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Anthropometric profile and nutritional intake in patients with epilepsy

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Abstract

Background: **quality of life impairments are common in patients with epilepsy, especially due to cardiovascular comorbidities, overweight and obesity.**

Objectives: **to evaluate the nutritional status of patients with epilepsy based on anthropometric measurements and dietary intake.**

Methods: **this cross-sectional study involved 72 patients recruited by convenience from the Epilepsy Clinic of the Clinical Hospital of Porto Alegre, Brazil. The sample consisted of patients of both genders, aged over 18 years, who had been diagnosed with epilepsy for at least one year. The following variables were investigated: anthropometric measurements (weight and height for the assessment of BMI and nutritional status, waist circumference for the assessment of cardiovascular risk); nutritional intake based on a food frequency questionnaire; socioeconomic status based on the Brazilian Economic Classification Criteria.**

Results: **the prevalence of overweight/obesity was 66.7%, and 85.4% of the women had a high cardiovascular risk. Patients displayed a low frequency of seizure control (41.7%), high carbohydrate and protein intakes, as well as low mono- and polyunsaturated fatty acid intakes (including omega 3 and 6 fatty acids). No differences in nutritional status or intake were observed between patients with controlled versus uncontrolled seizures.**

Conclusions: **patients with epilepsy have comorbidities risks, as evidenced by their tendency to overweight and obesity, and abdominal obesity. Although seizure control did not appear to be related to nutritional status and intake, the presence of such comorbidities underscores the need for nutritional monitoring and intervention**

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PERFIL ANTROPOMÉTRICO E INGESTA NUTRICIONAL EN PACIENTES CON EPILEPSIA

Resumen

Introducción: **la calidad de vida alterada es común en los pacientes con epilepsia, especialmente debido a las comorbilidades cardiovasculares, el sobrepeso y la obesidad.**

Objetivos: **evaluar el estado nutricional de los pacientes con epilepsia en base a mediciones antropométricas y la ingesta alimentaria.**

Métodos: **este estudio transversal involucró a 72 pacientes reclutados por conveniencia en la Clínica de Epilepsia del Hospital de Clínicas de Porto Alegre, Brasil. La muestra consistió en pacientes de ambos sexos, mayores de 18 años, que habían sido diagnosticados de epilepsia durante al menos un año. Variables investigadas: medidas antropométricas (peso y talla para la evaluación del estado nutricional y el IMC, circunferencia de la cintura para la evaluación del riesgo cardiovascular); la ingesta nutricional en base a un cuestionario de frecuencia de alimentos; nivel socioeconómico basado en los Criterios de Clasificación Económica del Brasil.**

Resultados: **la prevalencia de sobrepeso/obesidad fue del 66,7%, y el 85,4% de las mujeres tenían un alto riesgo cardiovascular. Los pacientes presentaron una baja frecuencia de control de las crisis (41,7%), alta ingesta de carbohidratos y proteínas, así como baja ingesta de ácidos grasos mono y poliinsaturados (incluyendo ácidos grasos omega 3 y 6). No se observaron diferencias en el estado nutricional ni el consumo entre los pacientes con convulsiones controlados o no controlados.**

Conclusiones: **los pacientes con epilepsia tienen riesgos de comorbilidades, como se evidencia por su tendencia al sobrepeso/obesidad y obesidad abdominal. Aunque el control de las crisis no parece estar relacionado con el estado nutricional y la ingesta, la presencia de tales comorbilidades apunta la necesidad de vigilancia nutricional e intervención en estos pacientes, con un enfoque especial**

in these patients, with a special focus on macronutrient redistribution and on dietary fatty acid levels.

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Key words: *Epilepsy. Nutritional intake. Cardiovascular risk.*

en la redistribución de macronutrientes y en los niveles de ácidos grasos en la dieta.

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Palabras clave: *Epilepsia. Ingesta nutricional. Riesgo cardiovascular.*

Introduction

Epilepsy affects between 0.5 and 1% of the world's population[1,2]. Its most common form is temporal lobe epilepsy (TLE), which is diagnosed in 30 to 40% of cases[3,4], followed by frontal lobe epilepsy (20-30%)[5].

Quality of life impairments are common in patients with epilepsy, especially due to the high prevalence of comorbidities such as type II diabetes mellitus, arterial hypertension and stroke in this population. High rates of cancer and blood cholesterol are also observed in patients with epilepsy[6,7]. Additionally, overweight and obesity are commonly reported in individuals with epilepsy, who have higher body mass index (BMI) values[8] and obesity rates than the general population (34.1% and 23.7%, respectively)[9].

Few studies have addressed the eating habits of patients with epilepsy[10,11], save for those which have investigated the effects of a ketogenic diet in children and adults with drug resistant epilepsy[12,13].

Given the high rates of overweight, obesity and their associated comorbidities in this population, it is especially important to evaluate the nutritional status and intake of patients with epilepsy.

Materials and methods

This cross-sectional study involved patients recruited by convenience from the Epilepsy Clinic of the Hospital de Clínicas de Porto Alegre, Brazil. The sample consisted of patients of both genders, aged over 18 years, who had been diagnosed with epilepsy for at least one year. The following exclusion criteria were applied: pregnancy or lactation at the time of the study, presence of other neurological diseases which impaired cognitive functioning, and a diagnosis of cancer[14]. Data were collected from 2013 until 2014.

Clinical data (type of epilepsy, number of seizures in the previous year, age of epilepsy onset) were collected from patient report forms. Seizure control was defined as the absence of consecutive seizures in the previous 12 months[15].

Weight and height were assessed using a calibrated digital scale with a precision of 0.1kg (Toledo®, model 209PP/2, São Paulo, Brazil) and a wall-mounted stadiometer accurate to 0.1 cm (Harpenden, Holtain®, Crymych,UK). Waist circumference (WC) was measured using a 2m-long measuring tape (Sanny® Medical SN-4011, São Paulo, Brazil). Weight and height measurements were then used to calculated patient BMI (weight divided by the square of the height), which was expressed in kg/m^2. Nutritional status according to BMI and cardiovascular risk according to WC were evaluated based on cut-offs recommended by the WHO (2000)[16] and WHO (1998)[17], respectively.

Nutritional intake was assessed using a food frequency questionnaire (FFQ) which is validated for use in adult and elderly populations of Porto Alegre, RS, Brazil, and was found to have adequate reproducibility in the semi-quantitative assessment of the intake of 137 different foods[18]. Total calorie as well as micro and macronutrient intake were assessed individually for each patient the *NUTRIBASE* Clinical Edition software, version 10.0[19]. Results regarding the intake of micro and macronutrients, and of omega 3 and 6 fatty acids were then compared to DRIs [EAR (estimated average requirement), AI (adequate intake, RDA (recommended dietary allowances)].[20] The intake of lipids, cholesterol, saturated, mono- and polyunsaturated fatty acids were evaluated based on NCEP-ATP III guidelines[21]. Socioeconomic status was evaluated based on the Brazilian Economic Classification Criteria – CCEB[22] .

Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means and standard deviations. Chi-squared test tests were used to evaluate associations between categorical variables, while Student's *t*-tests were used to compare group means. Data were analyzed using the *Statistical Package for social Sciences (SPSS)* software, version 18.0, and results were considered significant when $p \leq 0.05$.

The present study was approved by the Research Ethics Committee of the Hospital de Clínicas de Porto Alegre, RS, Brazil, under project number 12.0178, and all experimental procedures were performed in accordance with the Declaration of Helsinki.

Results

Of the 88 patients attended at the epilepsy clinic during the study period, one declined participation in the study and 15 did not meet inclusion criteria, which resulted in the inclusion of 72 participants in the sample. A high prevalence of TLE was found in the sample (79.1%), and a large number of patients had their first seizure prior to age 20 (Table I).

Table I
Sample characteristics of patients with epilepsy (n = 72)

Characteristics	*Mean ± SD; n and %*
Age (years)	46.3 ± 12.4
Gender	
Male	(30) 41.7
Female	(42) 58.3
Seizure control	
Controlled	(30) 41.7
Uncontrolled	(42) 58.3
Socioeconomic status (ABEP)	
B	(20) 33.9
C	(36) 61.0
D	(3) 5.1
Type of Epilepsy	
TLE	(57) 79.1
Other	(15) 20.8
Age of Seizure Onset (years)	
0-10.	(18) 25.4
11-20.	(24) 33.8
21-30.	(12) 16.9
>30	(17) 23.9
BMI (kg/m²)	28.4 ± 6.0
Nutritional Status Classification (BMI)	
Thinness	2.8
Eutrophy	(22) 30.6
Overweight	(21) 29.2
Obesity	(27) 37.5
WC (cm)[#]	
≥94 cm in men; 80 cm in women	(54) 76.1
<94 cm in men; 80 cm in women	(17) 23.9

ABEP: Brazilian Association of Research Companies, Economic Classification Criteria (ABEP, 2011); WC Waist Circumference; TLE: Temporal Lobe Epilepsy; BMI: Body Mass Index. Seizure control: no consecutive seizures in the previous year[20] . [#] WHO cut-offs (1998, 2000); other causes of epilepsy: traumatic brain injury, neonatal anoxia, surgery and hemorrhagic strokes.

Mean BMI in the sample was 28.4 ± 6.0 kg/m², with 66.7% of participants being classified as obese or overweight. WC measurements revealed a high level of cardiovascular risk in the majority of the sample (76.1%) (Table I). Between-gender analyses revealed that cardiovascular risk was higher among women than in men (85.4% and 63.3%, respectively).

A total of 41.7% of patients in the sample had not had any seizures in the previous year (Table I), and 70% of these individuals were classified as being overweight or obese. However, no significant associations were found between nutritional status (as assessed by BMI), cardiovascular risk (as assessed by WC) and seizure control (Table II). Additionally, no significant differences were found between the BMI values of patients with controlled versus uncontrolled seizures (28.5 ± 5.1 and 28.5 ± 6.7 kg/m², respectively; Student's t-test $p = 0.908$). BMI comparisons between genders also revealed an absence of significant differences between the BMI values of men and women with controlled versus uncontrolled seizures [men: 27.0 ± 3.3, 28.5 ± 5.2 kg/m² for those with controlled and uncontrolled seizures, respectively; (p = 0.376, Student's t-test); women: 29.2 ± 5.9, 28.4 ± 7.7 kg/m² for those with controlled and uncontrolled seizures, respectively; (p = 0.737, Student's t-test)].

Comparisons with DRIs revealed elevated carbohydrate and protein intakes among patients with epilepsy (approximately 2 and 4 times higher than recommended, respectively). The daily intake of monounsaturated (MUFAs) and polyunsaturated fatty acids (PUFAs), such as omega 3 and 6 fatty acids, was below recommended levels. However, saturated fatty acid intake was significantly higher than recommended guidelines. These results did not differ between patients with controlled versus uncontrolled seizures. Total lipid and MUFA intake in Kcal/kg was higher in patients with uncontrolled seizures than in those with controlled seizures, although this difference did not reach statistical significance. The two groups were also similar in their intake of all aforementioned nutrients (Table III).

Discussion

The mean BMI values found in the present study were similar to those reported in an investigation of Chinese patients with epilepsy[23]. However, the percentage of patients considered to be overweight and obese (66.7%) was higher than that found in a pre-

Table II
Nutritional status, cardiovascular risk and seizure control in patients with epilepsy

Variables	*Nutritional Status*			*WC*		
	Eutrophy (%)	*Overweight/Obesity*	*p**	*Risk*	*No Risk*	*p**
Seizure control			0.800			0.701
Yes (n=30)	9 (30)	21 (70)		24 (80)	6 (20)	
No (n=42)	15 (35.7)	27 (64.3)		30 (73.2)	11 (26.8)	

WC: Waist Circumference; Risk: presence of cardiovascular risk according to WC (≥ 80 cm in women, ≥ 94 cm in men); No risk: absence of cardiovascular risk according to WC (< 80 cm in women; < 94 cm in men). *Chi-square test.

Table III
Nutritional intake in patients with epilepsy

Variables	*Total*	*Controlled seizures*	*Uncontrolled seizures*	*p**	*EAR/AI*/RDA (♀♂)*
Energy (kcal)	2745.68±786.33	2702.28±768.08	2780.15±810.33	0.704	
Kcal/kg weight	38.29±14.95	36.63±12.98	39.60±16.43	0.445	
Proteín (g)	105.98±33.89	100.22±30.51	110.55±36.15	0.241	56 (♂) / 46 (♀)*
PTN (% energy intake)	15.59±3.10	15.08±3.30	16.00±2.92	0.255	10-35.
Proteín (g/kg weight)	1.46±0.60	1.34±0.49	1.56±0.66	0.165	0.66
Carbohydrates (g)	411.88±141.40	413.07±154.66	410.94±132.30	0.954	100
CHO (% energy intake)	59.63±8.24	60.32±9.04	59.08±7.64	0.565	45-55.
Sugars (g)	158.09±81.05	170.41±89.67	148.30±73.39	0.294	
Sugars (% energy intake)	22.57±8.51	24.48±7.85	21.06±8.82	0.121	
Fiber (g)	38.78±19.92	36.99±21.17	40.21±19.06	0.535	30-38 (♂) / 21-25 (♀)
Total lipids (g)	82.12±29.44	79.42±25.98	84.26±32.15	0.528	ND
Lipids (% energy intake)	27.09±6.48	26.94±6.74	27.22±6.36	0.870	25-35.
Saturated FA	31.99±13.69	31.17±13.23	32.65±14.20	0.680	
Saturated FA (% energy intake)	10.58±3.53	10.64±4.10	10.53±3.08	0.904	<7
PUFAs (g)	11.66±4.70	11.70±4.46	11.62±4.94	0.949	
PUFAs (% energy intake)	3.84±1.10	3.95±1.18	3.76±1.05	0.525	10
MUFAs (g)	25.98±11.73	24.33±8.92	27.29±13.54	0.333	
MUFAs (% energy intake)	8.57±3.28	8.17±2.24	8.89±3.91	0.396	20
Trans FA (g)	0.76±0.63	0.69±0.41	0.81±0.76	0.460	
Trans FA (% energy intake)	0.25±0.18	0.24±0.15	0.26±0.21	0.692	
Cholesterol (mg)	367.52±197.66	350.04±177.38	381.38±214.01	0.543	<200
ω 3 (g)	0.71±0.67	0.67±0.42	0.74±0.68	0.632	1,6 (♂)* /1,1 (♀)*
ω 3 (g/1000 kcal)	0.26±0.18	0.25±0.16	0.26±0.19	0.920	
ω 6 (g)	1.93±2.02	2.28±2.39	1.65±1.65	0.232	14-17 (♂)* / 11-12 (♀)*
ω 6 (g/1000 kcal)	0.75±0.85	0.92±1.07	0.61±0.59	0.161	
ω 6: ω 3 ratio (g)	2.85±2.12	3.22±2.10	2.56±2.11	0.226	
Sodium (mg)	2206.77±931.05	2160.61±785.59	2243.36±1042.47	0.734	1.3-1.5 (♀♂)*

FA: fatty acid; AI: adequate intake; CHO: carbohydrate; EAR: estimated average requirement; g: gram; kcal: kilocalorie; kg: kilogram; mg: milligram; MUFA: monounsaturated fatty acid; PTN: protein; PUFA: polyunsaturated fatty acid; RDA: recommended dietary allowances; ω-3: omega-3 fatty acid; ω-6: omega-6 fatty acid; μg: microgram. Data expressed as mean ± standard deviation. *Student's t-test.

vious study of patients with epilepsy (55.2%)[24]. Obesity was 2.5 more common in the present sample than in healthy populations of a similar age (37.5% and 14.8%, respectively)[25], suggesting that patients with epilepsy may be more likely to develop obesity-associated comorbidities, such as cardiovascular diseases[6,7].

Studies suggest that patients with epilepsy often present with cardiovascular conditions and metabolic complications[6,7,14,26]. Such risks are often estimated based on WC measurements, which act as indicators of abdominal obesity[16]. The high prevalence of elevated WC in the present sample suggests a serious need for the monitoring of these variables in populations with epilepsy. This is corroborated by the higher metabolic risk observed, especially among women. These discrepancies were also observed between the present sample and the general population. Population-based studies have shown that the prevalence of elevated WC is higher among women than men (at a 3:1 ratio), resulting in a prevalence of metabolic syndrome that is five times higher in the former than in the latter[27].

The prevalence of patients with controlled seizures who were classified as being overweight or obese was similar to that reported in an American study, which found that 71.8% of patients who reported no seizures in the previous 12 months were overweight or obese[24]. These findings suggest that nutritional status may not be associated with seizure control.

In addition to being above recommended levels, the mean carbohydrate intake in the sample was also 1.5 times higher than that reported by Southern Brazilian populations of both genders and similar ages[25]. This finding may contribute to the increased prevalence of overweight/obesity in patients with epilepsy as compared to the general population. The elevated calorie intake to body weight ratio found in patients with epilepsy may be attributable to the high intake of carbohydrates and proteins reported by these individuals.

Associations between seizure control and PUFAs, especially omega 3 fatty acids, have been previously reported in the literature. These nutrients appear to affect voltage-gated sodium channels in a similar way as AEDs. Therefore, omega 3-enriched diets may contribute to the effects of AEDs on seizure control[28]. The absence of an association between omega 3 and seizure control in the present study may be explained by the similar and low levels of omega 3 intake observed in patients with controlled versus uncontrolled seizures. In addition to having a possible influence on seizure control, unsaturated fatty acids incorporated in cell membranes may also reduce cardiovascular risk by means of their impact on serum triglyceride levels[29] and on the expression of proinflammatory and proatherogenic mediators[30]. These findings reinforce the importance of adequate fatty acid intake.

The elevated saturated fatty acid intake levels found in the present study are also a cause for concern. These substances have been associated with increased cardiovascular risk due to their correlation with plasma LDL concentrations[31]; however, when 5% of the saturated fat content of a diet is replaced by PUFAs, a 10% reduction in cardiovascular risk is observed[32]. A similar but less pronounced effect has been reported for MUFAS[31], which points to the importance of both PUFA and MUFA intake for general health. High cholesterol intake also contributes to cardiovascular risk, since cholesterol build-up on arterial walls may trigger inflammatory processes and endothelial dysfunctions, leading to thrombosis and the rupture of atherosclerotic plaques[33] .

In the present sample, nutritional intake did not differ between individuals who presented with seizures in the previous year and those who did not report such phenomena, suggesting that diet may not be associated with seizure control. However, this conclusion must be interpreted with caution given our small sample size and the fact that other important variables, such as physical activity [34] and medication use[35,36], were not assessed. These factors may influence nutritional status and have an impact on the development of comorbidities.

Conclusions

The patients in the present sample had a high risk of comorbidities, as evidenced by their tendency to overweight and obesity, and their elevated abdominal obesity. Although seizure control did not appear to be related to nutritional status and intake in the present sample, the presence of such comorbidities underscores the need for nutritional monitoring and intervention in patients with epilepsy, with a special focus on macronutrient redistribution and on dietary fatty acid levels.

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