), the simple frequencies and percentages were presented for each category, considering only the patients who had available information. Adherence was expressed as their simple frequencies and percentages. Clinical indicators (viral load/CD4+ T lymphocytes) were analyzed by comparing the initial and final profiles using the paired nonparametric Wilcoxon´s test.

RESULTS

Initially, a total of 105 patients were selected; however, four patients were excluded (patients with cognitive difficulties and prisoners) and 01 patient died. Of those remaining (n=100), only <50 patients were used for the evaluation of the clinical indicators (CV and CD4) analyzed in this study, because the others either missed adherence monitoring or did not undergo laboratory tests, invalidating the before/after comparative analysis.

Table 2 shows the sociodemographic parameters of the study sample (n = 100). Regarding the age of the patients, 90.0% (n=100) were aged between 19 and 40 years (mean=35.42, min = 19, max = 66, SD = 10.61). The majority of patients were single (62.0%, n=100) and lived in Fortaleza, state of Ceará (96.0%). There was a predominance of males (69%; n=100) and mixed-race patients (65.0%, n=100). The analysis of schooling showed that a significant number of respondents had finished elementary school (42.0%, n= 42).

The results of the viral load and CD4 + T lymphocytes variables of patients receiving PTM are shown in Tables 3 to 6. Table 3 lists all patients submitted to this assessment at some moments; it was observed that the mean viral load at baseline (mean = 63838.71 copies/mL, SD = 80403.55 copies/mL) was well above the mean value at the end time (mean = 54 copies/mL, SD = 20.044 copies/mL), with the standard deviation at the initial time being also quite high, that is, the viral load measurements at the end time (VL = 37.12%) were more homogeneous and close to the respective mean than at baseline (VL = 125.95%). According to the observed data, a mean reduction of 89.45% (SD = 0.28986) in the viral load of all patients were found in PTM.

Of the 100 PLHIV/AIDS, only 27 had viral load tests at

Table 2. Distribution of PLHIV/AIDS according to their sociodemographic profile, CEMJA, Fortaleza- Ceará (Dec/2008 – Dec/2012).

Variables		N
Age	<30 years	33
	30 to 39 years	35
	40 to 49 years	22
	>50 years	10
	Total	100
City	Fortaleza	96
	Another city	04
Gender	Female	31
	Male	69
	Total	100
Marital Status	Married	36
	Single	62
	Widowed	02
	Total	100
Ethnicity	Mixed-Race	25
	White	65
	Black	10
	Total	100
Education	Illiterate	04
	Incomplete elementary school	27
	Complete elementary school	11
	Incomplete high school	8
	Complete high school	32
	Incomplete College/University	6
	Complete College/University	12
	Total	100

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

the beginning and at the end of the PTM. This may have been caused by different reasons, both related to the health system, as well as patient-related factors. Of those who had available test results, 90% (n = 27) of them were below 50 copies/mL, which is the target result for viral load when using antiretroviral therapy.

Considering only the patients in whom viral load measurements were performed at the two different points in time, that is, start and end (n=27), Wilcoxon´s test was used to compare the viral load measurements at these two points in time, leading to the inference that there is a significant difference between the values of initial and final viral loads in this study of pharmacotherapeutic monitoring of PLHIV/AIDS (value of the statistic W = -4.372, p-value <0.001).

The analysis result for the association between the adherence profile and the method of dispensing and the recorded values of viral load found is shown in Table 4. The mean baseline viral loads were well above the mean of the final viral load and the variability around the mean is also substantially higher. The mean reduction in viral load was 86.19% for the non-adherent patients and 90% for the group of adherent patients.

As for the Wilcoxon test as compared to the initial and final viral loads for adherent patients, a significant difference between measurements was found (value of statistic W = --3.724, p-value <0.001). For non-adherent patients, the value of the statistic was W = -2.366, with p-value = 0.018, indicating that there is a difference at the 5% significance level.

Another important indicator for clinical and laboratory monitoring for PLHIV/AIDS is the CD 4 + T lymphocyte count, as it indicates the body's positive immune response and acts decisively to minimize the morbidity and mortality of this disease when levels are found in standardization. According to the observed data (Table 5), the initial CD4 lymphocyte count was higher than 200 in 48.8% (n = 43) of the patients for whom the measurement was available in some of the assessments (initial or final), whereas the final CD4 was higher than 200 in 81.3% (n = 32) of patients. Thus, a considerable increase in the number of leukocytes was noticed in this class for PLHIV assessed during the course of PTM, with an average increase of 124.14% (SD= 1.31756).

Descriptive statistics in Table 5 show a lower T CD4 + lymphocyte count at baseline (minimum of 13 cells/mm^3, mean = 204.88, SD = 111.91 cells/mm^3) than at the end of PTM (maximum = 805 cells/mm^3, mean = 384 and SD = 186.61 cells/mm^3) and this difference was statistically significant when Wilcoxon test was applied (statistic W = -4.433, p-value <0.001), considering only those patients in whom CD4 measurements were obtained at two different points in time, that is, start and end (n=30). The variability around the means had similar values.

Similar to the viral load, the association between adherence and the mean values of CD4+ T lymphocytes was also studied. Based on the intersection of these data, the CD4+ T count was higher at the end time for both groups of patients, adherents and non-adherents, with the greatest difference being observed in the first group (Table 6). Thus, it was found that non-adherent patients had an average increase of 55.96% in the rate of CD4, whereas this increase was 148.94% for adherent patients, emphasizing the importance of adherence to the antiretroviral therapy.

To assess whether this difference had statistical significance, Wilcoxon test was performed to compare the values, which was only possible in 30 monitored individuals, as not all of them had both the test and

Table 3. Statistical profile for the clinical indicator viral load (VL) of PLHIV/AIDS in PTM.

Analysis time	N	Minimum (copies/ml)	Maximum (copies/ml)	Mean (copies/ml)	Standard Deviation (copies/ml)	Coefficient of variation (%)	Median (copies/ml)	Interquartile Range
Baseline viral load	38	< 50	299268.00	63838.71	80403.55	125.95	30138.50	93909.75
Final viral load	30	< 50	149.00	54.00	20.044	37.12	49.00	0.00

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

Table 4. Statistical analysis between the viral loads at the baseline/end and adherence of PLHIV/AIDS in PTM.

Adherence classification	Analysis time	N	Minimum (copies /ml)	Maximum (copies /ml)	Mean (copies/ ml)	Standard deviation (copies/ml)	Coefficient of variation (%)	Median	Interquartile range
Non-adherent	Baseline Viral Load	11	49.00	296442.00	51847.27	87146.62	168.08	13303.00	74585.00
	End Viral Load	9	49.00	50.00	49.11	0.33	0.67	49.00	0.00
Adherent	Baseline Viral Load	27	49,00	299268.00	68724.11	78696.99	114.51	57281.00	100871.00
	End Viral Load	21	49.00	149.00	56.09	23.82	42.47	49.00	0.00

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

Table 5. Statistical profile for the clinical indicator CD4+ T lymphocytes of PLHIV/AIDS in PTM.

Analysis time	N	Minimum (copies/ml)	Maximum (copies/ml)	Mean (copies/ml)	Standard Deviation (copies/ml)	Coefficient of variation (%)	Median	Interquartile range
Baseline CD4	43	13.00	593.00	204.88	111.91	54.62	200.00	117.00
End CD4	32	71.00	805.00	384.03	186.61	48.59	348.50	255.00

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

adherence results. Thus, it can be concluded that the difference between the CD4 counts is significant for adherent patients (W = -4.107 p-value <0.001). We once again emphasize that the number of non-adherent patients is small, which may have compromised the test results (W = -1.680, p-value = 0.093).

In relation to adherence, the self-report method showed an overall adherence rate of 95.0% (n = 100) among HIV patients undergoing pharmacotherapeutic follow-up. On the other hand, the Pharmacy Dispensing Records method showed median, mean and standard deviation values for the time between the dispensations of respectively, 30.00, 33.07 and 15.55 days. Also, the minimum time between dispensations was equal to one day and the maximum was 220 days. The 95% confidence interval for the mean time between dispensations was equal to 30.03 and 36.12. Table 7 shows a good compliance to antiretroviral pharmaco-therapy with a regular adherence rate of 76% for the group undergoing monitoring and 10% (n = 100) for patients that withdrew from the study (> 90 days without returning).

DISCUSSION

AIDS has a strong negative impact on the current context of health. Considering the importance of the pandemic and the need for studies that associate adherence with clinical indicators through new care strategies for PLHIV (Santos et al., 2010), the present study was designed in the context of pharmaceutical care and its interfaces with these patients. In particular, the sociodemographic characteristics of the monitored patients coincide with those of other national and international studies (Echevarría et al., 2004).

Regarding the monitoring of therapeutic success of HIV+ patients, the main clinical indicators are the viral load and CD4 lymphocyte count, because these parameters of immunological evaluation are important in determining factors related to drug therapy (Brazil, 2008; Hirsch et al., 2009). Some data show that a low count of CD4+ T cells may be a risk factor related to the disease that affects the patient's adherence to treatment (Schilkowsky et al., 2011). Studies try to explain this situation using two theories: the physical and cognitive

Table 6. Statistical analysis between the CD4 count at the baseline/end and adherence of PLHIV/AIDS in PTM.

Adherence Classification	Analysis Time	N	Minimum (copies/ml)	Maximum (copies/ml)	Mean (copies/ml)	Standard Deviation (copies/ml)	Coefficient of Variation (%)	Median	Interquartile Range
Non-adherent	Baseline CD4	12	112.00	428.00	219.17	90.26	41.18	221.00	133.25
	End CD4	9	71.00	675.00	374.55	184.19	49.17	355.00	275.50
Adherent	Baseline CD4	31	13.00	593.00	199.35	120.14	60.26	194.00	120.00
	End CD4	23	133.00	805.00	387.74	191.53	49.39	342.00	262.00

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

Table 7. Distribution of PLHIV receiving PTM in relation to the adherence profile (dispensing pharmacy records method).

Classification: Pharmacy Dispensing Records			Total
Regular adherence	Irregular adherence	Treatment dropout	
76	14	10	100

Source: Direct Research, José de Alencar Center of Medical Specialties (CEMJA), November 2008/January 2012.

patient receives as the disease progresses (Melchior et al., 2007; Gir et al., 2005; Garrido and Castro, 2005).

In pharmacotherapeutic monitoring studies (Eidam et al., 2006; Martinez, 2012; Rathbun et al., 2005; Ma et al., 2010; Henderson et al., 2011; Moriel et al., 2001; Silveira, 2009) conducted with people living with HIV, pharmaceutical interventions also positively influenced the clinical outcomes through improved adherence to ART and, hence, suppression of viral load and increase in CD4+ count. In this study, both clinical indicators were statistically significant ($p<0.001$) before/after PTM. One possible explanation is the fact that the group that is being studied underwent a closer monitoring, which probably minimizes the concerns about the health-disease process and, consequently, facilitates the adherence to treatment. The attainment of expected levels of CD4+ T cells and viral load is intrinsically related to patient adherence to ART, with the possibility of near-normal values in immunological evaluation indices (Rocha et al., 2001).

Adherence refers to the degree to which the patient's behavior related to the therapeutic regimen fits what was established by the physician and the multiprofessional team. Adherence includes the willingness to undergo treatment and the ability to take the medications as prescribed (Gusmão and Mion, 2006). It is a multifactorial and dynamic process that encompasses physical, psychological, social, cultural and behavioral factors; it requires decisions that are shared and communicated between the PLHIV, the multidisciplinary health care team and their social networks (Saldanha et al., 2009).

Inadequate adherence to treatment of chronic diseases is an important worldwide problem. In developed countries, mean adherence to the continuous use of drugs is 50% and in developing countries, this percentage is even lower (Oigman, 2006). The studies regarding adherence to antiretroviral agents, in particular, have shown rates ranging from 37 to 83% (Sabaté, 2003). A meta-analysis of North American studies reported rates between 28.3 and 69.8% (Kim et al., 2014). This rate depends on the studied drug, method and demographic characteristics. In Brazil, a review (Bonolo et al., 2007) identified that the level of non-adherence to antiretroviral drugs ranged from 5 to 67%. In this case, observational research with these patients, previously done in same place and using the same two methods, albeit without PTM, found a compliance rate of 45.7%.

In this study, most patients receiving PTM showed good adherence with the used methods (95% and 76%) as compared to other services that use traditional dispensing models and do not follow patients through PTM. It should also be noted, that non-dispensation of drugs to those patients with a lower adherence was not due to lack of medication supply, but rather because of non-attendance of the patient or the caregiver at the Pharmaceutical Care Unit to receive the drugs on the day scheduled by the pharmacist.

Another major challenge for those working with HIV+ patients is to choose the most effective method of measuring adherence to drug treatment (Ventura, 2006). The literature does not mention an established method for assessing adherence as the “gold standard” (Chesney,

2006) and all of the methods have advantages and limitations to be overcome. No single method provides a precise result and two or more concomitant methods should be used to improve accuracy (Mcmahon et al., 2011). The self-report method has the advantages of easy application and low cost, but generally leads to overestimated results, which may have occurred in this study that found an adherence rate of 95%.

The method of pharmacy dispensing records was chosen for this study because the Brazilian government already provides an electronic control system for ART, which facilitates the operationalization of measuring adherence through this mechanism. This method has been increasingly the object of interest in studies with PLHIV (Ross-Degnan et al., 2010). Researchers recently conducted a review on this subject and identified 36 studies (24 in developed countries and 12 in developing countries) that evaluated the association between the pharmacy-dispensing data and measurements of adherence and laboratory or clinical results. The data showed that the measurement methods that included the number of days during which a patient received the antiretroviral drugs seemed to be more effective. Four of these studies clearly favored the use of pharmacy data, while only one favored self-reporting (Keith, 2011).

Literature shows that the practice of pharmaceutical care through PTM improves adherence to antiretroviral (Rodrigues et al., 2010; Hernanz et al., 2004) and significantly contributes to the care of PLHIV. Other authors demonstrated that patients who were followed by clinical pharmacists had significant improvement at the initial moment in their CD4+ lymphocyte count, in viral loads and in the management of adverse reactions (March et al., 2007). Souza et al. (2010) considered that pharmacotherapeutic guidance during PTM was effective in promoting continued adherence to antiretroviral treatment, because all patients who adhered to treatment in the intervention group maintained an undetectable viral load.

Some limitations were detected in this study. Initially, the very specific care required for PLHIV/AIDS already constitute a challenge due to social, cultural, economic and psychological dilemmas faced by these individuals, which have an impact in terms of meeting the schedule and adherence to recommendations established between health professionals and patients. Additionally, for technical and operational reasons for facilitate the study, and because this was a convenience sample, through funding by temporal demand, it may have passed on a sample size with a number not as robust and sufficient to perform statistical tests to subsidize a more accurate analysis of the intended outcomes.

Other limitations of the small size of PLHIV/AIDS, was conducting benchmarking follow-up viral load CD4+ lymphocyte measures at the laboratory in the start and end times so that the differential analysis could be performed. This may reflect the difficulties of access and structure of services or even organization between the service unit and the carrying out of laboratory assessments. However, it was often caused by the fact that patients missed the appointment for blood collection. This scenario is quite typical in studies using real-world data. Also, with respect to limitations, for ethical reasons, all patients had to receive pharmaceutical care and it was not possible to use a control group, in which the subjects followed themselves longitudinally, while pharmaceutical care was controlled by the patients themselves during the nine months. Interventions were measured at the beginning and end of the AFT, which limited the interpretation of the findings to be associated with the potential impact of the intervention and pharmaceutical care.

Conclusion

Despite therapeutic and political advances regarding PLHIV in the last decade, a high level of adherence to antiretroviral treatment is still an obstacle to be overcome. The treatment involves a complexity of social, psychological (stigma), pharmacological (adverse reactions and drug interactions) and other factors that impact the implementation of strategies that strengthen holistic care, as well as the monitoring of clinical key indicators such as CD4+ T cells and viral load in order to establish adherence over time.

In this sense, at the time of dispensing, the pharmacist has an excellent opportunity to interact with patients and the interdisciplinary team through an efficient and continuous pharmaceutical care program. The findings of this study showed that most patients undergoing pharmacotherapeutic monitoring improved their assessed clinical indicators (CD4 and viral load), and this may be a reflection of a higher rate of adherence to pharmaco-therapy instituted among patients monitored at the secondary level of health. This highlights the importance of a humane approach in the chain: respecting the psychosocial values during the follow-up of clinical indicators, guidance and monitoring of PLHIV.

The pharmacist can act favorably to achieve the proposed therapeutic goals and improve the quality of life of these patients.

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Conflict of interests

The authors declare that there is no conflict of interest.

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