Intake polyunsaturated fatty acids and its effect on the lipid profile among the Chilean GLUT1-DS cohort on a ketogenic diet

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BACKGROUND AND OBJECTIVE

Glucose transporter type 1 deficiency syndrome (GLUT1-DS) is a neurological disorder caused by mutations in the SLC2A1 gene. The main treatment is ketogenic diet therapy (KDT), but long-term can cause adverse effects, such as osteopenia and dyslipidemia. Concerning dyslipidemia, several benefits have been associated with consuming PUFA in the diet, mainly with the omega-3 family: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). This is because the intake of omega-3 affects reducing triglyceride and cholesterol levels, thus providing important benefits for cardiovascular health.

Objective: Determine the intake of essential fatty acids (PUFA), specifically DHA and EPA, and evaluate the lipid profile in the Chilean cohort of patients with GLUT1-DS

METHODS

A cross-sectional study. 13 GLUT1-DS subjects were matched for age, sex, and nutritional status with 13 control subjects. Subjects with GLUT1-DS were on KDT for more than a year. A variant in the SLC2A1 gene was found in all of them.

- **Anthropometric evaluation:**
  - Weight/height or body mass index/age
  - Height/age
- **Blood tests:**
  - Lipid profile
  - Liver profile
  - Vitamin D levels
- **Dietary intake:**
  - 24-hour reminders for 3 days.
  - Energy (kcal/d) and macronutrients (%Energy).
  - Fats: saturated (SFA), monounsaturated (MUFA), polyunsaturated (PUFA), omega 3, α-linolenic acid (ALA), EPA, and DHA (%Energy, mg/d).

Statistics: means ± standard deviation (SD) or median with the interquartile range (IQR 25- 75) for each variable. Linear associations were performed using the Spearman test. Ethical considerations: was approved on April 14, 2021.

RESULTS

13 GLUT1-DS (54% men): 1 risk of malnutrition, 6 normal weight, 3 overweight, and 3 obese.
No differences were observed between groups for the rest of the biochemical parameters evaluated.

GLUT1-DS group: 10.2 ± 5.5 years old
Energy: 1614.2 ± 428.6 kcal/d

Carbohydrates :3.9%E (2.5; 8.3)*
Protein : 13.2 ± 3.9%E*
Fat : 81.2%E (77.2; 83.9)*

SFA : 38.4%E (34.8; 41.3)*
MCT : 17% E
MUFA: 22.4 ± 5.5%E*
PUFA :16.9%E (13.9; 20.5)*

1.8±1.0%E*
- **ALA:** 2359 mg/d (1174; 3351)*
- **EPA+DHA:** 315 mg/d (0;546)*

11/13 managed to meet their requirements (ALA 0.6-1.2%E, and EPA+ DHA 100- 250 mg according to age)

Control group: 9.9 ± 5.4 years old
Energy: 1401.1 ± 253.2 kcal/d

Carbohydrates: 54%E (49.3; 58.9)*
Prot: 18.6 ± 1.6%E*
Fat: 26.8%E (20.3; 33.4)*

SFA : 10.8%E (8.1; 12.2)*
MUFA: 8.8± 3.2% E*
PUFA : 4.9% E (3.5; 5.7)*

0.03±0.06%E
- **ALA** 0 mg/d (0; 66.7)

A positive correlation was observed between saturated fat consumption and alanine transaminase (ALT) concentration in blood (ρ= 0.47; p= 0.017). An inverse correlation between MUFA fat intake, triglycerides (ρ= -0.527; p= 0.005), and VLDL (ρ= -0.53; p= 0.005).

*Valor p < 0.05

CONCLUSION

- The GLUT1-DS patients consume 81% fat, of which 56.3% are healthy fats, which would prevent an alteration of the lipid profile and liver function.
- It is recommended to give a greater contribution of MUFAs, PUFAs, mainly EPA+DHA, to prevent lipid and liver profile changes and avoid adverse effects that could later cause pathologies associated with malnutrition due to excess.