

A Comparative Study of the Profile of Cognitive Impairment and Associated Factors among Subsets of Human Immunodeficiency Virus Patients in a Special Human Immunodeficiency Virus Clinic in South-East Nigeria

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Abstract

Context: The human immunodeficiency virus (HIV) is a neurotropic virus with several neurological manifestations including cognitive impairment. **Aims:** This study aimed to determine and compare the frequency of cognitive impairment and associated factors among subsets of HIV-positive patients and matched controls using neuropsychological test battery. **Settings and Design:** This was a comparative cross-sectional descriptive study conducted in a Southeastern Nigerian Special HIV clinic. **Subjects and Methods:** Two subsets of HIV patients; the combination antiretroviral therapy (CART) experienced patients and the CART naïve patients and matched HIV negative subjects were surveyed using the World Health Organization/University of California, Los Angeles neuropsychological test battery. **Statistical Analysis:** Statistical Package for the Social Science version 20.0 was used. **Results:** The overall frequency of neurocognitive impairment was 76.1% (mild 44.6% and moderate-to-severe cognitive 31.5%). Although there was no statistically significant difference in the percentages of CART naïve patients (76.3%; $n = 29/38$) and CART-exposed (75.9%, $n = 41/54$) that had cognitive impairment, severe cognitive impairment was more among the CART naïve patients (44.4%; $n = 24/54$) and mild cognitive impairment more among CART-exposed (63.1%; $n = 24/38$). CART-exposed patients had better scores in most of the subtests of the battery compared to CART-naïve patients but the observed difference was not statistically significant. The observed relationship between cognitive impairment and age, sex, or level of education was also not statistically significant. **Conclusion:** HIV-associated neurocognitive impairment is still common in HIV patients and treatment with ART may reduce its severity.

Keywords: Combination antiretroviral therapy, human immunodeficiency virus, neurocognitive impairment, neuropsychology test

Résumé

Contexte: Le virus de l'immunodéficience humaine (VIH) est un virus neurotrope présentant plusieurs manifestations neurologiques, dont des troubles cognitifs. **Objectifs:** Cette étude visait à déterminer et à comparer la fréquence des troubles cognitifs et des facteurs associés parmi des sous-ensembles de patients séropositifs et des témoins appariés à l'aide d'une batterie de tests neuropsychologiques. **Cadre et Conception:** Il s'agissait d'une étude descriptive transversale comparative menée dans une clinique spécialisée dans le VIH au sud-est du Nigéria. **Sujets et Méthodes:** Deux sous-ensembles de patients VIH; les patients ayant déjà suivi un traitement antirétroviral combiné (TARC) et les patients naïfs de TARC et les sujets séronégatifs

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appariés ont été interrogés à l'aide de la batterie de tests neuropsychologiques de l'Organisation mondiale de la santé et de l'Université de Californie à Los Angeles. **Analyse Statistique:** Le progiciel statistique pour les sciences sociales version 20.0 a été utilisé. **Résultats:** La fréquence globale des troubles neurocognitifs était de 76.1 % (troubles cognitifs légers 44.6 % et troubles cognitifs modérés à sévères 31.5 %). Bien qu'il n'y ait pas eu de différence statistiquement significative dans les pourcentages de patients naïfs de CART (76.3 %; n = 29/38) et exposés à CART (75.9 %, n = 41/54) qui présentaient des troubles cognitifs, les troubles cognitifs graves étaient plus fréquents chez les patients naïfs de CART (44.4 %; n = 24/54) et les troubles cognitifs légers plus fréquents chez les patients exposés à CART (63.1 %; n = 24/38). Les patients exposés au CART ont obtenu de meilleurs scores dans la plupart des sous-tests de la batterie par rapport aux patients naïfs au CART, mais la différence observée n'était pas statistiquement significative. La relation observée entre les troubles cognitifs et l'âge, le sexe ou le niveau d'éducation n'était pas non plus statistiquement significative. **En Conclusion:** Les troubles neurocognitifs associés au VIH sont encore fréquents chez les patients atteints du VIH et le traitement par TAR peut en réduire la gravité.

Mots-clés: l'immunodéficience humaine, thérapie antirétrovirale combinée, test de neuropsychologie, virus de troubles neurocognitifs

INTRODUCTION

Sub-Saharan Africa (SSA) is home to about 12% of the world's population but accounts for about 71% of the global burden of human immunodeficiency virus (HIV) with South Africa and Nigeria accounting for a significant number of infections.^[1] In 2013 the prevalence of neuro-AIDS in SSA is estimated to be over 11 million Africans.^[2] The prevalence of HIV associated neurocognitive dysfunction (HAND), one of the neurological complications of HIV, is reported to be lower in SSA compared to North America and Europe, but this might be attributable to spasticity of data in SSA rather than a true difference in prevalence.^[3]

HAND research in Africa has been hampered by the fact that valuable neuropsychological batteries for the study of HAND are western in origin and not validated in nonwestern settings. The use of these tools is also impeded by the high disease burden in SSA that makes it overwhelming to be used by clinicians in the clinical settings as well as infrastructural deficits and lack of neuropsychological expertise in SSA.^[4,5] Several studies on HAND conducted in SSA have utilized several screening tools and neuropsychological test batteries with varying sensitivity for the diagnosis and classification of HAND.^[6-11] The World Health Organization/University of California, Los Angeles (WHO/UCLA) neuropsychological test battery chosen for this study was developed with the intention to reduce the negative influence of language and education on neuropsychological testing and has acceptable cross-cultural usability and adaptability.^[12] This study aimed to determine and compare the frequency of cognitive impairment and associated factors among subsets of HIV-positive patients and matched controls using neuropsychological test battery.

SUBJECTS AND METHODS

Study design and study area

This was a comparative cross-sectional descriptive study conducted at the Special HIV clinic of a tertiary health center in South-East Nigeria. The center is one of the major centers for comprehensive HIV care and investigations in Nigeria's southeast region. This Special HIV clinic provides HIV care services to an average of about 400 persons per week. The services rendered include HIV tests, pre- and posttest counseling, CD4 count and

viral load test, and other ancillary investigations such as full blood count and serum electrolytes, urea, and creatinine.

Study duration

This study was held over a 19-month period between May 2019 and November 2020.

Sample size calculation

The minimum sample size for the study was obtained from the formula $n = \frac{Z_{1-\alpha/2} [P(1-P)]}{d^2}$ Where n = desired sample size and $Z_{1-\alpha/2}$ = standard normal variate. At 5% type 1 error ($P < 0.05$), it is 1.96, P = expected prevalence in population based on previous study or pilot study. According to a recent study by Osaigbovo *et al.*,^[13] the prevalence of neurocognitive impairment was found to be 37.9% (0.38). d = absolute error of precision and for the purpose of this study, this was set at 10% (0.1). 10% was added for attrition which brings the final sample size to 100.

Inclusion criteria

HIV-positive patients were enrolled if they were between 18 and 65 years of age, gave consent to participate, and were literate enough to obey instructions with a minimum of completed primary school education.

Exclusion criteria

Participants were excluded if they had a history of drug abuse/alcohol abuse, mental illness, medical conditions such as chronic kidney disease, chronic liver disease, cerebrovascular accident, epilepsy, and head trauma, or had some physical deformity that could interfere with their abilities to carry out instructions requiring motor activity. Patients were also excluded if they had any acute illnesses, delirium and encephalopathy, fever, headache, and focal neurologic signs (like cranial nerve 3 or 6 palsy or hemiparesis).

Similar inclusion and exclusion criteria were applied to the HIV-negative participants in addition to a negative HIV screening test.

Study protocol

Data were collected prospectively over the study period. All consecutive consenting HIV patients that met the inclusion criteria were recruited in the study. Their demographic and

clinical data were collected using a structured questionnaire. Medical history present and past were also obtained to ensure the absence of comorbidities that could cause remote or immediate cognitive impairment. General examination focused on searching for the presence of stigmata of chronic disease like weight loss, pallor, oral thrush, skin rashes (dermatomal or nondermatomal), and lymphadenopathy was performed. Detailed neurologic examination was performed with emphasis on the pupils, cranial nerve abnormalities, muscle power, tone and reflexes, involuntary movements, cerebellar examination, and sensation aimed at ruling out rule out the presence of opportunistic infections, stroke, and other central nervous system (CNS) abnormalities as HAND is a diagnosis of exclusion.

Neuropsychological assessment was performed using subtests drawn from the limited WHO/UCLA test battery. The test battery has nine subtests but four subsets were subdivided into two giving rise to a total of 13 scores in all. The functional domains tested by this battery include motor speed/fine motor control (timed gait, finger tapping, color trails 1 and 2, WAIS block design, WAIS digit symbol, grooved pegboard, trail making A); sustained attention (color trails 1 and 2, trail making A); selective attention (color trails 2, WAIS digit symbol); cognitive flexibility (color trails 2, WAIS digit symbol); perceptual/motor analysis (WAIS block design); verbal memory (WHO/UCLA auditory verbal learning test); and verbal fluency (verbal fluency, animals and verbal fluency, first names). Lawton and Brody's instrumental activity of daily living was used to ascertain the activities of daily living of the HIV patients. The HIV-negative subjects also had

the questionnaire and the neuropsychological test battery administered on them and their performance recorded.

The HIV-negative controls were used to derive normative data on the WHO/UCLA test battery since there was none in our environment. The raw scores of the HIV-positive patients were transformed to Z scores to enable comparison with the mean scores of demographically similar HIV-negative controls. For mild neurocognitive impairment, a score that falls below by 1 standard deviation (SD) to 2 SD in at least 2 domains of the test battery was used. For moderate-to-severe impairment, a score that falls below by >2 SD in at least 2 domains was used. Laboratory testing was conducted by collecting 10 ml of venous blood from each of the HIV-positive participants for viral load, CD4 count, and packed cell volume. HIV RNA viral load was estimated using PCR done with the COBAS® Ampliprep/COBAS® TaqMan® HIV-1 Test, Version 2.0. CD4 count was performed using a fully equipped compact benchtop flow cytometer, the CyFLOW Counter.

Definition of terms

Neurocognitive impairment: Neurocognitive impairment was defined by Z-scores greater than 1 SD but less than 2 SD for mild and >2 SD for moderate to severe, respectively, in at least two neurocognitive domains of the test battery.

Undetectable viral load: An undetectable viral load level is defined as viral load below 20 copies/mL.

Statistical analysis

Data were collected, scrutinized for normality, and analyzed using the Statistical Package for the Social Sciences (SPSS™)

Table 1: Sociodemographic and clinical characteristics of study participants

Variables	HIV-cases			Control (n=92), n (%)	Test statistic (χ^2)	P
	CART-exposed (n=38), n (%)	CART-Naive (n=54), n (%)	Total (n=92), n (%)			
Age group (years)						
18–33	21	26	47 (51.1)	41 (44.6)	3.31	0.51
34–49	14	24	38 (41.3)	37 (40.2)		
50–65	3	4	7 (7.6)	14 (15.2)		
Age (years), median (IQR)	32 (20)	34 (10)	33 (13)	35.00 (19)	2.46*	0.29
Sex						
Male	11 (29.0)	24 (44.4)	35 (38.0)	46 (50.0)	4.84	0.09
Female	27 (71.0)	30 (55.5)	57 (62.0)	46 (50.0)		
Cognitive impairment						
Normal	9 (23.7)	13 (24.1)	22 (23.9)		0.97	0.59
Impaired	29 (76.3)	41 (75.9)	70 (76.1)			
Education						
6–12 years of education	13 (34.2)	20 (37.0)	33 (35.9)	55 (59.8)	3.41	0.18
Above secondary education	25 (65.8)	34 (63.0)	59 (64.1)	37 (40.2)		
IADL						
No impairment	36 (94.7)	50 (92.6)	86 (93.5)	92 (100.0)	6.53	0.04
Impairment	2 (5.3)	4 (7.4)	6 (6.5)	0		
Total	38	54	92 (100)	92 (100)		

* χ^2 =Kruskall-Wallis. U=Mann-Whitney U-test, χ^2 =Chi-square test. IADL=Instrumental activities of daily living, HIV=Human immunodeficiency virus, IQR=Interquartile range, CART=Combination antiretroviral therapy

version 20.0 (SPSS Inc., Illinois, USA).^[14] The continuous data were described using median and interquartile range. Categorical variables were described using frequency counts and percentages and analyzed using Chi-square test. Comparison of the domain-specific cognitive impairment was made between HIV-positive patients and HIV-negative subjects and between combination antiretroviral therapy (CART)-exposed and CART-naïve HIV-positive patients using Mann–Whitney *U*-test and Kruskal–Wallis test. *P* <0.05 was considered statistically significant.

RESULTS

A total of 92 HIV-positive patients (57 females and 35 males) and 92 HIV-negative subjects (46 females and 46 males) were enrolled into the study [Table 1]. The response rate in the study was 92% so that 92 were surveyed and 92 age-, sex-, and education-matched HIV-negative patients were then chosen as controls for the study. The HIV-positive patients were 38 CART-exposed and 54 CART-naïve patients. The overall

frequency of neurocognitive impairment was 76.1%. There was no marked difference in the percentages of CART-naïve patients (76.3%; *n* = 29/38) and CART-exposed (75.9%, *n* = 41/54) that had cognitive impairment.

The performance of the of HIV patients was classified into mild and moderate/severe using *Z* scores between 1 and 2 SD and >2 SD in at least 2 subtests of the test battery respectively. Mild impairment was found in 44.6% while moderate-to-severe impairment was seen in 31.5%. As shown in Table 2, moderate/severe cognitive impairment was more common among the CART-naïve patients (44.4%; *n* = 24/54) and mild cognitive impairment was more among CART exposed (63.1%; *n* = 24/38). The difference in their IADL was not statistically significant.

The relationship between demographic characteristics, clinical and laboratory variables, and cognitive impairment among HIV patients with cognitive impairment and those without cognitive impairment is shown in Table 3. The observed differences in the clinical and laboratory variables and impaired cognition were not statistically significant. Similarly, univariate analysis

Table 2: Comparison of frequency and severity of cognitive impairment and independent activity of daily living between subsets of human immunodeficiency virus patients

Variables	CART-exposed (<i>n</i> =38), <i>n</i> (%)	CART-Naïve (<i>n</i> =54), <i>n</i> (%)	Total (<i>n</i> =92), <i>n</i> (%)	Test statistic (χ^2)	<i>P</i>
Frequency of cognitive impairment	29 (76.3)	41 (75.9)	70 (76.1)	0.97	0.59
Severity of cognitive impairment					
Mild	24 (63.1)	17 (31.5)	41 (44.6)	11.95	0.003
Moderate to severe	5 (13.2)	24 (44.4)	29 (31.5)		
IADL					
No impairment	36 (94.7)	50 (92.6)	86 (93.5)	0.68	0.52
Impairment	2 (5.3)	4 (7.4)	6 (6.5)		

CART=Combination antiretroviral therapy, IADL=Instrumental activities of daily living

Table 3: Relationship between demographic characteristics, clinical and laboratory variables and cognitive impairment

Variables	Neurocognitive impairment		Test statistic	<i>P</i>
	Not impaired, median (IQR)	Impaired, median (IQR)		
PCV (g/dL)	34.00 (2.00)	33.80 (7.00)	<i>U</i> =501.50	0.42
Viral load (copies/mL)	2476.00 (69,563.00)	54,125.00 (258,299.00)	<i>U</i> =370.50	0.48
CD4 ⁺ count	345 (259.00)	398 (274.00)	<i>U</i> =151.50	0.69
Duration of treatment (years)	14.00 (18.50)	12.00 (6.75)	<i>U</i> =111.50	0.84
Age group (years)				
18–33	11 (50.0)	36 (51.4)	$\chi^2=2.74$	0.26
34–49	11 (50.0)	27 (38.6)		
50–65	0	7 (10.0)		
Total	22 (100.0)	70 (100.0)		
Sex				
Male	9 (40.9)	26 (37.1)	$\chi^2=0.10$	0.75
Female	13 (59.1)	44 (62.9)		
Total	22 (100.0)	70 (100.0)		
Level of education				
6–12 years of education	20 (90.9)	48 (68.6)	$\chi^2=4.332$	0.06
Above secondary	2 (9.1)	22 (31.4)		
Total education	22 (100.0)	70 (100.0)		

PCV=Packed cell volume, IQR=Interquartile range

Table 4: Comparison of domain specific performance on cognitive function between human immunodeficiency virus patients and control

NCI parameters, median (IQR)	HIV negative	CART-naïve	CART-exposed	χ^2*	P
CT-1 (s)	62.50 (46.25–79.75)	64.00 (52.50–86.00)	56.00 (50.50–76.25)	1.81	0.40
CT-2 (s)	142 (106.75–167.75)	154.00 (106.0–234.0)	142.00 (118.0–190.0)	4.11	0.13
AV LT	51.00 (45.00–57.00)	44.50 (39.00–68.00)	49.50 (44.75–56.25)	8.95	0.011
FTD (taps/10 s)	64.00 (59.00–69.60)	57.80 (55.58–62.03)	59.78 (56.00–64.25)	21.74	<0.001
FTND	59.20 (54.00–65.20)	53.20 (50.3–55.6)	53.85 (48.40–61.15)	22.65	<0.001
BD	27.50 (20.00–33.75)	22.00 (14.50–25.00)	17.00 (12.00–25.00)	28.49	<0.001
DS	51.00 (36.00–67.00)	35.00 (26.75–48.25)	43.00 (28.50–60.00)	20.96	<0.001
GPBD	71.00 (64.00–87.00)	74.00 (70.25–87.00)	78.00 (71.00–92.00)	5.94	0.05
GPBND	87.00 (75.00–105.00)	88.00 (76.25–112.00)	87.50 (81.75–124.25)	1.04	0.60
VFN	31.00 (26.00–35.00)	13.00 (22.00–33.00)	27.00 (22.00–33.50)	7.97	0.019
TM (s)	45.00 (34.00–61.00)	55.00 (42.75–82.50)	56.50 (39.25–75.25)	13.17	<0.001
TG (s)	11.00 (10.00–11.67)	11.67 (11.00–12.67)	11.50 (10.67–12.00)	19.03	<0.001

* χ^2 =Kruskall–Wallis test. CT 1 and 2=Color trails 1 and 2, AVLT=Auditory verbal learning test, FTD=Finger tapping, dominant hand, FTND=Finger tapping, nondominant hand, BD=WAIS block design, DS=WAIS digit symbol, GPBD=Grooved pegboard, dominant hand, GPBND=Grooved pegboard, nondominant hand, VFN=Verbal fluency, names, TMT=Trail making test, TG=Timed gait, CART=Combination antiretroviral therapy, IQR=Interquartile range

did not reveal any significant relationship between cognitive impairment and their age, sex, or level of education.

Comparison of domain-specific performance on cognitive function between HIV patients and control is shown in Table 4. The performance of the HIV-negative subjects was found to be statistically better than those of the HIV-positive patients in 10 of the 13 subtests administered. The differences in their performances on the Color trails 1 and 2, and the grooved pegboard, non-dominant hand was not statistically significant.

Table 5 shows the comparison of domain-specific performance on cognitive function between CART-experienced and CART-naïve HIV patients on the WHO/UCLA test battery using. Although the HIV patients on CART had better scores in most of the tests, these differences were not statistically significant.

DISCUSSION

The rate of neurocognitive impairment among HIV patients in the CART era globally is reported to be between 15% to 70% which is <76.1% found in this present study.^[15,16] Previous Nigerian studies using neuropsychological test batteries have also reported lower ranges between 28% and 63%, and none of these studies used the same neuropsychological test battery as in this present study further limiting direct comparisons.^[8–10,13] Heterogeneity in the other aspects of the study methodology beyond the tool used may also contribute to the observed differences in rates across studies.

Neuropsychological testing is the gold standard for the assessment of cognitive impairment; however, possibility of overestimation of prevalence values using this method exists.^[17,18] Some researchers are of the opinion that 8%–13% of the normative population, and therefore, the target population may be misdiagnosed with neurocognitive impairment using the Frascati's classification while some argue this value may

be closer to 5% if impairment in two or more domains is used to classify patients.^[17,18] In a study in southwest Nigeria, as much as 10% of the normal population was found to have suboptimal scores on neuropsychological testing which suggests a misclassification rate of 10%.^[8]

The observed differences in the neuropsychological performances of CART-exposed compared to the CART-naïve patients might indicate improved care of HIV patients in the country. With the increased public awareness and the national strategy of test and treat for HIV, most HIV patients get early diagnosis and are commenced on treatment before significant neuroinflammatory changes become apparent.^[19]

Mild cognitive impairment was more prevalent in this study (44.6%), and more so among CART-exposed patients (63.1%). The predominance of the mild form of cognitive impairment in the CART era has been attributed to several factors like the increased longevity of HIV patients, the modest effect of CART in the CNS compared to its peripheral effects as well as effect on the established CNS injury occurring before the initiation of CART or the effect of treatment of comorbidities.^[20–22]

This index study revealed impairments in several domains and the domains most affected were those subtests that represent verbal memory, motor speed and fine motor control, sustained attention, and cognitive flexibility. Affectations of these domains, if severe enough, can cause impairment in activities of daily living. However, majority of the HIV patients in this present study did not have impairment in their activities of daily living using the 8-item Lawton and Brody's activities of daily living. This might be due to several reasons like patients adapting to the clinical condition without needing assistance to avoid becoming burden to others, probable insensitivity of the screening tool used in this study to detect impaired activities of daily living in this patient population as has been reported by others, and underreporting by the patients.^[9,23] Furthermore,

Table 5: Comparison of domain-specific performance on cognitive function between combination antiretroviral therapy experienced and combination antiretroviral therapy naïve human immunodeficiency virus patients

NCI parameters	CART-Naïve	CART-exposed	U	P
CT-1 (s)				
Median (IQR)	64.00 (34.00)	56.00 (31.00)	893.50	0.29
Minimum–maximum	24.00–160	32.00–176.00		
CT-2 (s)				
Median (IQR)	154.00 (130.00)	142.00 (71.00)	767.00	0.64
Minimum–maximum	64.00–364.00	78.00–493.00		
AV LT				
Median (IQR)	44.50 (17.00)	49.50 (11.00)	794.50	0.07
Minimum–maximum	33.00–68.00	33.00–65.00		
FTD (taps/10 s)				
Median (IQR)	57.80 (5.76)	59.78 (8.75)	845.50	0.12
Minimum–maximum	43.50–85.75	48.40–77.40		
FTND				
Median (IQR)	53.20 (5.65)	53.85 (13.45)	894.50	0.37
Minimum–maximum	34.50–82.80	43.00–77.00		
BD				
Median (IQR)	22.00 (12.00)	17.00 (13.00)	865.00	0.20
Minimum–maximum	4.00–44.00	7.00–38.00		
DS				
Median (IQR)	35.00 (22.00)	43.00 (32.00)	773.50	0.07
Minimum–maximum	10.00–73.00	15.00–78.00		
GPBD				
Median (IQR)	74.00 (18.00)	78.00 (21.00)	903.50	0.40
Minimum–maximum	27.00–160	61.00–153.00		
GPBND				
Median (IQR)	88.00 (35.00)	87.50 (37.00)	881.00	0.31
Minimum–maximum	58.00–207.00	58.00–189.00		
VFN				
Median (IQR)	13.00 (6.00)	27.00 (11.00)	980.00	1.00
Minimum–maximum	6.00–33.00	18.00–43.00		
TMT A (s)				
Median (IQR)	55.00 (41.00)	56.50 (28.00)	972.00	0.67
Minimum–maximum	25.00–93.00	25.00–116.00		
TG (s)				
Median (IQR)	11.67 (1.67)	11.50 (1.33)	893.00	0.39
Minimum–maximum	8.67–14.33	9.33–18.00		

U=Mann–Whitney *U*-test, CT 1 and 2=Color trails 1 and 2, AVLT=Auditory verbal learning test, FTD=Finger tapping, dominant hand, FTND=Finger tapping, nondominant hand, BD=WAIS block design, DS=WAIS digit symbol, GPBD=Grooved pegboard, dominant hand, GPBND=Grooved pegboard, nondominant hand, VFN=Verbal fluency, names, TMT=Trail making test A, TG=Timed gait, CART=Combination antiretroviral therapy, IQR=Interquartile range

assessment of functional impairment using self-reporting methods like with the use of Lawson and Brody's IADL as was done in this index study is less sensitive compared to performance-based reporting.^[24]

Data regarding the predictors and associations of cognitive impairment in HIV patients has also been conflicting. In this study, though there was no statistically significant association between cognitive impairment and sociodemographic and

clinical variables, significant difference was observed between the male and female sex, with male patients having better scores than the females in motor speed and fine motor as well as verbal memory. Similarly, the younger age group (18–33) had better scores on the test for motor speed, fine motor, verbal memory, and sustained attention than the older age groups. Education was the factor with the greatest influence on neuropsychological testing. In this study, the participants with education above secondary school level, regardless of CART status, had better scores on all subtests of the battery except one. The duration of treatment in this study was also not found to be associated with neurocognitive impairment in contrast to a report in northwest Nigeria.^[10] The absence of statistically significant association found in this present study may indicate that if these factors are adequately matched for, they might not act as predictors of neurocognitive impairment; however other factors not obvious now might be responsible.

Laboratory correlates of neurocognitive dysfunction have also been a subject of debate. No association between viral load and CD4 count was detected in this study and this is in keeping with the findings of two other studies in the country.^[8,9] Contrariwise, one study in northern Nigeria mentioned earlier reported both CD4 count and viral load as predictors of neurocognitive dysfunction in HAND.^[10] Predictors of neurocognitive dysfunction in HIV remain a subject of further research and the answer to this may lie in other factors beyond the scope of this present study like viral clades and susceptibility genes as well as cardiovascular and other risk factors.^[25,26]

CONCLUSION

Neurocognitive impairment is common in HIV patients and could possibly be as common in SSA as in North America and Europe. Its presence can better be ascertained using neuropsychological test batteries; however, consensus on the battery of choice remains a challenge. The predictors of cognitive impairment in HIV remain a subject for further research and the answer to these may be found in other factors beyond the sociodemographic characteristics and clinical and laboratory variables of the HIV patients.

Limitations

The neuropsychological test battery utilized in this study has not been validated in Nigeria. We acknowledge this as a limitation and it was chosen because it was designed to be used across diverse cultures and has been validated in other SSA nations. Secondly, HAND is a diagnosis of exclusion and there is need to screen for other factors that could account for cognitive dysfunction in HIV patients. The authors therefore acknowledge the inability to do neuroimaging for the subjects and screen for depression or anxiety, which are major cofounding factors, as limitations to the study. However, attempts were made clinically to rule out the presence of space-occupying lesions and stroke.

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Conflicts of interest

There are no conflicts of interest.

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