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Research Article

## Determinants of adherence to ARVs in HIV+ women enrolled in the PMTCT program in the West and North Regions of Cameroon

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### Abstract

**Background:** According to UNAIDS 2019, 52% of people worldwide living with HIV is on antiretrovirals (ARVs), HIV positive women representing 80% of them. This study aimed at highlighting the determinants of adherence to ARVs for HIV positive women enrolled in PMTCT programs in the West and North Regions of Cameroon.

**Methods:** A descriptive and analytical cross-sectional study was carried out from February to September 2019 in three treatment centres in the West (Bafoussam Regional Hospital and Dschang District Hospital) and North (Garoua Regional Hospital) regions in Cameroon. Data were collected using a questionnaire administered face to face and encoded in Excel 2013, then analyzed using SAS version 7.8. P-values < 0.05 were considered statistically significant

**Results:** One thousand (1000) women were interviewed. The mean age was 17 ±2 years (Range: 12 – 67 years); 231 (23.1%) were single. Overall, the prevalence of ART-adherence was 68.6%. After multivariate analysis using multiple logistic regression; *having one HIV-infected children* (aOR=60.9; 95%CI=[7.6; 489.1]; P=0.001), *non-disclosure of serological status with the spouse/boyfriend* (aOR=25.2; 95%CI=[9.2; 68.9]; P<0.001), *not being educated* (aOR=7.7; 95%CI=[4.4; 13.3]; P<0.001); and *taking ARVs once or less daily* (aOR=50; 95%CI=[20.0; 100.0]; P<0.001) were four risk factors for non-adherence.

**Conclusion:** ART-adherence among Cameroonian pregnant women is still very far below UNAIDS target (95%), with four potential key determinants identified. As we are progressively moving towards the elimination of HIV vertical transmission in 2030 as advocated by UNAIDS, local policies should be reinforced in order to consolidate the strides made so far.

**Keywords:** HIV, PMTCT, Pregnancy, Adherence, option B+, Cameroon.

## INTRODUCTION

In line with the multiple efforts undertaken to improve access to antiretroviral drugs (ARVs) in sub-Saharan Africa, ARV coverage among people living with HIV (PLWHIV) in Cameroon has increased from 0% in 2003 to 22% in 2014. However, the success of HIV programs does not depend exclusively on access to ARVs, but also on retention in care and adherence to ARVs. This is critical to achieving viral load suppression, preventing the emergence of new HIV resistant strains, reducing transmission and the number of HIV-related deaths <sup>1</sup>. The use of antiretroviral therapy (ART) is a fundamental strategy proposed by the World Health

Organization (WHO) for the prevention of mother-to-child transmission (PMTCT) of HIV <sup>2</sup>. This strategy has led to a considerable reduction in the morbidity and mortality rates associated with HIV/AIDS <sup>3</sup>. In 2019, 37.9 million (32.7 million-44.0 million) people were living with HIV worldwide. These included 36.2 million (31.3 million-42.0 million) adults and 1.7 million (1.3 million-2.2 million) children (<15 years). In 2010, 23.3 million (20.5 million-24.3 million) people living with HIV had access to antiretroviral treatment, but only 54% (37-73%) of children aged 0-14 years and 68% (52-82%) of adult women aged 15 years and older had access to treatment <sup>4</sup>.

Sub-Saharan Africa has the highest burden of HIV in the world. Guidelines and programs for HIV prevention plans should be designed following an assessment of the cost-effectiveness of country-level activities, with the aim of contextualizing interventions to achieve much better results<sup>5</sup>. Despite the fact that significant progress has been made in eliminating mother-to-child transmission of HIV in sub-Saharan Africa, much remains to be done<sup>6</sup>. In 2019, in Cameroon, 540 000 people were living with HIV. The incidence of HIV among the population during that year was 1.02% for all age groups combined. HIV prevalence, that is, the percentage of people living with HIV, was 3.6% among adults (between 15 and 49 years). 23,000 new HIV infections were registered. 18 000 people died of HIV-related causes. Antiretroviral coverage among pregnant women living with HIV to prevent transmission of the virus to their children was 80%, preventing 4,200 new infections among newborns. The rate of early infant diagnosis, that is, the percentage of HIV-exposed babies tested before their eighth week of age, reached 61% in 2018<sup>7</sup>.

The most highlighted barriers to achieving PMTCT of HIV are late initiation of antiretroviral treatment, non-adherence and non-involvement of men in the process. Hence, the need to implementing the 90-90-90 goals for the elimination of MTCT is imperial<sup>8,9</sup>. However, because HIV-infected pregnant women experience a great psychological crisis, health care providers need to use an approach that is as user-friendly as possible<sup>10</sup>.

Many studies conducted in different regions of Cameroon show some disparity in the prevalence of adherence to ARVs among PMTCT women. For example, a prevalence of adherence to ARVs of 65.2% was reported in the study conducted by Tebeu *et al.* in the Health Districts of Ndop and Fundong, North West Region of Cameroon<sup>11</sup>, another of 67.5% in 2012 in the study by Perfura *et al.*, at the Jamot Center in Yaoundé<sup>12</sup>, and finally a prevalence of 62.7% in the Kumbo Health District<sup>13</sup>; compared to a prevalence of 87.1% in Ethiopia<sup>14</sup>. Similarly, several studies conducted in Cameroon and sub-Saharan Africa show that demographic and socio-economic factors, patient-related factors, factors related to health care systems and ART, stigmatization, transportation costs, deprivation of food and whether or not the woman's HIV status is shared with her partner, family and community, educational level, occupation, and lack of knowledge of the spouse's HIV status can positively or negatively influence adherence to ART for HIV-positive women<sup>1-3,11-15</sup>.

However, the factors that impede adherence to antiretroviral treatment in Cameroon are not well known and may be influenced by the specific lifestyle habits of each Cameroonian region. For a much better efficiency of local ARVs programs, it is essential to identify barriers to adherence and then determine and implement appropriate measures to promote and improve it.

## MATERIALS AND METHODS

This was a cross-sectional descriptive and analytical study conducted from February to September 2019 in three treatment centres of PLWHIV, belonging to the Western (Bafoussam Regional Hospital and Dschang District Hospital) and Northern (Garoua Regional Hospital) regions. This study aimed to highlight the determinants of adherence to ARVs among a cohort of women followed within the aforementioned healthcare facilities in PMTCT programs.

Data was collected using a questionnaire administered face-to-face to all PMTCT women who came for consultations or for ARV supplies during our survey. The minimum sample size for our study was calculated using the standard formula for cross sectional studies<sup>16</sup> which resulted in 395 women. Once collected, the data were entered and processed using Excel 2013 software and analyzed using SAS version 7.8 software.

From the descriptive analysis, we extracted frequencies and proportions. Adherence to treatment was assessed by combining two methods. The direct method taking into account clinical parameters such as CD4 count ( $\geq 350$  CD4), Viral Load ( $\leq 50$  copies) and the indirect method taking into account the intrinsic elements of the patient like the therapeutic protocol, the absence of annoying post-medication manifestations. A patient with a positive score (greater than or equal to 3) to both methods was declared adherent. Univariate analyses were carried out using a Chi square test and multivariate analyses by the binary logistic regression method using adherence or non-adherence to treatment as the dependent variable. A significance level of 0.05 and odds ratio value compared to the number one (1) allowed us to decide on the relationship between the variable of interest (adherence) in our study and the independent variables. For the profession, we have divided it into three sectors, namely primary (farmer, housewife, other without qualification), secondary (craftsman, merchant) and tertiary (civil servant, retired).

**Ethical approval:** To conduct this study, we obtained the ethical approval Number CEN°158/CRERSH/2019 of the Center Regional Committee for Ethics and Research in Human Sciences.

**Consent of participants:** In this study, informed written consent was obtained from each participant, prior to his inclusion in the study.

## RESULTS

### Socio-demographic Features

A total of 1000 women equally distributed in the West and North Regions of Cameroon (500 women per region) took part in this study. According to age, women participating in this study were relatively young ([12 - 34] years); with very few among them (26%; 260/1000) living in rural areas. According to ethnicity, the bamileké women were more represented (57.2%; 572/1000) and 72.4% (724/1000) women in our study population were Christian women. About 18.4% (184/1000) participants never went to school and were thus considered as not-educated. According to civil status, we counted 44.4% (444/1000) single women, 47.5% (475/1000) married, 3.9% (39/1000) divorced and 4.2% (42/1000) widows. Among the married women, 48.21% (229/475) belonged to a polygamous home. As regarding the legal spouses (for the married women) and the boyfriends (for both the single, the divorced and even some widows) about 23.69% (218/920) of them were HIV-negative. Finally, 25.2% (252/1000) of women declared not having any children while 36.5% (365/1000) declared to have more than four living children; among all these living pregnancies, 8.82% (66/748) women only had at least one HIV-infected children; with a median age of 3 [interquartile range: 0.5 - 6] years old for these infected children. Table 1 below gives in-depth details of all socio-demographic parameters.

**Table 1:** Socio-demographic characteristics of sampled PMTCT women

<b>Variables</b>	<b>Term and Conditions</b>	<b>Total</b>	<b>Percentages</b>
<b>Age (N=1000)</b>	<b>[12-34]</b>	727	72.7
	<b>[35-67]</b>	273	27,3
<b>Residential Area (N=1000)</b>	<b>Rural Areas</b>	260	26
	<b>Urban Areas</b>	188	18.8
	<b>Semi-urban Areas</b>	552	55.2
<b>Ethnicity (N=1000)</b>	<b>Bamiléké</b>	582	58.2
	<b>Foufouldé</b>	81	8.1
	<b>Toupouri</b>	241	24,1
	<b>Haoussa</b>	96	9.6
<b>Religion (N=1000)</b>	<b>Christian</b>	724	72.4
	<b>Muslim</b>	179	17.9
	<b>Other</b>	97	9.7
<b>Level of Education (N=1000)</b>	<b>Not educated</b>	184	18.4
	<b>Primary</b>	352	35.2
	<b>Secondary</b>	359	35.9
	<b>University</b>	105	10.5
<b>Civil Status (N=1000)</b>	<b>Single</b>	444	44.4
	<b>Married</b>	475	47.5
	<b>Divorced</b>	39	3.9
<b>Matrimonial regime (N=475)</b>	<b>Widow</b>	42	4.2
	<b>Polygamous</b>	229	48.21
<b>HIV status of the partners (N=920)</b>	<b>Monogamous</b>	246	51.79
	<b>Positive</b>	616	67.0
	<b>Negative</b>	218	23.7
<b>Number of Children (N=1000)</b>	<b>Unknown</b>	86	9.3
	<b>No children</b>	252	25.2
	<b>1 child</b>	173	17.3
	<b>2-4 children</b>	210	21.0
<b>Number of HIV-infected Children (N=748 women)</b>	<b>Above 4 children</b>	365	36.5
	<b>None</b>	682	91.2
	<b>1 HIV(+) child</b>	37	4.9
<b>Profession (N=1000)</b>	<b>More than 1 HIV(+) child</b>	29	3.9
	<b>Primary sector</b>	728	72.8
	<b>Secondary sector</b>	203	20.3
	<b>Tertiary sector</b>	69	9

**Social behaviours and others parameters**

Disclosure of the serological status with spouse/boyfriend and family members was not systematic in the study population; about 21.7% (217/1000) and 44% (440/1000) women respectively had not disclosed their serological

status in either case. Similarly, 34.4% (344/1000) and 29.4% (294/1000) of the spouses and other family members respectively were not informed of their treatment. As a result, 35.1% (351/1000) of the women interviewed did not receive support from family members. (See table 2 for more clarifications)

**Table 2:** Disclosure of the serological status with the family

<i>Characteristics</i>	<i>Total</i>	<i>Percentage (%)</i>
<b>Disclosure of the status with spouse/boyfriend (N=1000)</b>		
Yes	783	78.3
No	217	21.7
<b>Spouse informed of the treatment (N=1000)</b>		
Yes	656	65.6
No	344	34.4
<b>Disclosure of the status with other family members (N=1000)</b>		
Yes	560	56
No	440	44
<b>Other members (friends) aware of your treatment? (N=1000)</b>		
Yes	706	70.6
No	294	29.4
<b>Do you receive support from these members (N=1000)</b>		
Yes	649	64.9
No	351	35.1

**Antiretroviral therapy and treatment outcomes**

Respectively 2.4% (24/1000) and 3.7% (37/1000) of the women surveyed admitted having difficulties meeting the doctor responsible for their clinical follow-up and having difficulties meeting the pharmacist in charge of dispensing

ARVs. However, all (100%) of them declare that they get help from their doctors and care providers when necessary and are satisfied (99.6%) with the advice given by health workers to facilitate their experience with the disease. (Table 3).

**Table 3:** PMTCT woman interaction with care providers

<i>Characteristics</i>	<i>Total</i>	<i>Percentage (%)</i>
<b>Difficulties in meeting the Doctor (N=1000)</b>		
Yes	24	2.4
No	976	97.6
<b>Getting help when needed (N=1000)</b>		
Yes	1000	100
No	0	0.0
<b>Satisfaction with advice given by Health Workers (N=1000)</b>		
Yes	996	99.6
No	4	0.4
<b>Difficulty meeting the Pharmacist (N=1000)</b>		
Yes	37	3.7
No	963	96.3
<b>Member of an association of PLWHIV? (N=1000)</b>		
Yes	562	56.2
No	438	43.8

About 94.2% (942/1000) of the women enrolled were under a first line regimen (2 nucleoside reverse transcriptase inhibitors + 1 non-nucleoside reverse transcriptase inhibitors). Only 12.1% (121/1000) of them had a viral load of less than 50 copies/ml and 13.9% (139/1000) were found with a CD4 count of more than 350 cells/mm<sup>3</sup>.

Embarrassing manifestations at the initiation of ART treatment were encountered in 71.4% (714/1000) of the women surveyed. Vomiting [13% (130/1000)] and dizziness

[11.9% (119/1000)] were the most frequently reported symptoms of discomfort after ARV treatment, and these decreased in 20.1% (201/1000) of cases as the drugs were taken. Among our respondents, 52.5 (525/1000) had initiated antiretroviral treatment at least 36 months before our survey and 2.4% (24/1000) of them were taking between two (02) and four (04) ARV tablets per day. Finally, 91% (910/1000) of these women reported a remarkable improvement in their health during the course of the medication. (See table 4 for more clarifications)

**Table 4:** Antiretroviral therapy and treatment outcomes

<b>Characteristics</b>	<b>Total</b>	<b>Percentage (%)</b>
<b>Therapeutic protocol (N=1000)</b>		
1st line	942	94.2
2nd line	58	5.8
<b>Viral load (N=1000)</b>		
≤ 50 copies	121	12.1
> 50 copies	879	87.9
<b>CD4 count (N=1000)</b>		
≤ 350	861	86.1
> 350	139	13.9
<b>ART initiation date (N=1000)</b>		
Less than 12 months	107	10.7
12-24 months	197	19.7
24-36 months	171	17.1
More than 36 months	525	52.5
<b>Number of ART tablets per day (N=1000)</b>		
One (01) tab	806	80.6
Two (02) tabs	170	17.0
2-4 tabs	24	2.4
<b>Embarrassing post-medication events (N=1000)</b>		
Vomiting	130	13.0
Vertigo	119	11.9
Asthenia	11	1.1
All of the above	16	1.6
Nothing	720	72.0
Other	4	0.4
<b>Evolution of trouble some manifestations with medication (N=1000)</b>		
Nothing	720	72.0
Decrease	207	20.7
Increase	2	0.2
No change	71	7.1
<b>Improvement in health since treatment (N=1000)</b>		
remarkable Improvement	910	91.0
No Improvement	90	9.0
<b>Treatment interruption in the previous year (N=1000)</b>		
Yes	119	11.9
No	881	88.1
<b>Knowledge of the risks of non-medication (N=1000)</b>		
Yes	759	75.9
No	241	24.1

It was found that 99.2% (992/1000) of the women interviewed contributed in a way or another to their care. About 74.1% (741/1000) of their contribution was much more related to the cost of transportation to the healthcare facility and the purchase of drugs for opportunistic

infections. The monthly contribution quota most frequently mentioned was included in the range of 0-5000 Fcfa [64.2% (642/1000)]. However, 57.5% (575/1000) of the respondents considered this cost to be affordable, as long as it allowed them to regain their health (table5).

**Table 5:** Contribution to the therapeutic process

<i>Characteristics</i>	<i>Total</i>	<i>Percentage (%)</i>
<b>Contribution to Treatment (N=1000)</b>		
Yes	992	99.2
No	8	0.8
<b>Elements to Contribute for the Treatment (N=992)</b>		
Transport (T)	144	14.52
Analysis Fees (AF)	6	0.6
Transport and Analysis Fees	61	6.15
Transport and purchase of drugs (against opportunistic infections)	741	74.7
All of the above	40	4.03
<b>Cost of contribution (N=992)</b>		
0-5000 FCFA	642	64.72
5000-10000 FCFA	170	17.14
> 10000 FCFA	180	18.14
<b>Appreciation of the burden of the contribution (N=1000)</b>		
High	276	27.6
Affordable	575	57.5
Good	149	14.9

**Overall prevalence of adherence to ARVs**

Combining both direct and indirect methods described above, we came out with a general prevalence in terms of adherence to antiretroviral treatment of around 69.6% (696/1000). Data collected from these women reveal a

higher prevalence of adherence to antiretroviral therapy in the North Region than in the West; with respective values of 74.0% (370/500) and 63% (315/500). Three reasons were given by our respondents to justify non-adherence: forgetfulness (80.5%), fear of the spouse/boyfriend (12.0%) and drug stock out (7.5%).

**Table 6:** Monitoring of ART- adherence

<i>Characteristics</i>	<i>Total</i>	<i>Percentages (%)</i>
<b>Reasons for Non-adherence to ART (N=1000)</b>		
Forgetfulness	805	80.5
Fear of the spouse	120	12.0
Drug stock out	75	7.5

**Key determinants of non-adherence**

With the use of univariate analysis, we were able to come out with 9 key determinants of non-adherence. The region of residence, the level of education, the civil status and matrimonial regime (for the married women in particular), disclosure of serological status, the number of HIV-infected children, the frequency of ARVs uptake per day, the immunological status and finally the level of viral suppression; all showed a statistical significance with respect to non-adherence. As for the region of residence and the

marital status, being from the North region or from a polygamous home were risk factors of non-adherence ( $p < 0.001$ , OR=1.67 and  $p < 0.001$ , OR=2.54 respectively). Being educated, married, having more than one HIV-infected child and the disclosure of serological status were found to be protective socio-demographic parameters ( $p < 0.001$ , OR=0.31;  $p < 0.001$ , OR=0.16;  $p = 0.002$ , OR=0.10; and  $p < 0.001$ , OR=0.12 respectively). One time ARVs uptake per day, CD4 > 350 cells/mm<sup>3</sup> and viral load < 40 RNA copies/ml were also found to protect against non-adherence within our study population (see table 7).

**Table 7:** Multiple logistic regression of significant variables

<b>Variables</b>	Not adherent	Adherent	OR (p-values)
<b>Region of residence</b>			
North	185	315	1.67 (<0.001)**
West	130	370	
<b>Level of Education</b>			
Schooled women	216	600	0.31 (<0.001)**
unschooled	98	86	
<b>Civil status</b>			
Married	62	413	0.16 (<0.001)**
Not married (single, divorced and widows)	252	273	
<b>Matrimonial regime (for those married only)</b>			
Polygamy	42	187	2.54 (<0.001)**
Monogamy	20	226	
<b>Disclosure of serological status with the spouse/boyfriend and the family</b>			
Yes	178	656	0.12 (<0.001)**
No	60	26	
<b>Number of HIV-infected children</b>			
More than one	1	28	0.10 (0.002)**
0 or 1	187	537	
<b>Frequency of daily uptake of ARVs</b>			
One-time	186	620	0.15 (<0.001)**
Twice	128	66	
<b>Immunological status</b>			
CD4 > 350 cells/mm <sup>3</sup>	29	110	0.53 (0.002)**
CD4 < 350 cells/mm <sup>3</sup>	285	576	
<b>Viral load</b>			
Undetectable (<40 copies/ml)	24	97	0.5 (0.001)**
Detectable (>40 copies/ml)	290	589	

After multivariate analysis using multiple logistic regression; *having one HIV-infected children* (aOR=60.9; 95%CI=[7.6; 489.1]; P=0.001), *non-disclosure of serological status with the spouse/boyfriend* (aOR=25.2; 95%CI=[9.2; 68.9]; P<0.001),

*not being educated* (aOR=7.7; 95%CI=[4.4; 13.3]; P<0.001); and *taking ARVs once or less daily* (aOR=50; 95%CI=[20.0; 100.0]; P<0.001) were four risk factors for non-adherence (see table 8).

**Table 8:** Multiple logistic regression of significant variables

<b>Variables</b>	<b>Adjusted odd ratio</b>	<b>95% confidence intervals</b>	<b>Regression coefficient</b>	<b>Standard error</b>	<b>p-values</b>
<b>Region of residence (West vs. North)</b>	0.7	[0.4; 1.2]	-0.36	0.26	0.16
<b>Disclosure of the status (No vs. Yes)</b>	25.2	[9.2; 68.9]	3.22	0.51	< 0.001**
<b>Daily arvs uptake (One or less vs more than one)</b>	50.0	[20.0; 100.0]	-3.74	0.39	< 0.001**
<b>Number of HIV-infected children (more than one vs. one)</b>	60.9	[7.6; 489.1]	4.11	1.06	0.001**
<b>Level of education (wasn't schooled vs. Schooled)</b>	7.7	[4.4; 13.3]	2.03	0.28	< 0.001**
<b>Civil status (unmarried vs. married)</b>	1.6	[0.9; 2.6]	0.46	0.25	0.06
<b>CD4 count (&gt;350 vs. &lt;350 cells/mm<sup>3</sup>)</b>	0.8	[0.2; 3.6]	-0.20	0.76	0.78
<b>Viral load (&lt;40 vs. &gt;40 RNA copies/ml)</b>	0.3	[0.06; 1.9]	-1.03	0.84	0.22

## DISCUSSION

This study conducted among HIV-positive pregnant women under option B+ in the regions of North and West Cameroon aimed to identify the determinants of therapeutic adherence. Indeed, achieving the WHO goal of eliminating all vertical transmission of HIV remains a dilemma in resource-limited countries including Cameroon. The main objective of PMTCT interventions is to reduce barriers at each step of the continuum of care to successfully prevent vertical transmission of HIV. Despite the adoption of Option B+ and the combination of ARV delivery services at antenatal clinics, these barriers remain problematic for mother-child couples.

Our results thus reveal an overall adherence level of 68.6%, i.e. 74.2% and 63% for the Northern and Western regions respectively. A much lower prevalence has been reported in Nigeria<sup>15</sup> where only 32.7% of HIV-positive pregnant women under option B+ reported 100% ART consumption over a four-day booster period. Another study in Tanzania reported low adherence of 26.3% and 61.1% among respondents living in urban and rural settings, respectively<sup>17</sup>. However, this is far below the 81.4%<sup>18</sup>, 87.1%<sup>14</sup> and 89%<sup>19</sup> found in northern Ethiopia and Kenya by other studies. Despite the differences observed among these African settings these figures are still far below the 95% recommended in order to ensure a zero risk of infection of the virus in newborns but also to prevent the occurrence of resistance.

No association between age and ART adherence was found in our study. Similar results have also been obtained by many other studies documented that found no association between maternal age and ART adherence<sup>20,21</sup>.

As in many previous studies conducted in sub-Saharan Africa, sharing HIV status with one's spouse proved to be a real facilitator of adherence in pregnant women ( $p=0.0001$ ), decreasing the probability of adherence by up to 4.88 times in those whose status remained unknown to the spouse. A similar result was found by Ebuy, H., Yebyo et al in Ethiopia where disclosure of HIV status was positively associated with good adherence increasing up to 4.2 times among women who had disclosed their status to their spouses<sup>14</sup>. According to WHO globally, pregnant women in sub-Saharan Africa have the lowest rate of disclosure of HIV status<sup>22</sup>. Fear of sharing HIV status with partners, family or community remains a major barrier to treatment adherence and use of PMTCT services<sup>2,15,23,24</sup>. In the same logic, the daily frequency of ARV use emerges as an element influencing therapeutic adherence. Indeed, women who had to take their medication twice a day were less adherent ( $p=0.0001$ ) than those who were entitled to a single dose. Indeed, it is more difficult to have to hide twice a day to take a medication with someone who shares our daily life night and day and/or to miss doses if we do not have the support of a spouse. A review conducted in 2014 by Hodgson, reveals that sharing status with one's spouse and being able to benefit from his or her support and participation throughout pregnancy significantly improves women's adherence and retention during the PMTCT program<sup>25</sup>. The need to further mobilize male involvement in PMTCT programs is essential over time if we are to increase women's adherence to antiretroviral therapy and also eliminate vertical transmission of HIV.

Women's education level is identified in our study as influencing adherence to antiretroviral therapy. Indeed, women with higher education levels were 5.43 ( $P\text{-value}<0.0001$ ) times more adherent compared to women with no education. A similar result was found by Tarekegn et al. in 2019 in a study of pregnant women on antiretroviral

therapy in six public health facilities in Ethiopia. In this study, a significant association was found between educational attainment and adherence to ART; women with at least primary education were five times more likely to adhere to ART than those who could not read or write [OR 4.54 (95% CI; 1.72-11.95)]<sup>3</sup>. Similarly, many other studies have made the same finding<sup>2,15</sup>.

In our study, an association between multiparity and therapeutic adherence was found. Indeed, women with more than 4 children were more adherent than those with fewer children. Similar results were obtained in Zimbabwe<sup>26</sup> and Nigeria<sup>27</sup>. This could be explained by the fact that the latter had already been enrolled in the PMTCT program at least once in a previous pregnancy and had been satisfied with the services and outcome due to the negative serological status of their children. As a result, they were more willing to adhere to the program than those who had been enrolled for the first time. This finding was also found by Murithi et al, in a study conducted in Kenya<sup>28</sup>. Also in a study conducted in Uganda in 2017, some mothers reported discontinuing ART after losing their babies or even after delivery or when they stopped breastfeeding. Health workers in PMTCT services therefore have a dual responsibility to sensitize women on the importance of adherence to ART during and after pregnancy and even after weaning and adherence to medically prescribed dosages<sup>29</sup>. The commitment and adherence of expectant mothers who are enrolled in the program will depend on the effectiveness of the results obtained.

Limitation of this study includes selection bias on the field or the fact that we did not use a robust model in multiregression analysis.

## CONCLUSION

This study was meant to establish a relationship between the socio-cultural and biological parameters and the determinants of non-adherence to ARVs among a PMTCT cohort. Indeed, the cohort of women included in this study came from two regions with totally different cultures and behaviors. Only 4 parameters were more or less strongly statistically significant as regards non-adherence after multi-regression analysis. These results suggest that effective prevention of non-adherence among PMTCT women should take into consideration strategies to encourage disclosure of serological status among close relatives, women's education and ART involving one-time drugs uptake per day. Also, as we are progressively moving towards the elimination of HIV vertical transmission in 2030 as advocated by UNAIDS, all barriers to the continuum of care should be identified and tackle adequately according to local sets.

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confidence in the integrity of the contributions of their co-authors.

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