

# Factors Associated with Successful Treatment among People Living with HIV: A Study in Cotonou Health Center 1 (Benin), 2018

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**Abstract** The aim of the study was to identify factors associated with successful HIV treatment amongst cases seeking care and treatment in Cotonou Health Center 1. This was a cross-sectional study design in which 297 people living with HIV (PLWH) enrolled for care and treatment at the Cotonou Health Center, were followed over a period of 13 months from November 2017 to December 2018. Cotonou 1 Health Center, is a reference center for the treatment and care of the people living with HIV and key populations in Benin. The objective was to identify the factors associated with the therapeutic success at the Cotonou 1 Health Center. The average age of the respondents was  $42.60 \pm 10.69$  years with extremes ranging from 19 to 78 years; the average weight was  $61.13 \pm 13.50$  kg with extremes ranging from 37 to 115 kg. Successful HIV treatment has been defined by a VL < 1000 copies/ml. The main factors associated with successful HIV treatment were geographical accessibility, age, gender, socio-economic level, whether or not traditional medicine is used, adherence to treatment, the value of CD4 to initiation of ARV treatment and reception. Four potential predictors have been identified by the logistic regression model: economic level ( $p < 5\%$ ); compliance ( $p < 10\%$ ); age ( $p < 5\%$ ) and sex ( $p < 5\%$ ). To conclude our study, we can say that the UNAIDS 90-90-90 targets will be achieved by 2020 in Cotonou I Health center. However, this center need to improve on crucial factors identified during our study such as economic level, compliance of patients and sensitization of young people (15-24 years) and male to reach this goal.

**Keywords** HIV, PLWHIV, Antiretroviral Therapy,

Therapeutic Success, Cotonou

## 1. Introduction

In 2017, there were approximately 36.9 million people living with HIV worldwide, including 1.8 million new infections. With more than 35.4 million deaths to date, HIV continues to be a major global public health problem. Sub-Saharan Africa, where 26 million people were living with HIV in 2017, is the most affected region. Of those who had access to treatment, 81% had their viral load suppressed globally; 75% in central and West Africa and 71% in Benin (2018 global statistics, WHO). Individual HIV viral load is the recommended indicator to evaluate the effectiveness of antiretroviral treatment, the level of adherence to HIV treatment and therefore the existence of risk of HIV transmission (WHO, 2016). The baseline viral load for treatment failure or success is 1,000 copies/ml in accordance with the consolidated guidelines on the use of antiretroviral drugs in the treatment and prevention of HIV infections (WHO, 2016). Indeed, people with viral load below the threshold of 1,000 should be considered as having suppressed viral loads. The objective of this study was to identify and analyze the factors associated with the therapeutic success at the Cotonou 1 Health Center in Benin.

## 2. Materials and Methods

The study was carried out at the Cotonou 1 Health

Center. Cotonou 1 Health Center is a reference health center in management and monitoring of key populations (sex workers, men who have sex with other men). This was cross-sectional study conducted over a 13-month period (November 2017 to December 2018) in which 297 people living with HIV (PLWH) and seeking care and treatment at the Cotonou 1 Health Center, were followed. The study has enrolled PLWHIV initiated at HIV treatment for at least six months who attended this center during the data collection period. The sample consists of people who came for antiretroviral treatment intake or routine medical visit. All patients who met the inclusion criteria were systematically enrolled. The sample size calculation used the Schwartz formula. Thus, the minimum size required was 288 patients. Data collection was based on a pre-tested questionnaire. Enrolled patients were tested for HIV viral load and classified into two groups: patients with therapeutic success (VL under 1000 copy/ml) and patients with no therapeutic success (VL beyond 1000 copies/ml). Data were captured and analyzed using Epi Data and SPSS version 20.0 software. Bivariate analyses and logistic regression were performed to identify associated and potential predictors of therapeutic success. The significance level of 5% was considered to retain the significant variables and the strength of the association was measured by the calculation of the rating ratios.

### 3. Ethical Considerations

The study protocol has been submitted to the National Ethics Committee for Health Research in Benin. The favorable opinion of the Ethics Committee was obtained under N° 15 on 30 May 2018.

### 4. Results

#### 4.1. Socio-Demographic Characteristics

Table 1 below presents other socio-demographic characteristics of the respondents. A total of 297 patients were enrolled in the study. Of the 297 participants, 69% were females, giving a male to female ratio of 0,45. The majority (71%) were in the age bracket of 25 to 49 years. The ages of the respondents ranged from 19 years to 78 years, with an average of 42.60 ( $\pm 10.69$  years). The weight of the respondents ranged from 37 to 115 kg with the average weight of 61.13  $\pm$  13.50 kg. Those who had primary level of education (35%) was the most represented followed by 26% who reported that they had not formal educations. The majority (64%) of the respondents indicated that they were living a distance of more than 5 km from health center of Cotonou 1.

**Table 1.** Socio-demographic characteristics, PLWHIV, the Cotonou 1 Health Center, Benin, November 2017 to December 2018

	N	Frequency (%)	
<b>Sex (n= 297)</b>			
	Male	93	31
	Female	204	69
<b>Age (n= 297)</b>			
	15-24	14	5
	25-49	212	71
	50 et +	71	24
<b>Marital status (n= 292)</b>			
	Single or divorced or widow	163	56
	Married or monogamous couple	87	30
	Married or in polygamous home	36	12
	Other	6	2
<b>Education level (n= 297)</b>			
	Not educated	77	26
	Literate	6	2
	Primary level	104	35
	Secondary level	82	28
	Higher level	28	9
<b>Occupation (n= 289)</b>			
	Student	8	3
	Housewife/farmer	104	36
	Trader	46	15
	Artisan/artist	74	26
	Civil servant/salaried employee	41	14
	Sex workers	16	6
<b>Religion (n= 291)</b>			
	Catholic Christian	130	45
	Other Christian	100	34
	Muslim	40	14
	Traditional religion	10	3
	Non believer	6	2
	Other	5	2
<b>Geographic accessibility (n= 292)</b>			
	>=5KM	188	64
	<5KM	104	36

### 4.2. Family Life and Supporting Network for PLWHIV

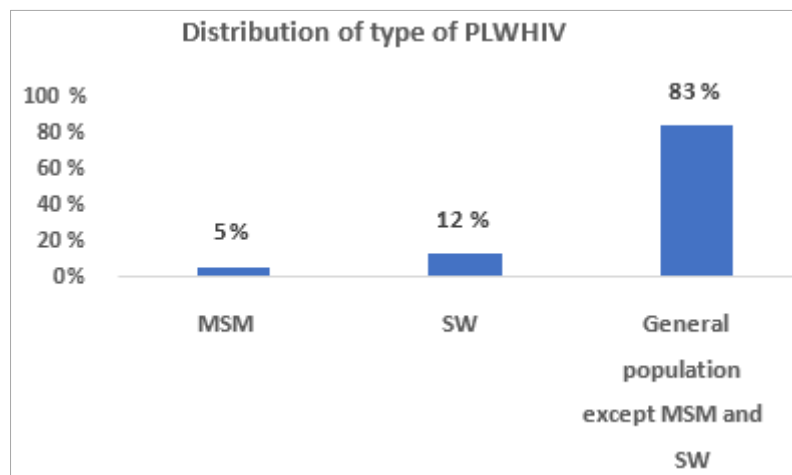
Table 2 presents the distribution of PLWHIV by family life and supporting networks. The majority (88%) of respondents were not members of any PLWHIV association.

**Table 2.** Distribution of PLWHIV by family life and supporting network, PLWHIV, the Cotonou 1 Health Center, Benin, November 2017 to December 2018

	n	Frequency (%)
<b>Family network (n= 296)</b>		
Lives alone	73	25
Lives as couple	59	20
Lives with an extended family	84	28
Lives as a couple with children	39	13
Lives with the friends	2	1
Other	39	13
<b>Social network (n= 285)</b>		
Not member of an association	252	88
Passive member	15	5
Active member	13	5
Head of an association	5	2

### 4.3. Type of PLWHIV Population Surveyed

The following figure shows the distribution of respondents by type of population belonging



**Figure 1.** Distribution of PLWHIV by type of population, PLWHIV, the Cotonou 1 Health Center, Benin, November 2017 to December 2018

Majority (83%) of PLWHIV were from general population, while Sex Workers were 12% and Men who have Sex with Men 5%

### 4.4. Factors Explaining Therapeutic Success among Surveyed PLWHIV

The treatment success rate for this study is 79%. The tables below show the relationships between therapeutic success and the independent variables of the study.

**Table 3.** Relationship between therapeutic success and socio-demographic determinants

	Therapeutic success				P
	Yes		No		
	n	%	n	%	
<b>Age (n=293)</b>					<b>0,037</b>
15-24 years	7	58	5	42	
25-49 years	165	78	46	22	
50 years or +	60	86	10	14	
<b>Sex (n=292)</b>					<b>0,048</b>
Female	162	80	41	20	
Male	69	78	20	22	
<b>Education level (n=292)</b>					<b>0,266</b>
Not educated	62	81	15	19	
Literate	4	67	2	33	
Primary level	27	64	27	26	
Secondary level	66	81	15	19	
Higher level	23	92	2	8	
<b>Religion (n=288)</b>					<b>0,845</b>
Catholic Christian	104	81	25	19	
Other Christian	77	78	22	22	
Muslim	32	82	7	18	
Traditional religion	2	20	2	20	
Non believer	4	67	2	33	
Other	3	60	2	40	
<b>Geographic accessibility (n=289)</b>					<b>0,011</b>
<5KM	72	71	30	29	
>=5KM	156	83	31	17	
<b>Economic level (n=289)</b>					<b>0,04</b>
Very low	64	72	25	28	
Low	126	80	31	20	
Average	38	88	4	9	

**Table 4.** Relationship between therapeutic success and the PLWHIV network (family, social and population type)

	Therapeutic success				P
	Yes		No		
	n	%	n	%	
<b>Type of population (n=293)</b>					<b>0,412</b>
General population	190	79	52	21	
SW	32	86	5	14	
MSM	10	71	4	29	
<b>Family network (n=293)</b>					<b>0,176</b>
Lives with an extended family	59	70	25	30	
Lives alone	61	84	12	16	
Lives as a couple without children	47	81	11	19	
Lives in a couple with children	31	79	8	21	
Other	34	87	5	13	
<b>Social network (n=283)</b>					<b>0,395</b>
Not member of an association	201	80	51	20	
Passive member	10	67	5	33	
Active member	9	69	4	31	
Head of an association	3	100	0	0	

**Table 5.** Relationship between therapeutic success and factors that may influence ART intake

	Therapeutic success				P
	Yes		No		
	n	%	n	%	
<b>HIV status disclosure (n=291)</b>					<b>0,981</b>
Yes	158	79	42	21	
No	72	79	19	21	
<b>Therapeutic education (n= 292)</b>					<b>0,289</b>
Yes	228	79	59	21	
No	3	60	2	40	
<b>Perception of HIV infection (N=292)</b>					<b>0,21</b>
Infectious disease	161	83	33	17	
Don't know	52	73	19	27	
Witchcraft	12	71	5	29	
Curse	7	70	3	30	
<b>Attending physician (n=291)</b>					<b>0,553</b>
Senior physician	71	81	17	19	
Other physician	159	78	44	22	
<b>Use of traditional medicine (n= 291)</b>					<b>0,049</b>
No	207	81	50	19	
Yes	23	68	11	32	
<b>reception by PLWHIV (n= 291)</b>					<b>0,05</b>
Very satisfied	171	80	43	20	
Satisfied	54	81	13	19	
Moderately satisfied	4	40	6	60	
<b>Care (n= 291)</b>					<b>0,409</b>
Very satisfied	149	81	36	19	
Satisfied	64	74	22	26	
Moderately satisfied	3	15	3	15	

**Table 6.** Relationship between therapeutic success, treatment adherence, treatment protocol and CD4 value at antiretroviral treatment initiation

	Therapeutic success				P
	Yes		No		
	n	%	n	%	
<b>Adherence to ART treatment (n= 291)</b>					<b>0,038</b>
Adherence (0 omission)	177	82	39	18	
Not adherence (>=1 omission)	54	72	21	72	
<b>Number of CD4 at ART initiation (n=272)</b>					<b>0,001</b>
0 to 200	92	70	40	30	
200 to 350	64	93	5	7	
350 to 500	23	77	7	23	
> 500	36	88	5	12	
<b>ART scheme (n=292)</b>					<b>0,198</b>
TDF+3TC+EFV	126	81	30	19	
AZT+3TC+NVP	44	79	12	21	
ATZ+3TC+EFV	37	86	6	14	
TDF+3TC+NVP	12	60	8	40	
TDF+3TC+LVP-r	9	64	5	36	
AZT+3TC+LVP-r	3	100	0	0	

A statistically significant association was found between treatment success and geographic accessibility, quality of reception, use of traditional medicine, CD4 values at initiation to ART, age, adherence to ART, economic level and gender of PLWHIV surveyed. PLWHIV located more than 5 km from Cotonou 1 health center are more likely to have therapeutic success than those located less than 5 km away. Older ages were found to be associated with treatment success. Other factors that were found to be significantly associated with treatment success were being high socioeconomic powers and, absence of history of use of traditional medicine in the patient's treatment pathway. It was also found that PLWHIV who were initiated at CD4

values between 200 and 350 and those who adhered well to ART treatment were more likely to have treatment success. Finally, a good reception of PLWHIV at the health center seems to promote therapeutic success. Although the findings indicate that the proportion of the key populations such as Sex Workers with treatment success was higher than the PLWHIV in the general population, this difference was not statistically significant ( $P=0.412$ ).

Based on the step-by-step modelling approach, first testing the interactions and then the potential confounding variables, the final model we arrived at is presented in the table below.

**Table 7.** Multivariate model of potential predictors of therapeutic success

Independent variables	N	OR	95% IC	P
Age				0,041*
15-24 years	11	1		
25-49 years	187	4,083	[1,033 – 16,134]	
50 and over	63	6,799	[1,528 - 30,250]	
Adherence to ART				0,071**
Not adherence	65	1		
Adherence	196	1,884	[0,947 -3,747]	
Economic level				0,048*
Very low	81	1		
Low	141	1,823	[0,935 - 3,552]	
Average	39	3,644	[1,117 - 11,888]	
Sex				0,044*
Male	82	1		
Female	179	2,404	[1,023 – 5,650]	

\* = p significant at risk  $\alpha$  de 5%; \*\* = p significant at risk  $\alpha$  de 10%

According to this model, being female ( $p < 0.05$ ) is more associated with treatment success than being male; female PLWHIV were found to be 2.4 times more likely to have therapeutic success than male. Also, the economic level is crucial in therapeutic success, the probability for a PLWHIV to have therapeutic success is high when he has a good economic level ( $p < 0.05$ ). In other words, PLWHIV who have low socio-economic status are 1.8 times more likely to have therapeutic success than those at a very low economic level and also those at an average economic level are 3.6 times more likely to have a therapeutic success than those of very low economic level. Adherence to antiretroviral treatment was found to be associated with therapeutic success ( $p < 0.1$ ). A PLWHIV who adhered to ART were 1.9 times more likely to have therapeutic success than PLWHIV not adherent. The PLWHIV who were in the age group of 25-49 years were found to be 4 times more likely to have therapeutic success than those in the age group of 15-24 years. PLWHIV over the age of 50 were 7 times more likely than PLWHIV in the 15-24 age group to have therapeutic success ( $p < 0.05$ ).

## 5. Discussion

The bivariate analysis identified eight factors associated with therapeutic success in Cotonou health center. These include the geographic accessibility of PLWHIV, age, sex, socio-economic status, use of traditional medicine, adherence to treatment, CD4 values at initiation of ART and patient reception. Among these factors the logistic regression allowed to retain mainly socioeconomic level, adherence to treatment, age and sex. This conclusion is not shared by Sheehan DM et al who have shown that viral load suppression does not take into account differences in age, sex, mode of HIV transmission, stage of AIDS diagnosis, socio-economic status, urban or rural residency of PLWHIV.

This study, on the other hand, notes that predictors of poor care retention and viral suppression appear to differ by race and ethnicity [1]. For Detsis M. et al, lack of social support and alcohol are the factors most associated with adherence to treatment and therefore therapeutic success [2]. Siefried K. et al, on the other hand, have found an association between social, economic, cultural factors and therapeutic success [3]. Many authors cited adherence as a therapeutic success factor for PLWHIV [4,5,2]. The same finding was made by Emmanuel N. et al (2015) who cited adherence to ART treatment regardless of sex, age and previous immune status as a factor associated with therapeutic success for PLWHIV [6]. Ferreira C. and Gay M.C. found similar findings [6]. This association was also found by our study. Indeed, a PLWHIV adherent to ART is 1.9 times more likely to have a therapeutic success than a PLWHIV non-adherent according to the results of our study. This is easily understood if it is viewed within the

general framework of the management of any pathology where it is known that a person can heal from a disease for which there is a curative treatment, which should be taken in accordance with necessary doses per day and within the duration of treatment. The same findings were made in several studies which have shown that adherence is a major factor in the success of antiretroviral treatment [7,8,9]. Adherence below 95% is associated with immunological and virologic failure.

Economic power is also a key factor for the therapeutic success of PLWHIV according to the findings of this study which showed that as the economic power of PLWHIV increases, the likelihood therapeutic success increases. Siefried K. et al reached similar identified namely the economic factors as determinants of therapeutic success [3]. If it is known that although the support to PLWHIV is free in Benin according to the policy document, standards and support procedures, this free of charge does not cover all benefits, namely certain medicines for the management of opportunistic infections, related costs such as transport, food and certain biological tests [4]. All of these restrictions can contribute to non-adherence to antiretroviral treatment and, therefore, to the failure to achieve therapeutic success. It is then very easy to understand that the economic power of PLWHIV can be crucial for therapeutic success.

Sheehan DM et al demonstrated that viral load suppression does not consider differences in the age and gender of PLWHIV [1]. However, in our study, these two variables were identified as determinants of therapeutic success in PLWHIV followed-up at Cotonou health center. Regardless of our study, there is evidence that women are fortunate to come into natural contact with the health system through prenatal consultations and therefore benefit from early diagnosis of HIV infection. They could thus benefit from an adapted treatment very early on whereas men could be tested at a late stage, thus compromising their chance of having a therapeutic success because it has been shown that the earlier one starts treatment, the better the result [10]. Our study came up with similar results in demonstrating that PLWHIV who started treatment at CD4 number above 200 cells/ml are more likely to have therapeutic success than others. In terms of age, although the literature review did not allow us to have papers that specifically cited age as a determinant of therapeutic success, other cited socio-demographic characteristics overall as determinants of therapeutic success. If we know that awareness grows with age, it would be easy to understand that the older the PLWHIV gets, the more aware he is of his illness and the better his adherence to treatment will be, and therefore this could promote therapeutic success.

## 6. Conclusions

To conclude our study, we can say that the UNAIDS



90-90-90 targets will be achieved by 2020 in Cotonou I Health center. However, this center need to improve on crucials factors identified during our study such as economic level, compliance of patients and sensitization of young people (15-24 years) and male to reach this goal.

Despite the limitations associated with this study and especially the information biases, the results we have achieved are largely similar to those from the literature review.

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## Conflict of Interest

The authors stated that there was no conflict of interest.

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