



Educational level and cognitive impairment in people living with HIV on antiretroviral treatment in Ecuador.

Alejandro Checa ¹, Eliana Navas ^{2,*}, Jonathan Molina-Benavides ³, Verónica Valencia ⁴

¹ Neuropsicólogo Clínico, Hospital de Especialidades “Eugenio Espejo”, Ecuador

<https://orcid.org/0000-0002-2145-8702>

² Médica General, Hospital de Especialidades “Eugenio Espejo”, Ecuador

<https://orcid.org/0000-0002-5715-1171>

³ Psicólogo Clínico, Hospital de Especialidades “Eugenio Espejo”, Ecuador

<https://orcid.org/000-001-5462-9240>

⁴ Médica Psiquiatra, Hospital de Especialidades “Eugenio Espejo”, Ecuador

<https://orcid.org/0000-0001-8979-8087>

* Correspondence: Avenida Gran Colombia S/N y Yaguachi. Mail: eliana.navas@hee.gob.ec

Contacto: 0995251131

Abstract

Despite the accessibility of modern antiretroviral therapy (HAART), neurocognitive decline persists among some people with HIV. The objective is to assess whether there is a relationship between educational level and cognitive impairment in people living with HIV on antiretroviral treatment.

This is a cross-sectional cohort study conducted between January 2021 and July 2021 in the HIV Unit of the Eugenio Espejo Hospital in Quito. In people on antiretroviral treatment and undetectable viral load using the short neuropsychological battery NEUROPSI. 110 subjects

were recruited, mainly men (97.2%), of which 51.8% were between 18 and 30 years old. The participants with complete higher education 38.64% presented normal performance and the remaining 61.36% moderate decline, there is a highly significant association between level of instruction and cognitive impairment ($p = 0.006$). In our cohort study, in PLWHA in Ecuador, patients with a higher level of formal education have a lower risk of suffering from cognitive impairment, age and sex seem not to be related.

Keywords: Educational level, cognitive impairment, HIV

Introduction

Despite the accessibility of modern antiretroviral therapy (HAART), neurocognitive impairment persists among some people with HIV (1). The envelope glycoprotein 120 (gp120) of the human immunodeficiency virus (HIV) induces neurotoxicity, related with HIV-associated neurocognitive disorders (HAND), the mechanism of gp120-mediated neurotoxicity is mainly apoptosis. Currently, there are no treatments that address the neurotoxicity of gp120 (2).

Biocompatible and effective therapy that readily crosses the hematoencephalic barrier is needed to treat neuronal toxicity seen in HIV-infected individuals. This neurodegenerative process would be related to the increased chances of cognitive impairment. Our study focuses on the relationship between educational level and the presence of HIV-associated neurocognitive disorders (HAND), since the molecular weight of the different antiretroviral treatments, fat solubility and association with plasma proteins prevent adequate permeability of the hematoencephalic barrier (3). It would result in a partial suppression of HIV viremia in cerebrospinal fluid (CSF) despite the fact that the patient may have an undetectable viral load in plasma (4).

Research in this regard has been scarce in Latin America and especially in Ecuador. At present, cognitive decline among people living with HIV on antiretroviral therapy leads to a reduction in quality of life. Besides, it is a major challenge due to the high prevalence of HIV-associated neurocognitive disorders and its concomitant consequences in relation to morbidity, including patients with adequate immunological and virological status (5). The fact that the virus establishes itself in the CNS in the early stages and persists within the CNS can help us

understand HIV-related brain injury even when highly active antiretroviral therapy is effective (6).

This study focuses on the relationship between educational level and HIV-associated neurocognitive disorders in people under antiretroviral treatment, since there is still not enough scientific evidence to explain whether formal instruction is a protective factor in this population. Considering that education could strengthen the cognitive reserve, a neuropsychological construct that refers to the ability to tolerate changes in brain structures related to a given pathology (7).

Subjects and methods

This was a cross-sectional study conducted between January 2021 and July 2021 in the HIV Unit of the Eugenio Espejo Hospital in Quito, Ecuador. This is one of the largest hospitals in Ecuador and it is responsible for providing care for at least 10% of PLWHA nationwide. The study was authorized by the respective authorities of this hospital and informed consent was obtained from each subject.

All HIV positive patients diagnosed with third and fourth generation HIV ELISA tests under antiretroviral treatment with a Dolutegravir-based regimen, with an instruction of more than 13 years of study and undetectable viral load who attend the HIV clinic in the period mentioned above were invited to participate in the study.

After signing the consent form, each one was evaluated using the short neuropsychological battery NEUROPSI (8), which consists of three categories: normal, moderate deterioration and severe deterioration. The Spanish version of the NEUROPSI short neuropsychological battery has been previously validated (9).

The evaluation with this battery was carried out in subjects between 18 and 55 years old with no previous history of depression or psychiatric illness. Participants with neurological diseases were excluded.

The captured data were entered into an electronic and descriptive statistics database, the statistical analysis contemplated a 95% confidence interval, using Chi square, for which the SPSS version 23 program was used. $p < 0.05$ as significant.

Results

A total of 110 subjects were recruited, mainly male 97.2% (n = 102), of which 51.8% between 18 and 30 years old (n = 57) and 41.8% (n = 46) between 31 to 50 years old. From people between 18 and 30 years old, only 17.54% (n = 10) presented normal performance, while 80.70% (n = 46) had moderate deterioration and one subject presented severe deterioration. Regarding the participants aged between 31 and 50 years, 26.08% (n = 12) did not show cognitive alterations and 73.92% (n = 34) were classified as moderate deterioration. As per the subjects between 50 and 55 years old, 17.29% (n = 1) presented a normal test and the remaining 81.75% (n = 6) moderate deterioration.

In relation to the 102 male participants, 20.58% (n = 21) had no cognitive impairment, 70.43% (n = 80) showed moderate impairment and only one subject had severe impairment. The female sex, 25% (n = 2) had normal cognitive performance and the remaining 75% (n = 6) had moderate cognitive impairment.

Regarding instruction, those who had incomplete higher education 9.38% (n = 6) did not present cognitive alterations, 89.06% (n = 57) obtained moderate deterioration and one participant serious deterioration. The participants with complete higher education 38.64% (n = 17) presented a normal performance and the remaining 61.36% (n = 27) moderate deterioration. Two postgraduate subjects were found to be moderately impaired.

It was found that there is no relationship between cognitive impairment and age (p = 0.703). Similarly, there is no positive association between sex and cognitive impairment (p = 0.924). Finally, there is a highly significant association between educational level and cognitive impairment (p = 0.006).

Discussion

In the present study, it was found that around 80% of PLWHA treated at the HIV Clinic at the Eugenio Espejo Hospital in Quito, Ecuador had some degree of cognitive impairment, much more than previously reported in a similar population in Ecuador which was 45% (10). In this sense, it is important to mention that these people lead functional lives, which is why HANDs are generally unnoticed, resulting in an underdiagnosis, that will also depend on the sensitivity of the psychometric instrument used for the evaluation.

Severe and progressive neurocognitive decline is rarely seen in the post-HAART era, however; there are still mild and asymptomatic neurocognitive disorders, despite viral suppression (11). This study confirms what the worldwide literature describes regarding the incidence of this type of disorder. However, prolonged exposure to HAART could cause a deleterious effect on the central nervous system as shown by some studies (1).

Although many studies report that women with HIV are more vulnerable to cognitive impairment than men with HIV. This trend is not consistently described in the literature (12) indeed. In this study no differences were found in this regard, however, the small number of participating women is a serious limitation.

Cognitive decline is known to increase with aging in people living with HIV as shown by several studies (13), although no statistically significant association has been shown in the study in terms of age. It is worth doing a clinical analysis since, as seen in the results, the incidence of HAND in young adults, ranges between 80%, the same of older age groups, unlike what happens in a comparable healthy population (14). Therefore, the same incidence occurs in both young adults and older adults.

The relationship between educational level and HAND has been evaluated in some studies, though the results were inconsistent (15). Cognitive performance would be remarkably conditioned even in people with a high level of education in relation to the general population. Nevertheless, the deficits would be lower compared to subjects with the same pathology with less formal education (16). For this reason, the educational level can be considered as a protective factor in relation to HAND.

While we recognize that the screening tools used to assess cognitive impairment could have increased the number of diagnosed patients, we believe that the applied criteria allowed us to select the most clinically significant cases. Furthermore, another limitation was that the subjects were recruited from only one center, albeit one of the largest. There was no control group. In any case, our results support that patients with a higher level of education have a lower risk of suffering HAND among PLWHA in Ecuador.

Conclusions

In our cohort study, in PLWHA in Ecuador, patients with a higher level of formal education have a lower risk of suffering from cognitive impairment, age and sex seem not to be related. Therefore, the follow-up of these patients is essential as part of the care and treatment process.

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