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

Moussa Bachabi¹*, Badirou Aguemon¹, Fernand Guédou², Rene Keke³, Chaffa Oloukoï⁴, Edgard Marius Ouendo⁵

¹Cotonou Faculty of Health Sciences, (229) Benin
²Cotonou Health Center 1, (229) Benin
³National Reference Laboratory for HIV, Cotonou, (229) Benin
⁴National AIDS Control Program, Cotonou, (229) Benin
⁵Regional Institute of Public Health, Ouidah, (229) Benin

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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 crosssectional 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 ± 10.69 years with extremes ranging from 19 to 78 years; the average weight was 61.13 ± 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 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.

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 a 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 PLWHV 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 (±10.69 years). The weight of the respondents ranged from 37 to 115 kg with the average weight of 61.13 ± 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 (%) |
|--------------------------------|-------|---------------|
| **Sex (n= 297)**               |       |               |
| Male                           | 93    | 31            |
| Female                         | 204   | 69            |
| **Age (n= 297)**               |       |               |
| 15-24                          | 14    | 5             |
| 25-49                          | 212   | 71            |
| 50 et +                        | 71    | 24            |
| **Marital status (n= 292)**    |       |               |
| Single or divorced or widow    | 163   | 56            |
| Married or monogamous couple   | 87    | 30            |
| Married or in polygamous home  | 36    | 12            |
| Other                          | 6     | 2             |
| **Education level (n= 297)**   |       |               |
| Not educated                   | 77    | 26            |
| Literate                       | 6     | 2             |
| Primary level                  | 104   | 35            |
| Secondary level                | 82    | 28            |
| Higher level                   | 28    | 9             |
| **Occupation (n= 289)**        |       |               |
| Student                        | 8     | 3             |
| Housewife/farmer               | 104   | 36            |
| Trader                         | 46    | 15            |
| Artisan/artist                 | 74    | 26            |
| Civil servant/salaried employee| 41    | 14            |
| Sex workers                    | 16    | 6             |
| **Religion (n= 291)**          |       |               |
| Catholic Christian             | 130   | 45            |
| Other Christian                | 100   | 34            |
| Muslim                         | 40    | 14            |
| Traditional religion           | 10    | 3             |
| Non believer                   | 6     | 2             |
| Other                          | 5     | 2             |
| **Geographic accessibility (n= 292)** |       |               |
| >=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.

| Family network (n= 296) | n   | Frequency (%) |
|-------------------------|-----|---------------|
| 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            |

| Social network (n= 285) | n   | Frequency (%) |
|-------------------------|-----|---------------|
| 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

![Distribution of type of PLWHIV](image)

**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 |
| **Age (n=293)**     |     |
| 15-24 years         | 7   | 5  | 58% | 42% | 0.037 |
| 25-49 years         | 165 | 46 | 78% | 22% |
| 50 years or +       | 60  | 10 | 86% | 14% |
| **Sex (n=292)**     |     |
| Female              | 162 | 41 | 80% | 20% | 0.048 |
| Male                | 69  | 20 | 78% | 22% |
| **Education level (n=292)** |     |
| Not educated        | 62  | 15 | 81% | 19% | 0.266 |
| Literate            | 4   | 2  | 67% | 33% |
| Primary level       | 27  | 27 | 64% | 26% |
| Secondary level     | 66  | 15 | 81% | 19% |
| Higher level        | 23  | 2  | 92% | 8%  |
| **Religion (n=288)**|     |
| Catholic Christian  | 104 | 25 | 81% | 19% |
| Other Christian     | 77  | 22 | 78% | 22% |
| Muslim              | 32  | 7  | 82% | 18% |
| Traditional religion| 2   | 2  | 20% | 20% |
| Non believer        | 4   | 2  | 67% | 33% |
| Other               | 3   | 2  | 60% | 40% |
| **Geographic accessibility (n=289)** |     |
| <5KM                | 72  | 30 | 71% | 29% | 0.011 |
| >=5KM               | 156 | 31 | 83% | 17% |
| **Economic level (n=289)** |     |
| Very low            | 64  | 25 | 72% | 28% | 0.04 |
| Low                 | 126 | 31 | 80% | 20% |
| Average             | 38  | 4  | 88% | 9%  |

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

| Therapeutic success | P   |
|---------------------|-----|
|                      |     |
|                      | Yes | No |
| **Type of population (n=293)** |     |
| General population   | 190 | 52 | 79% | 21% | 0.412 |
| SW                  | 32  | 5  | 86% | 14% |
| MSM                 | 10  | 4  | 71% | 29% |
| **Family network (n=293)** |     |
| Lives with an extended family | 59  | 25 | 70% | 30% | 0.176 |
| Lives alone          | 61  | 12 | 84% | 16% |
| Lives as a couple without children | 47  | 11 | 81% | 19% |
| Lives in a couple with children | 31  | 8  | 79% | 21% |
| Other                | 34  | 5  | 87% | 13% |
| **Social network (n=283)** |     |
| Not member of an association | 201 | 51 | 80% | 20% | 0.395 |
| Passive member       | 10  | 5  | 67% | 33% |
| Active member        | 9   | 4  | 69% | 31% |
| Head of an association | 3   | 0  | 100%| 0%  |
### Table 5. Relationship between therapeutic success and factors that may influence ART intake

| Therapeutic success | Yes | No | P  |
|---------------------|-----|----|----|
| HIV status disclosure (n=291) | | | 0.981 |
| Yes | 158 | 79 | 42 | 21 |
| No | 72 | 79 | 19 | 21 |
| Therapeutic education (n=292) | | | 0.289 |
| Yes | 228 | 79 | 59 | 21 |
| No | 3 | 60 | 2 | 40 |
| Perception of HIV infection (N=292) | | | 0.21 |
| Infectious disease | 161 | 83 | 33 | 17 |
| Don’t know | 52 | 73 | 19 | 27 |
| Witchcraft | 12 | 71 | 5 | 29 |
| Curse | 7 | 70 | 3 | 30 |
| Attending physician (n=291) | | | 0.553 |
| Senior physician | 71 | 81 | 17 | 19 |
| Other physician | 159 | 78 | 44 | 22 |
| Use of traditional medicine (n=291) | | | 0.049 |
| No | 207 | 81 | 50 | 19 |
| Yes | 23 | 68 | 11 | 32 |
| Reception by PLWHIV (n=291) | | | 0.05 |
| Very satisfied | 171 | 80 | 43 | 20 |
| Satisfied | 54 | 81 | 13 | 19 |
| Moderately satisfied | 4 | 40 | 6 | 60 |
| Care (n=291) | | | 0.409 |
| 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 | Yes | No | P  |
|---------------------|-----|----|----|
| Adherence to ART treatment (n=291) | | | 0.038 |
| Adherence (0 omission) | 177 | 82 | 39 | 18 |
| Not adherence (>1 omission) | 54 | 72 | 21 | 72 |
| Number of CD4 at ART initiation (n=272) | | | 0.001 |
| 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 |
| ART scheme (n=292) | | | 0.198 |
| 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 α de 5%; ** = p significant at risk α 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 Cotonou1 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 the age and sex of PLWHIV [1]. 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.

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 Cotonou1 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 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.

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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