Relationships of dietary intake and sugar rich products consumption with hepatic fat content and insulin resistance among children with overweight/obesity: The PREDIKID study

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INTRODUCTION:

The prevalence of pediatric nonalcoholic fatty liver disease (NAFLD) has increased in parallel with childhood obesity. Eating habits, and particularly foods rich in sugar, could influence both the liver fat content and insulin resistance.

METHODS & MATERIAL:

A total of **110 children (10.6 ± 1.1 years) with overweight / obesity** from Vitoria-Gasteiz and surroundings were evaluated. The dietary intake was evaluated by means of two non-consecutive 24-hour memories. The hepatic fat content was determined by magnetic resonance and the insulin resistance was examined with the HOMA-IR index. Linear regression analyzes were performed to examine the associations between dietary intake and liver fat content and HOMA-IR adjusting for possible confounders (sex, age, energy intake, maternal educational level, total and abdominal adiposity and total sugar intake of the diet).

OBJETIVE:

The objective of this study was to examine the associations between food consumption (cereals, fruits and vegetables, meat and dairy products, dairy and substitute desserts, fish and shellfish, total sugars and added sugars) and nutritional composition (macronutrients and fiber)), as well as the influence of sugar-sweetened beverages (SSB) and desserts and dairy substitutes (DDS) on liver fat and insulin resistance in children Overweight / obese

Table 2. Associations of dietary energy and macronutrient intake, and other dietary components with hepatic fat content and insulin resistance in children with overweight/obesity.

	Hepatic fat content (%)						HOMA-IR					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*
Energy (kcal/day)	0.019	0.851	-	-	-	-	-0.063	0.520	-	-	-	-
Carbohydrates (g/day)	-0.125	0.433	-0.085	0.580	-0.545	0.587	-0.026	0.869	0.030	0.842	0.037	0.797
Fat (g/day)	0.192	0.249	0.184	0.252	0.167	0.292	0.050	0.765	0.018	0.914	-0.013	0.932
Proteins (g/day)	-0.114	0.422	-0.178	0.192	-0.150	0.268	-0.044	0.753	-0.089	0.513	-0.042	0.747
Fiber (g/day)	-0.140	0.179	-0.163	0.106	-0.162	0.103	0.003	0.979	-0.012	0.908	-0.011	0.909
Cereals (g/day)	-0.238	**0.021**	-0.194	0.055	-0.180	0.072	0.028	0.790	0.074	0.462	0.094	0.331
Fruits and vegetables (g/day)	0.011	0.907	0.026	0.781	0.043	0.641	0.014	0.887	0.026	0.779	0.053	0.551
Dairy products (g/day)	0.114	0.244	0.155	0.105	0.136	0.151	-0.091	0.353	-0.045	0.641	-0.081	0.378
Fish and shellfish (g/day)	0.083	0.390	0.048	0.608	0.048	0.602	0.098	0.308	0.075	0.421	0.081	0.363
Meat and meat products (g/day)	0.036	0.743	0.020	0.855	0.019	0.856	-0.076	0.494	-0.128	0.241	-0,128	0.220

HOMA-IR: homeostatic model assessment

Model 1: adjusted for sex, age, energy intake and maternal educational level; Model 2: Model 1 additionally adjusted for body fat percent; Model 3: Model 2 additionally adjusted for abdominal adiposity.

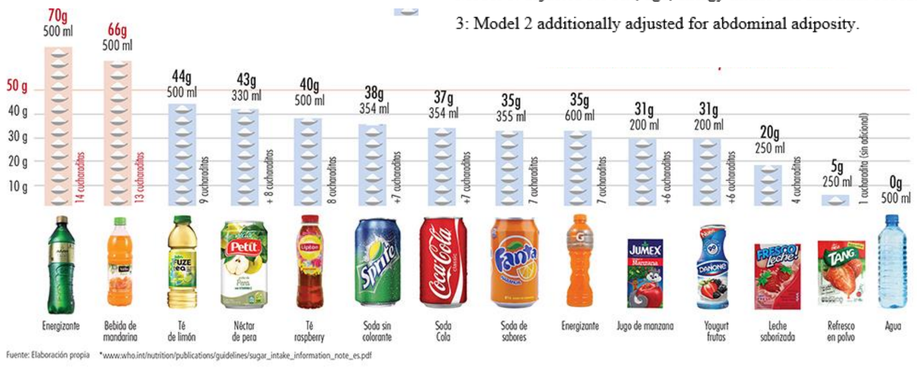

Table 1. Biological characteristics and dietary intake of participants with and without NAFLD of the PREDIKID study (mean and standard deviation).

Sugar from DDS (g/day)	**9.9 (10)**	**11.5 (12.4)**	**0.731**

BMI: body mass index; DDS: dairy desserts and substitutes; HOMA-IR: homeostatic model assessment; SSB: sugar sweetened beverages.

Table 3. Associations of sugar-sweetened beverages and dairy desserts and substitutes consumption, as well as their sugar content on hepatic fat content and insulin resistance (HOMA) in children with overweight/obesity.

	Hepatic fat content (%)								HOMA-IR							
	Model 1		Model 2		Model 3		Model 4		Model 1		Model 2		Model 3		Model 4	
	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*
SSB (g/day)	0.244	**0.013**	0.232	**0.016**	0.228	**0.016**	0.202	**0.042**	0.114	0.256	0.109	0.261	0.102	0.271	0.136	0.168
Sugar from SSB (g/day)	0.247	**0.013**	0.236	**0.015**	0.230	**0.016**	0.204	**0.042**	0.112	0.269	0.107	0.274	0.097	0.303	0.130	0.191
DDS (g/day)	0.059	0.559	0.032	0.748	0.052	0.595	0.025	0.801	-0.087	0.384	-0.154	0.119	-0.123	0.194	-0.116	0.231
Sugar from DDS (g/day)	0.066	0.513	0.039	0.693	0.058	0.560	0.029	0.771	-0.087	0.389	-0.153	0.123	-0.124	0.193	-0.117	0.230
Simple sugar (g/day)	0.116	0.330	0.151	0.189	0.175	0.123	-	-	-0.137	0.246	-0.104	0.364	-0.069	0.531	-	-
Added Sugar (g/day)	0.202	0.085	0.183	0.108	0.213	0.058	0.195	0.272	-0.020	0.863	-0.045	0.690	-0.002	0.984	0.126	0.466

DDS: dairy desserts and substitutes; HOMA-IR: homeostatic model assessment; SSB: sugar-sweetened beverages.

Model 1: adjusted for sex, age, energy intake and maternal education level; Model 2: Model 1 additionally adjusted for body fat percent; Model 3: Model 2 additionally adjusted for abdominal adiposity Model 4: Model 3 additionally adjusted for simple sugar intake.

CONCLUSIONS:

These results suggest that both the consumption of **SSB and its sugar content**, but not the DDS and its sugar, could be associated with a higher content of liver fat in overweight and obese children. Therefore, nutritional intervention programs should be promoted from childhood to improve dietary habits and prevent comorbidities associated with obesity.

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