



Cognitive functions in newly diagnosed patients with HIV infection in a tertiary health facility: Assessment using community screening interview for dementia

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ARTICLE INFO

Keywords:

Human immunodeficiency virus infection
Cognitive functions
Dementia
Nigeria

ABSTRACT

Introduction: Neurocognitive dysfunction is a detrimental complication of HIV infection. In this study we attempt to characterize the pattern of cognitive dysfunction in a sample of Nigerian patients with newly diagnosed HIV infection.

Methods: We conducted a prospective study in which 50 patients with newly diagnosed HIV infection were studied along with 50 normal control subjects. The participants were evaluated with the medical history, general, physical and neurological examination. Laboratory evaluation and chest X-Ray were done for all patients. The Community Screening Interview for Dementia (CSID) questionnaire was administered to all the study participants.

Results: About 70% of the patients were in advanced disease stage. The mean age (SD) of the patients and controls in years were 36.44 ± 8.22 and 35.40 ± 11.53 respectively. More than half (56%) of the patients had secondary level of education (12 years of education). About 20% of the patients had severe neurocognitive impairment while 48% had minor neurocognitive disorder. The patients with HIV infection performed poorly in the domains of language, memory, orientation, attention/calculation and praxis relative to controls ($p < 0.05$). There were no significant effect of gender, age, sex and level of education on cognitive functions in the patients ($p > 0.05$) but the presence of opportunistic infections had negative impact on the performances on orientation and total CSID scores in the patients with HIV infection ($p < 0.05$).

Conclusion: Patients with newly diagnosed HIV infection have poor cognitive functions when compared to normal controls and some presence of opportunistic infections in the patient is a significant risk factor for cognitive impairment.

1. Introduction

Human Immunodeficiency Virus (HIV) infection is a major cause of neurocognitive dysfunction in the world [1]. A recent data suggested that about 36.9 million people in the world were infected with HIV infection and that 70% of this population live in sub-Saharan Africa [2]. The cognitive impairment described in patients with HIV infection usually affected the domain of memory, attention/concentration, psychomotor speed, praxis and in advanced stages language and orientation may be affected [3,4,5]. The HIV associated neurocognitive disorder (HAND) is the term used to describe the cognitive impairment (NCI) that patients with HIV infection exhibit [6,7]. Asymptomatic

neurocognitive impairment (ANI) is the term used to describe a situation where patients with HIV infection exhibit cognitive deficits that are subclinical but could only be detected by neuropsychological test. The HIV associated dementia (HAD) is the most severe form of NCI in HIV patients and activities of daily living is impaired in the patients while the minor neurocognitive disorder (MND) is in between ANI and HAD in severity [7]. Timely detection of NCI in patients with HIV infection is very crucial as HAND could affect patients activities of daily living such as medication adherence employment, driving and so on.

The evaluation of cognitive function in HIV patients have been done previously with “Gold standard” neuropsychological tools which usually give a valid and reliable results [8,9,10]. These

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<http://dx.doi.org/10.1016/j.ensci.2017.10.001>

Received 4 July 2017; Received in revised form 15 October 2017; Accepted 20 October 2017

Available online 24 October 2017

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neuropsychological test batteries are usually not available in developing countries and simple, inexpensive, universally available, brief, screening tools are desirable for evaluation of NCI in patients with HIV infection in developing countries. Various screening tools that have been used in the past for HIV patients included Mini Mental State Examination (MMSE) scale, Montreal Cognitive Assessment scale, HIV Dementia scale, International HIV Dementia Scale, Simioni Symptoms Questionnaire, Cognitive Assessment Tool – rapid version and so on [11]. In this study, we used a simple, validated Community Screening Interview for Dementia (CSID) to evaluate the cognitive functions in patients with HIV function in our centre and also in addition evaluated the relationship between some clinical/socio demographic and laboratory variables with cognitive function in these patients.

2. Methods

This was a prospective study in which fifty patients with HIV infection were studied along with fifty normal control subjects. The study was carried out at Federal Medical Centre, Owo, Ondo State, Nigeria. The hospital was selected by the Federal Government for free management of Patients with HIV infection.

The inclusion criteria were age > 16 years, seropositivity to HIV infection, and patients must not be on anti-retroviral therapy (ART). The exclusion criteria were the presence of co-morbidities that could cause cognitive impairment in the patients such as Parkinson's disease, epilepsy, metabolic diseases, brain tumor, current use of psychoactive drugs, drug abuse, use of anticholinergic medications, previous head trauma with loss of consciousness. Other exclusion criteria were alcohol intake > 13 units/week, severe anaemia (PCV < 20%) and severe functional impairment (Karnofsky performance < 50%). Known psychiatric patients or those who showed clinical features of major psychiatric disorders such as major depression, schizophrenia, mania and so on were also excluded from the study.

The study participants had general physical and neurological examination done. The patients were staged clinically using World Health Organization staging system [12].

The presence of opportunistic infections were identified in the patients with the aid of chest x-ray, sputum microbiological testing and positive response to empirical therapy with anti-toxoplasmosis drug was taken as evidence of toxoplasmosis infection. The renal function tests and haematological work-up were done in all the patients while HIV serological testing were done with Enzyme linked immunosorbent assay (ELISA) and CD4 cell count was done by automated flow cytometry method.

2.1. Cognitive function evaluation

All the study participants had cognitive function assessment done with the aid of Community Screening Interview for Dementia (CSID) as adapted for Nigerians. The CSID is a 48 item-questionnaire that have been used in different developing countries and was found to be suitable for assessment of cognitive function. The result obtained from a study [13] showed that CSID is unaffected by culture and level of education. The CSID have been validated in several Nigerian studies on Alzheimers disease [14,15], epilepsy [16], liver cirrhosis [17] and HIV patients [18,19]. The CSID was shown to have impressive screening quality in a Nigerian Study [16].

The CSID is a simple “paper and pen” instrument that evaluate the following cognitive domains language (tasks assessing naming, comprehension, motor response, naming fluency, definition, and repetition) memory (tasks assessing, Recall, registration and remote memory), attention/calculation, orientation (time and place) and praxis (copying). The CSID is administered to the study participants by the neurologist in a quiet and well-lit room usually in the morning time to ensure that the participants were not fatigued and the scores obtained were documented.

2.2. Statistical analysis

The demographic characteristics variables between patients with HIV infection and controls were analyzed with Chi square (χ^2) test. The mean scores of the various domain of the CSID were compared between the patients and controls using the student's *t*-test. The relationship between the various clinical/socio-demographic variables and domains of the cognitive function were analyzed using the student *t*-test or one-way analyses of variance (ANOVA) as appropriate. The effects sizes of all these analyses were calculated using Cohen's *d* or η^2 as appropriate $d = 0.2$ – 0.5 – small effect size, 0.5 – 0.7 – medium effect size, ≥ 0.8 – large effect size. $\eta^2 = 0.01$ – 0.059 – small effect size, 0.059 – 0.138 – medium effect size, ≥ 0.138 –large effect size. Level of statistical significance was taken as $p < 0.05$.

3. Results

One hundred and thirty-one participants were initially recruited for the study but thirty-one participants (20 patients with HIV infection and 11 controls) were excluded from the study because of incomplete data and unwillingness to participate in the study. Fifty patients with HIV infection and fifty normal controls participated in the study. The mean age of the patients with HIV infection was 36.44 ± 8.22 years while that of the normal control was 35.50 ± 11.53 years ($p > 0.05$). The other socio-demographic characteristics of the study participant were as shown in Table 1.

Table 2 showed the frequency distribution of the clinical variables of the HIV positive patients in this study.

Table 3 showed the proportion of the participants that have severe neurocognitive impairment which is defined as any total CSID score which less than the mean total CSID score of the controls minus 2 standard deviation. In this study about 20% of patients with HIV and none of the control subject had severe NCI ($p < 0.001$).

Participants with minor neurocognitive disorder (MNCD) are defined as participants with total CSID score that were in the range between the 2 standard deviation and 1 standard deviation of the control mean. In this study, 48% of the patients with HIV infection and 36% of the controls had MNCD ($p < 0.05$). This is illustrated in Table 3.

The comparison of the cognitive function between the patients with HIV infection and normal control were as shown in Table 4. In this Table, the patients performed significantly poorer in all the domains of cognitive functions of the CSID instrument when compared to normal controls ($p < 0.05$).

Table 5 showed the relationship between having opportunistic infections (OIs) in HIV infected patients and their cognitive performances. Opportunistic infections was associated with impairment in memory

Table 1
Socio-demographic characteristics of study participants.

Variables	Cases N(%)	Control N(%)	Statistics	P
Sex				
Male	31(62.0)	32(64.0)	$\chi^2 = 0.043$	0.5000
Female				
Mean age (Year)	19(38.0)	18(36.0)	$t = 0.519$	0.605
Level of education Completed	36.44 ± 8.22	35.40 ± 11.53		
(Primary)	7(14.0)	2(4.0)		
Secondary	26(52.0)	32(64.0)	$\chi^2 = 3.420$	0.180
Tertiary	17(34.0)	16(32.0)		

Primary: At least 1–6 years of education.

Secondary: 7–12 years of education.

Tertiary: > 12 years of education.

$p \leq 0.05$: Significant.

χ^2 : Chi-square value.

t: Student *t*-test value.

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