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Correlation between clinical and cognitive aspects and nutritional indicators of elderly patients with new-onset epilepsy

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ABSTRACT

Objective: Nutritional indicators were correlated with cognitive and clinical aspects of 25 elderly patients with new-onset epilepsy (EPWE). The nutritional indicators of the EPWE were compared with those of a similar control group at a significance level of $p < 0.05$.
Results: There was lower cognitive performance, greater risk of malnutrition and muscle tissue depletion, and higher waist circumference (WC) in the EPWE. Longer epilepsy duration was correlated with loss of muscle mass (Pearson's correlation: 0.433; $p = 0.044$). Performance in the verbal fluency test, in the clock-drawing test, and in the immediate memory test was negatively associated with body fat. Better performance in the image recognition test was negatively associated with the indicators of muscle reserve.
Conclusion: There was lower cognitive performance, higher risk of malnutrition, and high abdominal obesity in EPWE. Cognitive performance was related to adiposity. Cognitive impairment and longer disease duration are related to increased nutritional risk.

1. Introduction

In the general population, overweight and obesity in middle-aged adults are associated with a decline in cognitive performance in cognitive tests in multiple domains, increased risk of dementia, structural changes in the brain, and white matter atrophy. However, the exact pathophysiological mechanism has not yet been fully explained, and it is still discussed in the literature [1, 2].

Studies suggest that patients with epilepsy have a high risk of developing overweight and obesity and higher body mass index (BMI) values when compared with the ordinary population [3–5].

Cognitive impairment is a frequent comorbidity in epilepsy; however, the mechanisms are complex and multifactorial [6]. The impact of overweight and obesity on cognitive functions in epilepsy is poorly studied. Baxendale et al. observed that lower performance in memory tests was associated with higher BMI values in 81 patients with refractory seizures [7]. We have not found any studies that assessed nutritional indicators and their relationship with clinical and cognitive aspects in elderly patients with new-onset epilepsy (EPWE).

Given the complexity of the subject, further studies are required to better understand the relationship between overweight/obesity and cognitive/clinical aspects of epilepsy.

Thus, the aim of this study was to assess the nutritional indicators of EPWE and their relationship with the cognitive and clinical aspects of epilepsy. The nutritional indicators were compared with those of a paired healthy control group (HC) regarding age, gender, education, and socioeconomic level.

2. Methods

2.1. Patients and HC

Twenty-five consecutive EPWE aged 62 years and older whose seizures began at the age of 51 years were recruited at the epilepsy outpatient clinic of the Pontifícia Universidade Católica (PUC)—Campinas Hospital, Campinas, São Paulo, Brazil. Epilepsy was diagnosed in accordance with the International Classification of Epilepsies and Epileptic Syndromes (International League Against Epilepsy [ILAE]) (Engel) [8] criteria.

The EPWE who agreed to participate in the study answered a questionnaire on sociodemographic (age, gender, education level, marital status, and socioeconomic status) and clinical (age at onset, seizure type and frequency, duration of epilepsy, number of antiepileptic drugs (AED) administered, and epileptic syndrome) characteristics. Seizure control was operationally defined as seizure-free for the last twelve months in this study.

Patients who had difficulty understanding the questions in the instruments because of their low level of education or mental disability

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were excluded, as well as those with a history of cancer or strokes, progressive neurological diseases, and neurodegenerative diseases.

A control group was set up with 49 individuals with no history of previous neurological, cognitive deficits or other chronic disorders and of similar gender, education, socioeconomic status, and age range. They were preferentially selected among family members of patients with epilepsy.

The patients were informed about the research protocol and signed the informed consent. The study was approved by the Human Research Ethics Committee of PUC—Campinas.

2.2. Procedure

The EPWE and HC were submitted to the following tests:
Assessment of nutritional indicators:

- Mini Nutritional Assessment (MNA) [9]: this questionnaire used to detect malnutrition in the elderly is composed of screening and global assessment. The questionnaire contains a 6-item screening part and a 12-item assessment part. All subjects completed the MNA screening. When subjects scored ≤11 out of 14 points (suggesting "malnutrition"), the 12-item assessment part was completed and a total score was calculated (MNA total = sum of scores on the screening and assessment parts). The global assessment differentiates three levels of nutritional status: a) no risk of malnutrition: MNA ≥24; b) risk of malnutrition: MNA of 17–23.5; and c) malnutrition: MNA <17 [10].
- Anthropometric data: the measurements and indicators of height (cm); weight (kg); body mass index (BMI, kg/m^2) [11, 12]; waist circumference (WC, cm) [12–16]; calf circumference (CC, cm) [11, 13]; arm circumference (AC, cm) [12–14]; subscapular skinfold (SSF, mm) [13–16]; triceps skinfold thickness (TST, mm) [13–16]; fat mass (FM, kg); [17]; body fat mass index (BFMI) [17]; resistance (Ohms), and reactance [17] were analyzed. Arm-muscle circumference (AMC, cm) [13, 15, 16] and circumference of the corrected arm muscle area (AMA, cm^2) [13, 15, 18] were calculated using the TST and AC measurements. The calculation of reactance, resistance (Ω), FM, and BFMI was based on anthropometric data and bioelectrical impedance analyzer. A nonextensible measuring tape or Lange adipometer was used to take the measurements on the dominant side in triplicate. The mean values of the measurements were classified according to the technique and criteria established in the literature for a population of this age group and adjusted for gender.

Cognitive assessment:

- Mini-Mental State Examination (MMSE) [19]: this questionnaire is a cognitive screening tool that assesses temporal and spatial orientation, registration and recall of three words, attention and calculation, language, and visual construction. Its maximum score is 30 points [20].
- Brief Cognitive Battery (BCB) [21]: this instrument requires the identification and naming of simple drawings of 10 common objects, followed by the incidental memory of these objects. Subsequently, the drawings are shown to the individuals on two more occasions, followed each time by the recall of the objects, to obtain the scores of immediate memory and the number of learned or encoded items, called the learning scores. This is followed by an interference phase that consists of a category fluency test (animals in 1 min) (VF animals), phonemic verbal fluency test (words FAS) (VF FAS), and the clock-drawing test. After this interference, (free) delayed recall and recognition of the 10 objects among 20 drawings (with 10 distracters) are assessed. This scale was developed in Brazil. The HC was submitted only to the VF animals, VF FAS, and clock-drawing tests.

In the cognitive assessment, the HC was submitted only to MMSE, VF animals, VF FAS, and the clock-drawing test.

2.3. Data analysis

Continuous variables were expressed as mean and standard deviation or percentiles. Categorical variables were expressed as number of cases (N) and frequencies (%). The chi-squared test was used to evaluate associations among categorical variables, and Student's *t*-test was used to compare group means.

Based on the significant correlations, nutritional indicators related to the best cognitive performance in the EPWE were determined by multivariate linear regressions stepwise. The best models were selected on the basis of *p*-values.

Data were analyzed using the software IBM SPSS Statistics, version 22. The significance level was set at $p < 0.05$.

3. Results

The diagnosis was of symptomatic focal epilepsies of vascular etiology in 17 cases and probably symptomatic focal epilepsies in eight cases, in accordance with the ILAE [8] criteria.

The sociodemographic and cognitive aspects of EPWE and the HC and the clinical data of the EPWE are shown in Table 1.

There was no significant difference in age, education, socioeconomic status, and gender between EPWE and the HC. The performance of EPWE in the MMSE and clock-drawing test was significantly lower than the HC.

3.1. Nutritional indicators

Results from the MNA questionnaire are shown in Table 2. The screening and the MNA total scores (applied to the subset of subjects with an initial low MNA screening score of ≤11) were significantly lower in EPWE than in the HC. A higher risk of malnutrition was observed in the EPWE when compared with the HC.

There was no significant difference in the BMI values between the EPWE and the HC. According to the BMI classification, the EPWE were predominantly classified as 'well-nourished' and the HC as 'overweight'. However, in the present study, 44% of the EPWE and 69.3% of the HC had a mean BMI value of ≥27, which indicates 'overweight' (Table 2).

Table 1
Sociodemographic, clinical, and cognitive aspects of EPWE and HC.

	EPWE (n = 25)	HC (n = 49)	*p*-Value
Age (y, mean ± SD)	72 (±5.2)	74.7 (±7.4)	0.107[a]
Gender: female/male	14/11	35/14	0.184[b]
Formal education (y, mean ± SD)	4.0 (±3.7)	4.3 (±2.0)	0.687[a]
Age at first seizure (y, mean ± SD)	61.0 (±8.9)		
Epilepsy duration (y, mean ± SD)	12.4 (±9.6)		
Seizure type — focal/exclusively generalized	20/5		
Seizure frequency — uncontrolled/controlled	18/7		
Antiepileptic drugs: one/≥2	22/3		
Focal epilepsy: probably symptomatic/symptomatic	8/17		
Neuropsychological battery test			
MMSE (mean ± SD)	23.0 (±2.5)	25.1 (±3.3)	0.03[a,*]
Clock-drawing test (mean ± SD)	5.4 (±2.4)	7.1 (±3.0)	0.010[a,*]
Immediate memory (mean ± SD)	7.1 (±1.5)		
Recognition (mean ± SD)	8.7 (±2.0)		
Delayed recall test — score (mean ± SD)	5.9 (±2.4)		
Delayed recall test (mean ± SD)	0.4 (±1.6)		
VF animals (mean ± SD)	11.4 (±4.8)	11.9 (±2.4)	0.649[a]
VF FAS (mean ± SD)	14.8 (±11.7)	16.9 (±4.0)	0.134[a]

EPWE: elderly patients with new-onset epilepsy; HC: healthy control group; MMSE: Mini-Mental State Examination score; VF animals: category fluency test; VF FAS: verbal fluency (words FAS).
[a] *t*-Test.
[b] Chi-square test.
[*] $p < 0.05$.