

Original Research

Demographic and Behavioral Determinants Related to ART Adherence Among HIV-Positive Patients in Luanda, Angola

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Abstract: Adherence to antiretroviral therapy (ART) improves the quality of life of people living with HIV (PLHIV), with emphasis on improving their immune status, reducing viral load and reducing the mortality rate from the Human Immunodeficiency Virus (HIV). To characterize the status of adherence to antiretroviral therapy and the factors associated with non-adherence among adult HIV patients in two health units of reference for people living with HIV/AIDS in Luanda, the capital of Angola (Hospital Divina Providência and Hospital Esperança/Centro de Saúde do Rangel). This is a cross-sectional study of 378 PLHIV on ART, who were interviewed to obtain sociodemographic data and completed a questionnaire to assess ART adherence. It was found that 95.5% of patients had moderate adherence, 4.20% had excellent adherence and 0.3% had poor adherence. Adherence to ART was related to monthly income ($p < 0.05$). In addition, borderline significance was observed between adherence rate and education level, with patients with primary or secondary education having moderate (35% - 50%) or excellent (38% - 56%) adherence rates. Patients over 30 had higher adherence rates, either moderate (30% - 57%) or excellent (44% - 56%). Women had approximately double the rates of moderate (75%) or excellent (63%) adherence to ART compared to men. Low adherence to ART was observed in married individuals and patients who use drugs or alcohol. This study looked at adherence to antiretroviral therapy among HIV-positive individuals in Luanda, Angola. The findings highlight the key role of socioeconomic factors, especially monthly income, in influencing the adherence levels of HIV patients in Angola. In addition, age, gender, education and marital status emerged as additional determinants that negatively affect adherence rates. These determinants emphasize the need for personalized interventions aimed at addressing the various barriers to ART adherence, with the aim of increasing the effectiveness of HIV/AIDS management to ensure a better quality of life for people living with HIV in Angola.

Keywords: HIV; Antiretroviral Therapy; Adherence Assessment; Angola.

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1. Introduction

Some 43 years after its discovery, the Human Immunodeficiency Virus (HIV) continues to be a global disease and public health problem. In 2022, it was estimated that there were 39 million PLHIV, of whom 29.8 million were on ART, with 1.3 million new infections and 620,000 deaths due to AIDS. The African Region of the Health Organization

(WHO) remains the most severely affected, with almost 1 in 25 adults (3.2%) living with HIV and accounting for almost two-thirds of all PLHIV worldwide. However, it is estimated that by 2023, countries such as Botswana, Eswatini, Rwanda, the United Republic of Tanzania and Zimbabwe will have reached the WHO's "95-95-95" target. This means that in these countries, 95% of people living with HIV know their HIV status; 95% of people know they are living with HIV and are on life-saving ART; and 95% of people on treatment have a suppressed viral load. Another 16 countries, eight of which are in the sub-Saharan Africa region, an area that accounts for 65% of all people living with HIV, are also close to achieving these goals. In Angola, the first cases of HIV infection were detected in 1985, and the number of HIV-positive individuals has been steadily increasing [1].

Universal access to antiretroviral therapy (ART) began in 2004, with successful results in reducing the morbidity and mortality associated with HIV. The first-line antiretroviral drugs currently used in Angola include tenofovir (TDF) and lamivudine (3TC) which are nucleoside reverse transcriptase inhibitors (NRTIs), and dolutegravir (DTG) as an integrase inhibitor (INI). In addition, zidovudine (AZT), which is an INTR, has been used to prevent vertical transmission of HIV, both orally and intravenously. Although antiretrovirals (ARVs) are provided free of charge and universally, adherence levels are still not desirable. There are people living with HIV who have HIV-1 variants with drug resistance mutations, posing a challenge to the effectiveness of ART, especially in low- and middle-income countries such as Angola [2-4].

Currently, it is estimated that 320,000 people live with HIV in the country, which represents a prevalence rate of 2%, considered low compared to neighboring countries. However, the situation remains worrying due to the emergence of new cases and resistance to antiretroviral drugs, which may be associated with drug adherence, which is why this study was carried out [3]. HIV is classified into types (HIV-1 and HIV-2), groups (M, N, O and P) and subtypes (A, D, F, H, J and K), with circulating recombinant forms and single recombinant forms, which correspond to people with risk behaviors who are newly infected with at least two viruses from different groups. HIV-1 is responsible for most HIV infections. All the HIV-1 variants of the M (major) group, which is the most prevalent in the world, have already been described in Angola [2].

Adherence to therapy is a multifactorial and collaborative process that depends on the individual's attitude towards a specific circumstance, seeking to develop autonomy and self-care. This adherence becomes a challenge for patients and health professionals, as it involves behavioral aspects related to the therapeutic regimen, such as schedules, duration of treatment, specific medication, recommendations and regularity of appointments, which interfere with the social, cultural and psychological habits of HIV-positive people [5]. It is of great importance to evaluate and understand the study scenario and the treatment behavior of PLHIV, so that adherence strategies can be developed, together with drug dispensing units, in an attempt to minimize the effects of inadequate adherence and increase the life expectancy of patients seeking medical and drug therapy [6]. In this study, we investigated the demographic and behavioral determinants related to adherence to ART among HIV-positive patients in Luanda, the capital of Angola.

2. Method

2.1 Study design and setting

This is a cross-sectional, prospective and analytical study with a quantitative approach. The study population includes HIV-positive individuals treated and monitored in two hospital units in Luanda, Angola, from 2018 to 2022. The sample consisted of 378 HIV-positive volunteers of both sexes, obtained by simple random selection during outpatient follow-up appointments at the aforementioned hospital units during the study period. The inclusion criteria were being an adult citizen aged 18 or over, of both sexes, with positive HIV serology, on antiretroviral treatment for at least 6 months. 41 participants were excluded either because they were pregnant or because they were <18 years

old (Figure 1). All the selected participants individually read and signed the informed consent form.

$$n = \frac{\sigma^2 \cdot p \cdot q \cdot N}{e^2(N - 1) + \sigma^2 p \cdot q}$$

n: Represents the sample size we want to calculate.

σ^2 : This is the deviation from the mean value that we accept in order to achieve the desired level of confidence, expressed as a number of standard deviations, which is equal to 4.

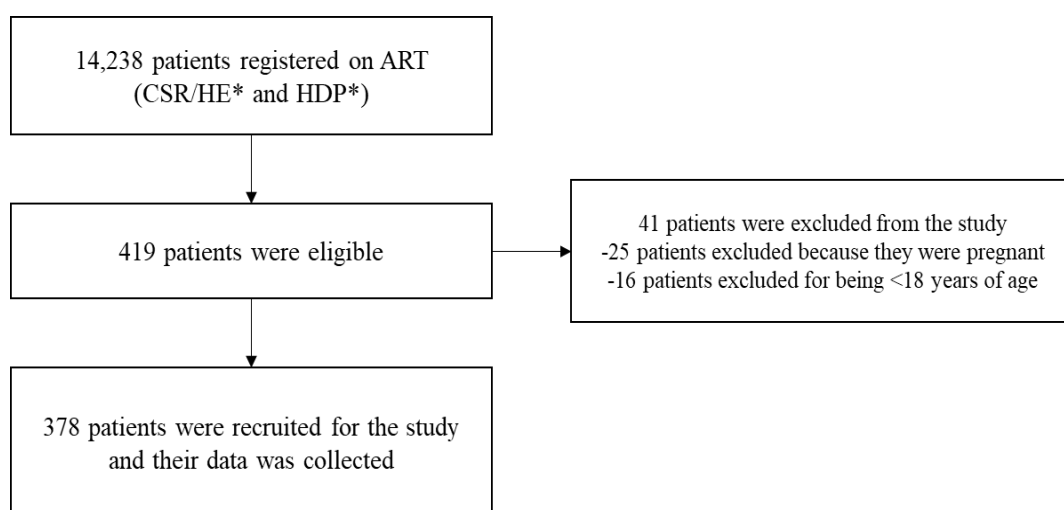
p: This is the percentage that estimates the lowest level of adherence, being equal to 30.

q: Represents the percentage 100-p which is equal to 90.

N: The size of the study population is 14,238 individuals.

e^2 : This is the maximum permitted error, which is equal to 5.

Figure 1. Study diagram.



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2.2 Data/sample collection and laboratory procedure

Sociodemographic data was collected using a structured interview designed for the study, including age, gender, professional status, level of education, sexual orientation, socioeconomic status, use of antiretroviral medication and mode of HIV transmission. The patients' clinical profile data was compiled directly from the medical records: duration of HIV infection (in months), levels of T-CD4+ lymphocytes and plasma viral load, antiretroviral medication, number of tablets and dosage (frequency). To assess adherence to treatment, Remor's "Cuestionario para la Evaluación de la Adhesión al Tratamiento Antirretroviral (CEAT-VIH)" was used in its adapted Brazilian version. To determine the degree of adherence to ART, the CEAT-HIV instrument score was used [7], where the highest score corresponds to the highest degree of adherence to treatment, with a minimum possible score of 17 and a maximum possible score of 89. The degree of adherence was divided into low/insufficient adherence (raw score ≤ 74), good/adequate adherence (raw score between 75 and 79) and raw score ≥ 80 is optimal/excellent adherence.

Data collection was carried out in the morning by the author and members of his team, on the days of the subjects' appointments, from October to December 2022, by

means of a simple random probability sample, using the technique of extracting respondents from the population by means of a table of three-digit random numbers.

2.2 Statistical analysis

The data collected was entered, coded and analyzed in SPSS v. 29. Descriptive analyses of the sample were carried out with frequencies (absolute and relative), mean and standard deviation (SD) of the sociodemographic, clinical and laboratory data considered variables, later presented as frequencies and percentages. The chi-square test (χ^2) was used to determine the association between the study's qualitative variables and adherence to ART. Two-tailed p-values were reported, and statistical significance was determined when $p < 0.05$.

3. Results

Analyzing the 378 volunteers who took part in the study, it was found that the age of the participants ranged from 18 to 79 years, with a mean of 42.6 and standard deviation of 11.19 years, showing a symmetrical distribution, with the majority being women (74.1%), with primary (49.9) or secondary (35.5%) education, employed (50.9%), single (95.5%), with biological children (88.9%), with an income of one or two minimum monthly wages (69.8%), professing the Protestant religion (65.3%), having disclosed their serological status to their partner (92.9%), not consuming alcoholic beverages (75.7%), not using drugs (97.9%) and with an RNA viral load ≤ 50 copies/mL (86.8%) (Table 1). Overall, 95.5% of patients had moderate adherence, 4.20% had excellent adherence and 0.3% had low adherence.

This study found a significant association between monthly income ($p = 0.048$) and adherence to ART among the study participants. However, the participants' age group, gender, level of education, occupation, marital status, biological children, religion, disclosure of serological status, consumption of psychotropic substances, and viral load were not significantly associated with adherence to ART ($p > 0.05$).

Table 1. Demographic and behavioral determinants related to ART adherence among HIV-positive patients in Luanda, Angola.

Independent characteristics	N (%)	ART adherence			p-value
		Low (%)	Moderate (%)	Optimal (%)	
Overall	378 (100)	1 (0.30)	361 (95.5)	16 (4.20)	
Age (years), Mean $\pm$ SD	42.6 $\pm$ 11.2	37.0	42.6 $\pm$ 11.3	44.4 $\pm$ 8.73	0.710
Age distribution					
<20	9 (2.40)	0 (0.0)	9 (2.50)	0 (0.0)	0.479
20 – 30	41 (10.8)	0 (0.0)	41 (11.4)	0 (0.0)	
31 – 40	115 (30.4)	1 (100)	107 (29.6)	7 (43.8)	
>40	213 (56.3)	0 (0.0)	204 (56.5)	9 (56.3)	
Gender					
Male	98 (25.9)	0 (0.0)	92 (25.5)	6 (37.5)	0.472
Female	280 (74.1)	1 (100)	269 (74.5)	10 (62.5)	
Educational level (Missing=1)					
Illiterate	18 (4.80)	0 (0.0)	17 (4.70)	1 (6.30)	0.088
Basic	188 (49.9)	0 (0.0)	179 (49.7)	9 (56.3)	
High school	134 (35.5)	0 (0.0)	128 (35.6)	6 (37.5)	
High-level	37 (9.80)	1 (100)	36 (10.0)	0 (0.0)	

Occupation (Missing=1)					
Unemployed	185 (49.1)	0 (0.0)	178 (49.4)	7 (43.8)	0.559
Employed	192 (50.9)	1 (100)	182 (50.6)	9 (56.3)	
Marital status (Missing=1)					
Unmarried	361 (95.5)	1 (100)	344 (95.3)	16 (100)	0.658
Married	17 (4.50)	0 (0.0)	17 (4.70)	0 (0.0)	
Children (Missing=1)					
No	335 (88.9)	0 (0.0)	40 (11.1)	2 (12.5)	0.925
Yes	42 (11.1)	1 (100)	320 (88.9)	14 (87.5)	
Monthly income (Missing=24)					
1 – 2	247 (69.8)	0 (0.0)	236 (70.0)	11 (68.8)	0.048*
3 – 4	88 (24.9)	1 (100)	85 (25.2)	2 (12.5)	
>4	19 (5.40)	0 (0.0)	16 (4.70)	3 (18.8)	
Religion (Missing=1)					
None	47 (12.5)	0 (0.0)	47 (13.1)	0 (0.0)	0.900
Catholic	81 (21.5)	0 (0.0)	78 (21.7)	3 (18.8)	
Protestant	246 (65.3)	1 (100)	232 (64.4)	13 (81.3)	
Islamic	2 (0.50)	0 (0.0)	2 (0.60)	0 (0.0)	
Spirit	1 (0.30)	0 (0.0)	1 (0.30)	0 (0.0)	
Reveal status to other					
No	27 (7.10)	1 (100)	12 (3.3)	14 (87.5)	0.672
Yes	351 (92.9)	0 (0.0)	349 (96.7)	2 (12.5)	
Alcohol					
No	286 (75.7)	1 (100)	274 (75.9)	11 (68.8)	0.688
Yes	92 (24.3)	0 (0.0)	87 (24.1)	5 (31.3)	
Drugs					
No	370 (97.9)	1 (100)	353 (97.8)	16 (100)	0.825
Yes	8 (2.10)	0 (0.0)	8 (2.20)	0 (0.0)	
RNA Viral Load					
≤50	328 (86.8)	1 (0.3)	313 (82.8)	14 (3.70)	0.306
51 – 500	21 (5.60)	0 (0.0)	2 (0.5)	0 (0.0)	
501 – 1000	2 (0.5)	0 (0.0)	2 (0.5)	0 (0.0)	
1001 – 10000	7 (1.9)	0 (0.0)	7 (1.9)	0 (0.0)	
10001 – 30000	2 (0.5)	0 (0.0)	1 (0.3)	1 (0.3)	
>30000	18 (4.8)	0 (0.0)	18 (4.8)	0 (0.0)	

*Statistically significant.

4. Discussion

In this study, adherence to ART among the majority of HIV-positive people was 95.5%. Family income was the main determinant of low adherence to ART among HIV patients. Poor adherence to ART is the main determinant of failure in virological suppression, development of resistance to ART, progression of HIV infection to disease and low survival rate from disease. Our results can be generalized to comparable contexts, since

our population is similar to other populations in sub-Saharan Africa, where HIV infection is endemic, and most HIV-positive people have some adherence to ART. There is currently an increase in the prevalence of individuals over 60 living with HIV/AIDS, and sexual transmission continues to be the main mode of HIV transmission [6]. The average age of the patients in our study at the time of diagnosis was 42.6 years [7].

This study revealed that the study population was predominantly female (74.1%), and the majority were over 40 years old (62.4%). Similar results were obtained in the study on the longitudinal analysis of sociodemographic, clinical and therapeutic factors of HIV-infected individuals in Kinshasa, Democratic Republic of Congo, where the majority of PLHIV were women (71%) and had a high level of education (68%). Demographic and behavioral determinants have a significant impact on adherence to antiretroviral therapy in HIV patients [8]. Our study shows that due to the greater number of participants belonging to the older age group (>40 years old) and the female sex, there is more adherence to health services related to the distribution of ART, as well as the search for a support network by this group of individuals.

The low number of female and male HIV-positive participants aged ≤ 40 in the study and seeking health services, may be related to the fear of exposure due to family, professional and social discrimination to which they are subjected. This study shows that there is no association, as proven by the Chi-square test with a p -value < 0.05 . However, studies in Africa do not always indicate that females predominate in research into HIV infection. In this context, a retrospective cohort analysis of people living with HIV/AIDS enrolled in HIV care at a referral center in Antananarivo, Madagascar, found that 67.1% were male. Another study on the epidemiological profile of PLHIV in an infectious diseases reference center in Rabat, Kingdom of Morocco, found that women accounted for 12.5% of the participants in the survey. In the social context of Angola, prejudice towards HIV-positive people is evident in the family, social and professional spheres, making HIV-positive individuals feel embarrassed by discrimination, mistrust and shame in regularly going to specialized health centers to receive ART [7, 9]. Our results suggest that there is an opportunity both for intervention at family level and for intervention aimed at society and the professional environment, with the aim of reducing the degree of prejudice and improving adherence rates to ART.

Studies carried out in Africa have revealed that a significant proportion of HIV infections occur in stable relationships, either due to previous infection of one of the partners or infidelity [10]. In five African countries, at least two thirds of couples with an HIV-positive partner were serodiscordant, and in half of them, the woman was the HIV-positive one. As for marital status, in this study there was a predominance of single people (95.5%). A similar result was obtained in a study carried out in Brazil, where of the 173 participants, 94 (53.7%) were single [11]. The results in similar realities show that irregular adherence to ART is often since many patients are aware of their HIV status and therefore decide to remain single. However, it is important to stress that the predominance of single people among the participants may indicate specific challenges in relation to adherence to treatment, such as less social support or greater difficulty in establishing care routines.

The results suggest that knowledge of serological status alone does not guarantee adherence to antiretroviral treatment. Other factors, such as the social context, family support and the characteristics of the marital relationship, can significantly influence adherence. It is essential that future research investigates in greater depth the factors that influence adherence to treatment in different social and cultural contexts, considering the diversity of interpersonal relationships and the specific needs of each population group.

The presence of biological children was common among the participants, which corroborates the results of other studies consulted. A survey of 254 HIV-positive participants found that 59% of the individuals had biological children. This information is relevant because the presence of biological children may suggest that sexual relations occur without the consistent use of condoms, which increases the risk of HIV transmission, especially in cases where the serological status of the partner is unknown [12]. Although not directly

related to adherence to ART, the presence of biological children among people living with HIV can be an indirect indicator of risk behaviors.

In our study, the majority of participants said they were Protestant (65.1%), Catholic (21.5%), Spiritist (0.3%), had no religion (4.8%) and other (8.2%). In contrast to the results of our research, a study consulted 160 HIV-positive participants, and in terms of religion, 38% of those interviewed declared themselves to be Catholic, 25.3% were Spiritist/Spiritualist, 19.3% were evangelical in origin and 17.5% reported having no religion [13]. Furthermore, historically, spirituality and religion have been considered important determinants of health, since their values and systems positively influence the formation of individuals, bring personal fulfillment and stability to their lives [14]. Religiosity has been significantly associated with better mental health outcomes, treatment adherence and quality of life among HIV-positive participants. There are reports that greater religiosity has led to lower levels of depression and anxiety, as well as greater adherence to antiretroviral drugs. Religiosity has also been identified as a protective factor against drug use and unprotected sex, which are risk behaviors that can contribute to HIV transmission. Researchers suggest that the expression of faith and participation in religious activities can play an important role in health promotion and disease management in HIV-positive people [15]. In our reality, many churches discredit conventional medicine, pushing people away, "commercializing" the so-called miracle of healing and manipulating laboratory results. The church has been pointed out as having a relevant role in social support, spiritual comfort and promoting well-being, so it shouldn't make believers enemies of science and conventional medicine but should empower them to adhere to health services and the like [16].

Most of the participants in our study (69.8%) earned a monthly income of one to two minimum wages (equivalent to 30 to 60 US dollars). This difference was statistically significant ($p < 0.05$), which suggests that low income is a factor that hinders adherence to treatment, even leading to the use of expressions such as "*I don't have enough money to eat or to pick up the drugs*". Many participants reported having to choose between buying food and prioritizing work to guarantee the family income, which compromises the receipt of medication for treatment. In addition, the need to work long hours to make ends meet can lead to neglecting treatment, for fear of losing their job or suffering prejudice in the workplace, which makes it difficult to adhere to treatment. In contrast to other studies where the predominant monthly income of the subjects (75.4%) ranged from one to three minimum wages (equivalent to 250–750 US dollars), better adherence to antiretroviral therapy was observed [17]. Given these findings, it is imperative to implement concrete measures aimed at improving adherence to ART, including the development of educational and awareness projects for individuals living with HIV. These initiatives should emphasize the importance of treatment adherence. Additional projects could also be implemented, such as psychological support to address financial insecurity, which may lead to anxiety and depression, further hindering medication adherence.

Many participants (92.9%) reported disclosing their serological status to someone. Disclosure of serological status has several advantages, such as gaining social support, reducing feelings of isolation, relieving the burden of keeping "a secret," decreasing stigma, strengthening interpersonal relationships, improving adherence to antiretroviral therapy, and enhancing psychological and physical well-being [17]. However, our study did not prove the existence of a relationship between disclosure of HIV status and adherence to ART ($p > 0.05$), as it should be considered that each individual's experience is unique and that disclosure can have different impacts depending on personal characteristics, social context and interpersonal relationships. There are several studies that address the relationship between HIV and alcohol consumption in Africa and around the world [18].

According to a study released by the World Health Organization (WHO) in 2016, alcohol consumption is related to risk behaviors, namely unprotected sex, which can increase HIV transmission. In addition, individuals who consume alcohol excessively are

more likely not to adhere to antiretroviral treatment, which can compromise the effectiveness of the treatment and the progression of the disease [19].

About Africa, a study published in the journal BMC Public Health in 2013 showed that alcohol consumption is associated with an increase in HIV prevalence in various regions of the continent. The study highlighted the importance of prevention in programs that address the relationship between alcohol consumption and HIV to reduce the risk of spreading infection and disease by this retrovirus [20]. It is therefore clear that alcohol consumption can have an impact on HIV transmission and treatment, both in Africa and the rest of the world. An integrated approach to HIV prevention and treatment should consider alcohol consumption as an important risk factor to be addressed, also remembering that excessive alcohol consumption can interfere with cognitive capacity, resulting in memory lapses, impaired life planning, disorganization and demotivation, making it difficult to comply with the treatment routine and increasing the risk of drug interactions. Several studies have highlighted that injecting drug use has been identified as a significant risk factor for HIV transmission, due to the sharing of needles and syringes between users [21].

A study conducted by the WHO in 2014, entitled *"Drug use and HIV for public health"*, emphasizes the relationship between drug use and HIV infection, highlighting the importance of public policies to reduce harm and prevent transmission of the virus among drug users. In addition, a report by the Joint United Nations Program on HIV/AIDS (UNAIDS) in 2019 points out that approximately one third of new HIV infections outside the countries of the sub-Saharan African region are related to injecting drug use [22].

In Africa, despite the lower transmission of HIV among injecting drug users compared to other regions of the world, the practice still represents a challenge to efforts to prevent and control the epidemic. Therefore, the studies and reports mentioned underline the need to address drug use as a significant risk factor for HIV infection, both in Africa and in other parts of the world, and to implement effective forms of prevention and harm reduction strategies for this vulnerable population [23]. Another recent study investigated the relationship between alcohol and drug use and adherence to antiretroviral therapy, the results of which showed that excessive alcohol consumption and the use of illicit drugs were associated with lower adherence to antiretroviral therapy, probably due to the negative effects of these substances on the ability to maintain treatment on a regular and consistent basis [24].

The instability in the lives of drug users, the stigma associated with drug use and HIV, as well as the comorbidities often present, make it difficult to adhere to treatment. Interruption of treatment, in turn, can lead to the development of viral resistance and the progression of the disease. This can be explained by the fact that users of psychotropic substances may have their own imaginary and temporary world, seeking to escape from reality, which influences low adherence to ART. These results show that the socio-demographic determinants associated with HIV infection differ from region to region, depending on the epidemiological characteristics of each country and sometimes associated with socio-cultural and religious factors.

The degree of adherence does not seem to be completely influenced by the sociodemographic characteristics of the sample. Other studies also did not consider socioeconomic level as a good predictor of the degree of adherence to treatment, except in situations of extreme poverty, which did not occur in the study sample. Likewise, the association between level of adherence and age is not clear in the literature. Previous studies [25, 8] suggest that factors beyond sociodemographic characteristics, such as social support, the quality of the doctor-patient relationship and the characteristics of the therapeutic regimen, can have a significant impact on treatment adherence. The complexity of the therapeutic regimen, medication side effects and the presence of comorbidities are examples of factors that can make adherence difficult.

5. Conclusion

In summary, this study investigated the determinants of adherence to ART among HIV-positive individuals in Luanda, the capital of Angola. The results highlight the critical impact of socioeconomic factors, namely monthly income, on adherence levels among HIV patients studied in Angola. Furthermore, factors such as age, sex, education and marital status were identified as other influences on adherence rates. These determinants highlight the need for personalized interventions to address the various barriers to ART adherence, thereby increasing the effectiveness of HIV/AIDS management and promoting a better quality of life for people living with HIV in Angola.

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