

Quality of life and handgrip strength of HIV patients diagnosed with neurotoxoplasmosis

Qualidade de vida e força manual em pacientes HIV com diagnóstico de neurotoxoplasmose

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Abstract – HIV / AIDS epidemic continues to be a major public health problem, and when there is poor adherence to treatment, patients become susceptible to other infections such as toxoplasmosis. The aim of this study was to evaluate the handgrip strength and quality of life of HIV infected patients diagnosed with neurotoxoplasmosis. A cross-sectional study was conducted with 40 HIV-infected patients, with and without diagnosis of neurotoxoplasmosis. Sociodemographic and clinical profile information was collected, and handgrip strength and quality of life were evaluated. Almost all patients of both groups used antiretroviral therapy. In the handgrip strength evaluation, no statistical difference was observed for the right and left hand between groups with and without neurotoxoplasmosis ($p > 0.05$). However, the classification of inadequate handgrip strength in the neurotoxoplasmosis group was significantly higher. In the quality of life domain, it was observed that financial concern had lower scores in the group with neurotoxoplasmosis ($p = 0.0379$). It was observed that neurotoxoplasmosis showed no association with epidemiological, clinical, handgrip strength and quality of life variables. However, patients with neurotoxoplasmosis showed a trend towards lower muscle strength.

Key words: Acquired immunodeficiency syndrome; Cerebral toxoplasmosis; Hand strength; Quality of life.

Resumo – Atualmente a epidemia do HIV/Aids continua sendo um problema de saúde pública de ampla relevância, e quando não há uma boa aderência do paciente ao tratamento o mesmo torna-se suscetível a outras infecções como a toxoplasmose. Objetivou-se avaliar a força de preensão manual e a qualidade de vida em pacientes infectados pelo HIV com diagnóstico de neurotoxoplasmose. Foi realizado um estudo transversal com 40 pacientes infectados pelo HIV, com e sem diagnóstico de neurotoxoplasmose. Foram coletadas informações sociodemográficas, perfil clínico e foram avaliadas a força de preensão manual e a qualidade de vida. Quase todos os pacientes de ambos os grupos utilizavam a terapia antirretroviral. Na avaliação de força de preensão manual não notou-se diferença estatística para a força manual direita e esquerda entre os grupos com e sem neurotoxoplasmose ($p > 0.05$). Contudo, a classificação de inadequado para a força manual no grupo com neurotoxoplasmose foi significativamente maior. Nos domínios da qualidade de vida, observou-se que a preocupação financeira apresentou menores escores no grupo com neurotoxoplasmose ($p = 0.0379$). Observou-se que a neurotoxoplasmose não demonstrou associação com as variáveis epidemiológicas, clínicas, da força manual e da qualidade de vida. Contudo os pacientes com neurotoxoplasmose apresentaram uma tendência para menor força muscular.

Palavras-chave: Força da mão; Qualidade de vida; Síndrome da imunodeficiência adquirida; Toxoplasmose cerebral.

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INTRODUCTION

Human immunodeficiency virus (HIV) infection and its clinical manifestation in the advanced stage, or acquired immunodeficiency syndrome (AIDS) are still considered a public health problem of great relevance due to its pandemic character and its transcendence. According to the Brazilian Epidemiological Bulletin, from 2007 to June 2017, 194,217 cases of HIV infection were reported in Sinan in Brazil¹.

HIV mortality has greatly reduced with advances in antiretroviral therapy (ART), so a person can live 25 years or more. About 50% of all cases die from non-HIV-related causes. Currently, HIV cases are managed as a treatment for chronic disease with increased life expectancy, although it may present multiple comorbidities².

Among the most common alterations in patients with AIDS, toxoplasmosis of the central nervous system caused by protozoan *Toxoplasma gondii* stands out, which is responsible for a large number of focal brain lesions³. Clinical manifestations depend on the location and extent of the lesion, often manifesting as diffuse encephalitis, meningoencephalitis or, more often, as a mass affect tumor lesion⁴. Motor dysfunction caused by hemiparesis is due to muscle weakness, motor control, balance, sensory deficit and postural tone abnormalities⁵.

There is a significant proportion of people living with HIV/Aids who have limitations, and loss of muscle mass is one of the most important^{6,7}. Therefore, muscular hypertrophy, fatigue and weakness are factors that can induce depression and reduce quality of life⁸.

In this perspective, it should be emphasized that understanding the quality of life and the handgrip strength related to people living with HIV/Aids represents an important instrument for their approach in the field of health care⁹.

Therefore, the present study aimed to evaluate the handgrip strength and quality of life in HIV-infected patients diagnosed for neurotoxoplasmosis.

METHOD

This cross-sectional study consisted of 40 HIV-infected patients of both genders aged 23-62 years (36.90 ± 8.18 years). Patients were divided into two groups: NT (n = 20) patients with diagnosis for neurotoxoplasmosis; SNT (n = 20) patients without diagnosis for neurotoxoplasmosis. All were attended at the Testing and Counseling Center - CTA/SAE, located in the municipality of Santarém - PA. Data were collected in the form of interviews, physical evaluation and medical records, as well as information such as age, gender, schooling, income, medications used, time of HIV infection diagnosis, diagnosis for neurotoxoplasmosis and TCD4 lymphocyte values.

Information collected was carried out in the first half of 2014 and the study was approved by the Ethics Committee for Research with Human Beings of the Department of Tropical Medicine - Federal University of

Pará, under CAAE number: 27162514.9.0000.5172 and with the signing of the Free and Informed Consent Form by all survey participants.

A calibrated analogue scale (Welmy Indústria Comércio, Santa Bárbara D'Oeste, SP, Brazil) with accuracy of 100 g was used to perform body mass measurements, and for height, stadiometer with accuracy of 0.5 cm was used. Body mass index (BMI) was calculated by dividing body mass by squared height.

Body composition was measured using the four-pole bioimpedance apparatus (Maltron International Ltd, model BF 900, Rayleigh, Essex, England), where fat percentage value was obtained and used for lean mass and fat mass calculations.

Handgrip strength was measured using a dynamometer (Kratos Equipamentos Industriais, Modelo ZM, Cotia - SP, Brazil, accuracy of 1 kg), in which the highest value of three attempts for each hand was considered as the result¹⁰.

To evaluate patients' quality of life, HAT/QoL (HIV/Aids - Targeted Quality of Life Instrument), an instrument prepared by Holmes and Shea¹¹ and validated for the Brazilian population¹² was used.

Values adopted as adequate for handgrip strength were those described by Caporrino et al.¹³; for TCD4 lymphocyte count, those of Scherzer et al.¹⁴, which is ≤ 200 cells / mm³, and for quality of life, the score of ≤ 50 points was adopted.

Data were grouped and tabulated using the Excel software. Subsequently, descriptive statistics were performed to verify mean, standard deviation, relative frequency, minimum and maximum values. After the normality test (Shapiro-Wilk), inferential statistics were performed using the unpaired t-test to perform comparisons between groups for parametric data, and the Mann-Whitney test, for non-parametric data.

To perform associations, the Chi-square test was used, which when significant, the Odds Ratio was applied. The BioEstat 5.0 software was used, with significance level of $p < 0.05$ for statistical tests.

RESULTS

Table 1 shows the sociodemographic and clinical characteristics of study participants regarding gender, age, schooling, ethnicity, marital status, family income, immunodeficiency status and use of protease inhibitor.

It is also noteworthy that the mean time of HIV diagnosis in the NT group was 49.40 ± 42.39 months; for the neurotoxoplasmosis diagnosis, 42.10 ± 31.85 months and for the ART use (antiretroviral therapy) was 47.40 ± 42.05 months. For SNT, the mean time of HIV diagnosis was 51.55 ± 35.45 months and the mean time of ART use was 37.95 ± 34.88 months.

Analysis of epidemiological and clinical variables (gender, age, schooling, ethnicity, income, use of protease inhibitor, time of HIV diagnosis and use of antiretroviral therapy) showed no association with the presence or absence of neurotoxoplasmosis ($p > 0.05$).

Table 1. Sociodemographic and clinical characteristics of patients with HIV/Aids treated at Santarém-PA

Variable	NT		SNT	
	n	%	n	%
Gender				
Male	16	80	14	70
Female	4	20	6	30
Age (years)				
23 — 32	5	25	5	25
33 — 42	10	50	11	55
43 — 52	4	20	3	15
53 — 62	1	5	1	5
Schooling (years of school)				
None	0	0	0	0
1 to 3	1	5	1	5
4 to 7	5	25	9	45
8 to 11	8	40	3	15
12 or more	6	30	7	35
Ethnicity				
Yellow	1	5	0	0
White	5	25	6	30
Indigenous	0	0	0	0
Brown	12	60	12	60
Black	2	10	2	10
Marital status				
Married / Living together	6	30	9	45
Single	12	60	10	50
Divorced	1	5	0	0
Widower	1	5	1	5
Income (minimum wage*)				
Less than 1	4	20	3	15
1 to 2	13	65	13	65
3 to 4	1	5	2	10
5 or more	2	10	2	10
Immunodeficiency status				
HIV	0	0	10	50
Aids	20	100	10	50
Use of Protease Inhibitor				
Yes	6	30	7	35
No	14	70	13	65

Note. NT - Neurotoxoplasmosis; SNT - Without neurotoxoplasmosis; * Minimum wage of R\$ 724,00 was adopted.

Table 2 shows the analysis of the association of CD4 lymphocytes, handgrip strength and quality of life of individuals with or without neurotoxoplasmosis. The results showed no significant association, but attention is drawn to higher percentages in the NT group for inadequate classifications, especially for handgrip strength (75% vs 45%).

ART administration (antiretroviral therapy) in the neurotoxoplasmosis group occurred in 95% of patients. In addition, for those who used the medication, adherence was 70%. In the group without neurotoxoplasmosis, the use of ART occurred in 90% of patients and adhesion was 29%.

Table 2. Association of the presence of neurotoxoplasmosis diagnosis with the concentration of TCD4 lymphocytes, handgrip strength and quality of life.

Variables	NT		SNT		p	OR
	n	%	n	%		
TCD4 lymphocytes						
Adequate	15	79	17	89	>0.05	---
Inadequate	4	21	2	11		
Handgrip strength of right hand						
Adequate	2	10	3	15	>0.05	---
Inadequate	18	90	17	85		
Handgrip strength of left hand						
Adequate	5	25	11	55	>0.05	---
Inadequate	15	75	9	45		
Quality of life						
Adequate	13	72	19	95	>0.05	---
Inadequate	5	28	1	5		

Note. NT - Neurotoxoplasmosis; SNT - Without neurotoxoplasmosis; OR - Odds ratio.

Table 3 shows that the comparative analysis of the handgrip strength of patients with and without neurotoxoplasmosis was not significant ($p > 0.05$). However, it was observed that the absolute value of the handgrip strength of right hand was 15% lower in the NT group (35.50 vs. 30.30 kg) and the handgrip strength of left hand was 17% lower in the NT group (36.30 vs 30.26 Kg), compared to SNT. The association of the presence or absence of neurotoxoplasmosis with handgrip strength did not show significance ($p > 0.05$).

Table 3. Comparison of handgrip strength values in relation to patients with and without Neurotoxoplasmosis.

	Minimum	Maximum	Mean	sd
NT				
HSr (Kg)	14	49	30.30	11.23
HSI (Kg)	5	54	30.26	14.33
SNT				
HSr (Kg)	22	55	35.50	10.07
HSI (Kg)	23	55	36.30	9.80

Note. NT - Neurotoxoplasmosis; SNT - Without neurotoxoplasmosis; HSr –handgrip strength of right hand; HSI - handgrip strength of left hand.

Quality of life, through its domains, is presented and compared between groups in Table 4. When comparing domains between groups with and without neurotoxoplasmosis, it was observed that the financial concern presented better index in the group without neurotoxoplasmosis ($p = 0.0379$). However, the other domains showed no statistical difference, but the scores were higher in the SNT group, except for the professional confidence, which was higher in the NT group. The difference between groups of 41% and 34% groups in the financial concern and HIV acceptance domains,

respectively, attracts attention, where the NT group has lower score ($p > 0.05$). The mean score of domains, as each domain individually, were not associated with the presence or absence of neurotoxoplasmosis ($p > 0.05$).

Table 4. Comparison of quality of life domains in relation to patients with and without Neurotoxoplasmosis.

	GF	SL	HC	FC	CM	HIVA	CC	PC	SF	Mean
NT										
Mean	63.02	74.07	55.67	33.31*	72.65	36.89	30.83	94.00	58.39	57.55
sd	20.97	20.21	34.43	34.54	29.53	32.44	30.21	12.42	45.57	16.72
SNT										
Mean	72.52	79.16	66.05	56.27	78.24	56.45	35.00	89.55	68.90	66.59
sd	17.61	16.64	32.79	32.23	19.28	35.68	24.06	14.04	34.50	14.23
$\Delta\%$	-13	-6	-16	-41	-7	-34	-12	5	-15	-14

Note. NT - Neurotoxoplasmosis; SNT - Without neurotoxoplasmosis; GF - general function; SL - satisfaction with life; HC - health concern; FC - financial concern; CM - concern with medication; HIVA - HIV acceptance; CC - confidentiality concern; PC - professional confidence; SF - sexual function; * Statistical difference of group without neurotoxoplasmosis; $p < 0.05$.

DISCUSSION

The aim of this study was to evaluate the handgrip strength and quality of life of HIV-infected patients diagnosed for neurotoxoplasmosis. Due to the scarcity and difficulties of finding studies on neurotoxoplasmosis, most articles discussed here addressed only HIV infection.

Regarding the sociodemographic profile, the study found that in both groups, males obtained higher frequency, a profile observed in studies performed with HIV-infected patients without neurotoxoplasmosis^{8,15}.

The Brazilian Epidemiological Bulletin¹ points out that the majority of cases of HIV infection are in the age group of 20-34 years, corresponding to 52.5% of cases. In the present study, the most frequent age group in both groups was 33-42 years.

Regarding ethnicity, both groups had predominance of brown ethnicity (60%), which corroborates the Epidemiological Bulletin¹, where 45.4% of individuals described themselves as brown. Another study carried out with HIV/Aids patients from the western region of Pará also reported that the predominant ethnicity was brown.

Regarding the immunodeficiency situation of patients, all patients from group with neurotoxoplasmosis had Aids and half of the SNT group developed Aids. The emergence of the side effects of ART makes many patients discontinue the use of the medication, leaving them prone to opportunistic infections, among them toxoplasmosis/neurotoxoplasmosis^{17,18}. Toxoplasmosis is the leading cause of central nervous system (CNS) damage in Aids. Typically, lesions found in the brain present effects that dominate clinical presentation¹⁹. A study with 250 patients in southern Brazil showed that there is a high risk of serious clinical toxoplasmosis in the study population both due to the reactivation of infection in seropositive patients who do not use regular ART and to the primary infection of seronegative patients, often due to misinformation about the forms of infection²⁰. The early introduction of ART improves survival and reduces relapses of cerebral toxoplasmosis²¹.

The use of protease inhibitor was present in 30% of patients with neurotoxoplasmosis and in 35% of SNT. The use of a protease inhibitor in ART with two nucleoside reverse transcriptase inhibitors is the second treatment line, being highly effective in reducing the plasma viral load of RNA/HIV-1¹⁷. Although the use of the protease inhibitor was similar in both groups, 85% of TCD4 lymphocytes were adequate in the SNT group, possibly due to the use of the therapy, which inhibits viral replication and delays the progression of immunodeficiency¹⁸.

Another study evaluated the incidence and risk factors for neurotoxoplasmosis in two periods before and after the availability of protease inhibitors and observed the efficacy of cotrimoxazole prophylaxis in protection against neurotoxoplasmosis with an additional protective effect of ART. However, the discontinuation of cotrimoxazole use causes deleterious effects to immunodeficient patients²².

When comparing handgrip strength between groups, no statistical difference was observed; however, values were 15% lower in the right limb and 17% lower in the left limb for NT. This finding is in line with the study by Raso et al.²³, who compared torque strength among HIV-infected patients who had TCD4 lymphocyte counts above and below 200 cells/mm³, all of them male. It was observed that in patients with TCD4 lymphocytes below 200 cells/mm³, torque strength was 20% lower.

Between 2009 and 2013, 138 individuals, most of them female, were evaluated to characterize the physical symptoms of individuals with HIV/Aids from the physiotherapeutic point of view, and the most common comorbidity was neurotoxoplasmosis, and frequent physical complaints were hemiparesis, pain, altered muscle tone and lipodystrophy²⁴.

Another study conducted in Germany also reported that neurotoxoplasmosis is the most important opportunistic infection of the central nervous system in patients infected with human immunodeficiency virus (HIV) and showed that neurotoxoplasmosis occurs mainly in HIV untreated patients, after analyzing the clinical characteristics of all patients diagnosed with neurotoxoplasmosis (n = 140), showing that neurological deficits were present in 37% of them²⁵.

The incidence of mortality due to neurotoxoplasmosis decreased substantially during the antiretroviral therapy era, especially when the patient survived the first year of HIV infection and the first three months of neurotoxoplasmosis. As a result, individuals diagnosed with HIV or neurotoxoplasmosis during the ART era could be considered as with low risk of mortality. Therefore, early HIV diagnosis and ART initiation are of paramount importance²⁶.

Thus, adherence to ART in addition to improving clinical outcomes and controlling disease progression, also results in better quality of life for patients²⁷. This study showed lower scores for the confidentiality concern domain and higher scores for the professional confidence domain in both groups, which can also be observed in studies by Galvão et al.²⁸ and Lopes et al.²⁹.

The study presents as limitation a large range in the age group, as well as

a limited number of patients and the absence of a control group without HIV infection. For better reliability of evaluations, DEXA (Dual-energy X-ray Densitometry) could be used to evaluate body composition, as well as electromyography and load cell resources to evaluate muscle activity and strength.

CONCLUSION

According to the method proposed, the handgrip strength of patients with and without neurotoxoplasmosis was statistically similar, but higher values for the group without neurotoxoplasmosis were observed. The financial concern domain had higher score in the group without neurotoxoplasmosis and confidentiality concern and professional confidence domains were those that showed the lowest and highest scores, respectively, in both groups. Therefore, the presence of neurotoxoplasmosis in the context of Aids and in the use of ART did not affect the handgrip strength and quality of life of people living with the disease. Other conditions associated with AIDS may already interfere with quality of life and handgrip strength.

Further studies should be carried out to better understand the clinical, motor/sensory and epidemiological profile of patients infected with HIV/ Aids diagnosed with neurotoxoplasmosis and, thus, provide better procedures for prevention, orientation and treatment of these patients.

COMPLIANCE WITH ETHICAL STANDARDS

Funding

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee – Federal University of Pará and protocol (576.771) was written in accordance with standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed experiments: LFGS and MBX. Performed experiments: LFGS, CNSL and KTLF. Analyzed data: LFGS, SYLT and MBX. Contributed with reagents/materials/analysis tools: LFGS, CNSL, SYLT and KTLF. Wrote the paper: LFGS, SYLT and MBX.

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