



# Sociodemographic and Psychological Determinants of Neurocognitive Disorders in People Living with HIV on TARVs in Kinshasa: Cross-sectional Study

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**Abstract:** *Background and aim:* Neurocognitive disorders are described in people living with HIV (PLWH) on therapeutic anti-retroviral (TARVs), but their determinants are not known. The aim of this study is to determine the determinants of neurocognitive disorders in PLWH on TARVs. *Methods:* 45 PLWH on ARVs were analyzed in a cross-sectional study conducted in 2 ARV distribution centers in Kinshasa from August to October 2020. Sociodemographic variables, perceived stress score and neurocognitive disorders were the parameters of interest. A logistic regression made it possible to identify the determinants. The threshold of statistical significance was  $p < 0.05$ . *Results:* We recorded 45 patients who met our inclusion criteria. The female sex was the majority (71.1%), the mean age was (50.6 plus or minus 9.1 years) with a sex ratio 3F: 1H, asymptomatic neurocognitive disorders (AND) was more noted in our patients and they were more in the attention and calculation component (60%). All of our patients were under stress, 58% of whom were under high stress; there has been a clear correlation between stress and AND, age  $> 60$  years [aOR: 4.09, 95% CI: 1.63),  $p = 0.022$ ), unmarried status [aOR: 4.40, 95% CI: 1.79-6.63),  $p = 0.017$ ] and high perceived stress [aOR: 4.97, 95% CI: 2.72-9.85,  $p = 0.008$ ) were independent risk factors associated with cognitive impairment in the population of study. *Conclusion:* The prevalence of neurocognitive disorders was high in PLWH on TARVs and these disorders concerned adults, educated, living alone with a predominance of women. Their determinants were age  $> 60$ , loneliness and high stress level.

**Keywords:** Asymptomatic Neurocognitive Disorders, Age  $> 60$  Years, Female Sex, High Stress, PLWH on TARVs

## 1. Introduction

Today, due to the dramatic increase in survival associated with therapeutic anti-retroviral combinations (TARVs), the central nervous system of people living with HIV (PLWH) faces prolonged infection with a neurotropic virus. This aging of the infected population is associated with the accumulation of comorbidities potentially interacting synergistically with HIV at the systemic but also central level [1].

Semiologically, neurocognitive disorders associated with

HIV include an essentially subcortico-frontal expression, the clinical profile of PLWH being able to be modified by the evolution of the disease over time but also by the change of criteria that define it [1].

In fact, in recent years, we have been evolving in a new paradigm with, in particular, an asymptomatic stage specific to PLWH and thresholds different from those used and recognized in the general population. In this context, it is

considered that between a third or even half of PLWH suffer from cognitive disorders, while the issues of screening for minor impairments and the prognostic value of these so-called prodromal stages are not resolved [1].

For several years now, many studies have focused on psychoneuroimmunology, which has been interested in the relationships between the nervous system; endocrine and immune [2-4]. The human immunodeficiency virus (HIV) is a neurotropic virus targeting nerve cells at the early stage of infection and it is a possible cause of the decline in cognitive abilities, especially when viral replication is not mastered. by treatments [5, 6].

We also know that stress is a reality that frequently accompanies HIV positive staff and knowing its impact on the body; the immunosuppressive effect (especially in lowering the CD4 count); it is therefore a potential factor that can promote the acceleration of the development of HIV and therefore of the neurocognitive disorder, as certain studies have shown [7, 8].

According to AAN (2016); poor resistance to stress in young adults are associated with greater cognitive impairment 25 years later [9]. Worldwide; about 35% of HIV patients; controlled on ARVs have cognitive impairment (much more asymptomatic neurocognitive disorder); with the proviso that the data are variable [10]. In Swiss; the prevalence of HAND is 69% of which ANI 42%; MND 28% and HAD 4%; in Africa the prevalence of mild cognitive impairment varies between 22-45% and very often they are asymptomatic neurocognitive disorders. Initially, neurocognitive disorders associated with HIV were due to HIV-related encephalitis; formidable complication progressing to severe dementia. However, thanks to the progress made in recent years, new highly active antiretroviral combinations have made it possible to decrease the prevalence of neurocognitive disorder among PLWHIV; decrease because despite these drugs some patients still have this disorder [5]. So the question arises; stress alone, is it the basis of this manifestation? This study aims to identify the determinants of neurocognitive disorders in PLWH on TARVs.

## 2. Methods

### 2.1. Study Setting and Design

We carried out a cross-sectional and analytical study on PLWH who have already been on ARVs for more than 5 years followed at the PODI center in order to elucidate the relationship that may exist between AND and perceived stress. In order to achieve our goals; we have chosen to work according to a quantitative method. This method is the most suitable for exploring neurocognitive function and assessing the level of stress perceived by PLWH.

### 2.2. Study Population

We questioned PLWH about taking their TARVs, adherence to treatment, self-acceptance, disease progression, daily experience, but also we questioned their cognitive

functions. We also answered the various questions that were put to us relating to HIV and stress.

### 2.3. Data Collection

Data was collected using a structured survey form. PLWH were admitted consecutively by interview conducted by the principal investigator. Those who had consented were informed of the purpose of the study and the reasons for which they were approached. An information sheet with detailed explanations was read for their intentions. The measuring instrument consists of several closed and open questions with short answers. The first part of the interview guide made it possible to collect information on the socio-demographic characteristics of the respondents (age, sex, marital status, profession, municipality of residence).

The second part of the sheet made it possible to identify the clinical characteristics. The third part took up the different questions of the mini mental test.

### 2.4. Statistical Analysis

The database designed was carried out by the Epi Info 7.0 software and the analysis was carried out using the SPSS 21 software. Descriptive analyzes consisted in the calculation of the frequencies for the categorical data and the means, standard deviations and the extremes for quantitative data. Comparison of proportions was performed using Pearson's chi-square or Fischer's exact test. The determinants of neurocognitive disorders were sought using univariate and multivariate logistic regression with calculation of the Odds Ratio and their 95% confidence intervals and finally estimated the degree of the association. The set statistical significance level was  $p < 0.05$ .

### 2.5. Ethical Considerations

The data were collected anonymously and confidentially. The privacy and confidentiality of the respondents were safeguarded. The three fundamental principles of ethics were respected at the time of the study, namely: the principle of respect for the person, that of beneficence, and that of justice. The protocol for this research study was conducted in accordance with the Declaration of Helsinki.

## 3. Results

### 3.1. Sociodemographic Variables

It appears from table 1 that 69% of the population had an age between 40 years and 59 years with an average age of  $50.6 \pm 9.1$  years and a sex ratio of 3 F: 1 H. 89% had a level high education. 60% of PLWH were employees (had a secure source of income). 53% of PLWH belonged to revival churches. This study showed that 62% of PLWH were living alone (lonely) (Table 1).

**Table 1.** Sociodemographic characteristics of the study population.

Variables	(n=45)	%
Age		
<40 years	7	15.6
40-49 years	10	22.2
50-59 years	21	46.7
≥60 years	7	15.6
Gender		
Male	13	28.9
Female	32	71.1
Educational level		
None	1	2.2
Primary	4	8.9
Secondary	34	75.6
High and University	6	13.3
Profession		
Employment	27	60.0
No employment	18	40.0
Religion		
Traditional	21	46.7
Non-traditional	24	53.3
Matrimonial status		
Married	17	37.8
Unmarried	28	62.2

**Clinical features****Duration of illness and treatment**

The mean duration of illness and treatment were  $10.6 \pm 5.7$  years and  $10 \pm 4.4$  years, respectively.

**Perceived stress score**

This table showed that 10% of PLWH had a perceived pathological stress score, ie 58% very high level and 42% moderate level.

**Table 2.** Clinical characteristics of the study population.

Variable	Effectifs (n=45)	Pourcentage
Duration of illness	$10.6 \pm 5.7$	(5-32)
Mean $\pm$ SD (range) (years)		
<10 years	25	55.6
≥10 years	20	44.4
Duration of the treatment		
Mean $\pm$ SD (range) (years)	$10.0 \pm 4.4$	(5-20)
<10 years	27	60.0
≥10 years	18	40.0
Perceived state of stress		
Moderate	19	42.2
High	26	57.8

**Neurocognitive disorders / Mini Mental Test**

This study showed that 51% had asymptomatic neurocognitive disorders.

**Dimension of neurocognitive disorders**

This study showed that attention and calculus were the dimensions most affected, 60% followed by temporo-spatial orientation and "interfering tasks" or 47 and 44% respectively (Table 3).

**Table 3.** Neurocognitive disorders / Mini Mental Test.

Type of disorder	Normal n (%)	NCD n (%)
Global neurocognitive disorder	2 (48.9)	2 (51.1)
Dimension of neurocognitive disorders		
Attention and calculation	1 (40.0)	2 (60.0)
Temporal-spatial orientation	2 (53.3)	2 (46.7)
Interfering task	2 (55.6)	2 (44.4)
Learning	4 (88.9)	(11.1)

The frequency of cognitive impairment was significantly higher in women than in men ( $p = 0.006$ ); in patients over 60 and under 50 ( $p = 0.001$ ); in unmarried than married ( $p = 0.024$ ) and in patients with high perceived stress than in moderate ( $p = 0.005$ ) (Table 4).

**Table 4.** Sociodemographic and clinical characteristics and cognitive impairment.

Variables	n	Normal n (%)	NCD n (%)	p
Gender				0.006
Male	13	9 (69.2)	4 (30.8)	
Female	32	13 (40.6)	19 (59.4)	
Age				0.001
<50 years	17	6 (35.3)	11 (64.7)	
50-59 years	21	15 (71.4)	6 (28.6)	
≥60 years	7	1 (14.3)	6 (85.7)	
Educational level				0.321
Low	41	21 (51.2)	20 (48.8)	
High	4	1 (25.0)	3 (75.0)	
Profession				0.572
Employment	18	9 (50.0)	9 (50.0)	
No employment	27	13 (48.1)	14 (51.9)	
Religion				0.231
Traditional	21	12 (57.1)	9 (42.9)	
Non-traditional	24	10 (41.7)	14 (58.3)	
Marital status				0.024
Married	17	12 (70.6)	5 (29.4)	
Unmarried	28	10 (35.7)	18 (64.3)	
Duration of illness		$10.2 \pm 3.9$	$10.9 \pm 6.9$	0.689
				0.434
<10 years	25	13 (52.0)	12 (48.0)	
≥10 years	20	9 (45.0)	11 (55.0)	
Duration of the treatment		$10.5 \pm 4.2$	$9.4 \pm 4.6$	0.426
				0.335
<10 years	27	12 (44.4)	15 (55.6)	
≥10 years	18	10 (55.6)	8 (44.4)	
Perceived state of stress		$42.6 \pm 2.9$	$44.4 \pm 3.7$	0.009
				0.005
Moderate	19	14 (73.7)	5 (26.3)	
High	26	8 (30.8)	18 (69.2)	

**3.2. Determinants of Cognitive Impairment in People Living with HIV**

In univariate logistic regression analysis, female sex, age <50 years, ≥ 60 years, unmarried status, and high stress had emerged as factors associated with cognitive impairment in the study population. After adjustment for all these variables of the univariate, age > 60 years [aOR: 4.09, 95% CI: 1.63],  $p = 0.022$ ), the status of the unmarried (aOR: 4.40, 95% CI: 1.79-6.63),  $p = 0.017$ ) and high perceived stress (aOR: 4.97, 95% CI: 2.72-9.85,  $p = 0.008$ ) were the risk factors independent factors associated with cognitive impairment in the study population (Table 5).

**Table 5.** Determinants of cognitive impairment in PLWHIV in logistic regression.

Independants factors	p	Unadjusted OR (IC 95%)	p	Adjusted OR (IC 95%)
Gender		1		1
Male				
Female	0.019	3.29 (1.83-12.78)	0.751	1.66 (0.07-3.41)
Age		1		1
50-59 years				
<50 years	0.320	1.22 (0.55-1.89)	0.083	1.06 (0.04-1.98)
≥60 years	0.030	3.27 (1.32-9.43)	0.022	4.09 (1.63-8.94)
Marrital status		1		1
Married				
Unmarried	0.027	4.32 (1.18-15.82)	0.017	4.40 (1.79-6.63)
Perceived state of stress		1		1
Moderate				
High	0.006	6.30 (1.69-23.53)	0.008	4.97 (2.72-9.85)

## 4. Discussion

### 4.1. Sociodemographic Characteristics

The population of this study is made up of adults, thus confirming the chronic nature of HIV / AIDS, thanks to TARVs [5]. Feminization in Sub-Saharan Africa is explained by the accumulation of biological and social factors of vulnerability (lesions and extent of the vaginal mucosa, insufficient access to education, economic dependence, limited access to family planning services and means of prevention, multiple partnerships of men) relegating women to the role of wife and mother [6].

The high prevalence of people with resources in the present study confirmed that in Africa, HIV / AIDS affects adults in productive activities [7]. More than half of the population attended revival churches which advocated the dynamics of persecution. This would reflect the violent psychosocial stress experienced by this population following the disastrous socio-economic situation they have been experiencing for more than two decades [8]. These churches provide more space to regulate anxiety [9]. The prevalence of single people in this study was consistent with the data in the literature according to which HIV / AIDS bordered on loneliness (frequent bereavement, discrimination, stigmatization, depression, etc.) [10, 11].

### 4.2. Clinical Characteristics

The mean duration of illness and treatment beyond 10 years confirmed the chronic nature of the disease [5]. All of the patients in this study had a perceived pathological stress score, demonstrating that despite the presence of TARVs, HIV / AIDS remained a very stressful pathology, a real affliction for patients [12].

### 4.3. Neurocognitive Disorders

Half of the PLHIV in this study suffered from asymptomatic neurocognitive disorders. Our data are similar to those reported in the literature literature [11]. The fact that only one group had neurocognitive disorders

would suggest a genetic component on viral receptors and or on the immune response [13]. In the present study, neurocognitive disorders predominated over attention and calculation, followed by temporo-spatial orientation and over (constructive praxies?). These disorders affect quality of life, interfere with treatment adherence and life expectancy [11].

### 4.4. Determinants of Neurocognitive Disorders

All associated factors (female sex, age > 60, loneliness and high stress score) as well as determining factors (age > 60, loneliness and high stress score) matched the data from the literature. Indeed, the female sex is more exposed to cognitive decline in the general population for genetic, psychological, hormonal and environmental reasons [14]. They are more likely to develop stress-related mental and physical illnesses including depression and neurocognitive disorders [15]. This female predominance deserves special attention in Sub-Saharan Africa where women play a key role in the domestic economy in the context of the HIV / AIDS pandemic, the wave of armed conflicts and their corollary of population displacement [16], the decline of cognitive functions is a physiological process in normal aging, it is more when aging is pathological and is accompanied by diseases accumulated over time and at the base of addiction [17-19]. Loneliness is also described as a major risk factor for neurocognitive disorders [20]. As for stress, an abundant literature confirms that it causes neurocognitive disorders through hippocampal atrophy, depression, lowering of CD4 cells through cortisol neurotoxicity and increased viral load in HIV. / AIDS [2, 8, 11, 21].

## 5. Conclusion

This study showed that half of PLWH on TARVs had asymptomatic neurocognitive disorders. This adult, educated, predominantly female population attended revival churches. The average duration of his illness and treatment exceeded 10 years. Determinants of neurocognitive disorders were age > 60 years, loneliness, and high perceived stress score.

## Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Conflicts of Interest

The authors declare no conflicts of interest for this work.

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