



Nutrición Hospitalaria



Trabajo Original

Epidemiología y dietética

The relationship between socioeconomic status and beverage consumption in children: The Cuenca Study

Relación entre el estatus socioeconómico y el consumo de bebidas en niños: Estudio de Cuenca

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Abstract

Introduction: beverage consumption constitutes a source of children's daily energy intake. Some authors have suggested that consumption of caloric beverages is higher in children with a low socioeconomic position because families limit their spending on healthy food in order to save money.

Objective: the aim of this study was to explore the relationship between socioeconomic status and Spanish children's beverage consumption.

Methods: a cross-sectional study was conducted in a sub-sample of 182 children (74 girls) aged 9-11 from the province of Cuenca (Spain). Beverage consumption was assessed using the YANA-C assessment tool, validated for HELENA study. Data for parental socioeconomic status were gathered by using self-reported occupation and education questions answered by parents and classified according to the scale proposed by the Spanish Society of Epidemiology.

Results: beverage intake was higher in children belonging to a middle-status family than in those of upper socioeconomic status ($p = 0.037$). The energy from beverages was similar in most water intake categories, except for water from beverages ($p = 0.046$). Regarding other beverages categories, middle-status children had higher consumption levels. In contrast, lower status children drank more fruit juices and skimmed milk. All of these do not show statistically significant differences.

Conclusions: our study did not find significant associations between beverages consumption and socioeconomic status in children. In fact, intake for most beverage categories was higher in middle-status children than in both other socioeconomic groups. Future research is needed in order to identify this complex relation between socioeconomic inequality and beverage intake behavior.

Key words:

Beverage choice.
Socio-economic status. Youths.
Obesity.

Resumen

Introducción: el consumo de bebidas supone una elevada carga energética en la dieta y algunos autores han sugerido que el consumo de bebidas azucaradas es mayor en niños con un estatus socioeconómico menor, debido a que las familias limitan su gasto en alimentación saludable para ahorrar dinero.

Objetivo: el objetivo de este estudio fue analizar la relación entre el estatus socioeconómico y el consumo de bebidas en niños.

Material y métodos: estudio transversal en el que se analizó una muestra de 182 niños (74 niñas) de 9-11 años de la provincia de Cuenca (España). El consumo de bebidas se obtuvo mediante el software YANA-C, validado para el estudio HELENA. Los datos de estatus socioeconómico de los padres se obtuvieron mediante un cuestionario autoadministrado de preguntas sobre ocupación y educación, clasificado según la Sociedad Española de Epidemiología.

Resultados: el consumo de bebidas fue mayor en niños de estatus socioeconómico medio ($p = 0,037$) con respecto a los niños de estatus socioeconómico alto. Los mismos datos se obtuvieron para la energía proveniente de las bebidas y en la mayoría de las categorías de agua analizadas, aunque solo fue significativo para el agua proveniente de bebidas ($p = 0,046$). En cuanto a otras categorías, los niños de estatus socioeconómico medio tienen mayores consumos. En cambio, los niños de estatus socioeconómico bajo reportan mayores ingestas de zumos de frutas y leches desnatadas, sin significación estadística.

Conclusiones: nuestro estudio no ha encontrado relaciones significativas entre el consumo de bebidas y el estatus socioeconómico en niños. Los mayores consumos de bebidas se dan en niños con un estatus socioeconómico medio con respecto a los otros dos grupos. Son necesarios más estudios para explorar las complejas relaciones entre el estatus socioeconómico y el consumo de fluidos.

Palabras clave:

Estatus socioeconómico.
Elección de bebidas.
Jóvenes. Obesidad.

Received: 04/05/2017 • Accepted: 04/08/2017

Milla Tobarra M, García Hermoso A, Lahoz García N, Notario Pacheco B, Lucas de la Cruz L, Pozuelo Carrascosa DP, García Meseguer MJ, Martínez-Vizcaíno V. The relationship between socioeconomic status and beverage consumption in children: The Cuenca Study. *Nutr Hosp* 2018;35:368-374

DOI: <http://dx.doi.org/10.20960/nh.1259>

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INTRODUCTION

In Spain, the prevalence of overweight and obesity has substantially grown in the past three decades (1). A large body of evidence has suggested that the relationship between obesity prevalence and obesity-related metabolic disorders has a socioeconomic gradient, in such a way that these disorders affect mostly people with limited resources and racial-ethnic minorities (2). Poor diet is a particular concern when talking about children of a low socioeconomic status (SES), because they eat less fruit and vegetables (3) and more sugar-added food (4). It is evident that the purchase of fruit and vegetables is price sensitive and that their high cost is a barrier to increase intake (5). In order to save money, families limit their spending on food, and tend to consume less healthy but cheaper food, as well as their expenses in relation to recreational physical activities (6).

One dietary factor which has recently been drawing attention is beverage consumption. Beverages are currently providing more calories and a larger percentage of daily energy intake than at any other time in history (7). Some authors have reported that the greatest increase of soft drinks consumption in USA has been observed in children and adolescents from lower SES and minorities (8), noticing also that they consume more soft drinks than their counterparts from high SES (9). Other authors have reported that, in less developed countries, higher levels of maternal education are associated with higher consumption of soft drinks by children, partly because there is no safe water to drink (10). With respect to other beverages, several review studies proved that high-fat dairy consumption within the typical dietary patterns is inversely associated with obesity risk (11, 12). Another recent study showed that higher-SES children had higher intakes of water coming from milk (13). In an Australian study, it was found that advantage adolescents who reported greater attachment to family mealtime rules had greater odds of consuming dairy foods frequently (14).

Water consumption is one of most studied questions during the last years. Some authors have proposed that drinking more water could be one method to reduce weight gain since water consumption could replace other caloric beverages and, thereby, reduce the total amount of calories consumed (15). In fact, our study shows that higher consumption of water in children was negatively associated with body mass index (BMI), body fat and other cardiometabolic parameters (16). Moreover, consumption of tap water provides a low cost beverage option and, according to a study carried out in the USA, one in six children does not drink tap water, a figure which is more pronounced among minorities, even in communities where tap water is safe (17). In addition, in some low income countries, like Mexico, the lack of available potable water in households and schools coincides with the increase in soft drinks consumption (18), as it occurs with American children's households, where plain water consumption (bottle and tap) tends to be associated with higher incomes (19). In contrast, no socioeconomic gradient for plain water consumption was observed among French children (20).

Due to controversial results and scant evidence, the aim of the present study was to explore if a relationship can be estab-

lished between socioeconomic status and beverage consumption in Spanish children.

MATERIAL AND METHODS

STUDY DESIGN AND PARTICIPANTS

This is a cross-sectional analysis of baseline data from a cluster-randomized trial aimed to assess the effectiveness of a physical activity program on prevention of excess weight in children from 20 public schools in the province of Cuenca (Spain) (21). For this report, data from a sub-sample of 182 children (74 girls) aged between nine and eleven in fifth grade of Primary Education, from 20 public primary schools, were used. The study protocol was approved by the Clinical Research Ethics Committee of the Hospital Virgen de la Luz in Cuenca.

ASSESSMENT OF BEVERAGE INTAKES

Beverage consumption of each participant was estimated using the Young Adolescents Nutrition Assessment on Computer (YANA-C), a self-administered computerized 24h dietary recall validated for European adolescents (22). The Spanish version of the YANA-C questionnaire was administered twice a week, once asking about a weekday and the second time, about a weekend day. The YANA-C program was installed in the computer room of each school, where pupils completed the questionnaire in groups. A trained staff member instructed the children on the software and thereafter, pupils completed it autonomously, although two or three staff members were present to provide assistance in case it was required.

Beverages were grouped in nine categories: a) water as a beverage (plain water, bottled water, and water with flavor without sugars added); b) soft drinks (calorically-sweetened soda and sport drinks); c) diet drinks (non-caloric sweetened beverages, diet sodas, or other diet beverages); d) fruit drinks (< 100% fruit juices and others with added sugars); e) 100% fruit juices (natural fruit juices and commercial 100% fruit juices without added sugars); f) skimmed and semi-skimmed milk; g) whole milk; h) milk drinks (beverages derived from milk with or without sugars); and i) other beverages (soya beverages, vegetable juices, coffee, tea, infusions, *horchata*, cereal drinks, etc.). The last group included various types of beverages consumed sporadically, with the aim of making further analysis. Alcoholic beverages were excluded. Beverage intake was defined as the sum of all these categories.

PARENTAL SOCIOECONOMIC STATUS

Data for parental SES were gathered by using self-reported questions completed by either father or mother about their occupation and education. Paternal and maternal information about their education was classified separately as Primary Education

(functionally illiterate, without any studies or not having completed Primary Education), middle education (Primary Education or high school/Secondary Education) and university education (university degree or PhD). Parental occupation was divided into five categories: a) supervisor/manager or freelance with ten employees or more; b) supervisor/manager or freelance with less than ten employees; c) freelance with no staff; d) non-qualified staff and unskilled worker; and e) household chores, unemployed and others. An index of SES was calculated based on the items that referred to the parents' education and parental occupation classifying SES as: lower-lower/middle, middle and middle/upper-upper, according to the scale proposed by the Spanish Society of Epidemiology (23). Information was gathered in three groups to obtain more accurate results as described below: lower-lower/middle, middle, and middle upper-upper.

CARDIORESPIRATORY FITNESS

Cardiorespiratory fitness (CRF) was assessed by the 20-m shuttle run test (24). Participants were required to run between two lines 20 m apart, while keeping pace with audio signals emitted from a pre-recorded compact disc. The running speed started at 8.5 km/h and increased 0.5 km/h each minute. The children were stopped when they could not follow the signal any more. The last half-stage completed was noted as an indicator of their CRF.

ANTHROPOMETRIC AND BODY COMPOSITION VARIABLES

Children were weighed and measured twice whilst wearing light clothing and without shoes, using a calibrated digital scale to the nearest 0.1 kg for weight and a wall mounted stadiometer to the nearest 0.1 cm for height. The mean of this measurements was used to calculate body mass index (BMI) as weight in kilograms divided by the square of the body height in meters (kg m^2). Waist circumference (WC) was calculated as the average of two measurements taken with flexible tape at the natural waist (the midpoint between the last rib and the iliac crest). Body fat percentage and fat free mass percentage were estimated using a BC-418 bioimpedance analysis system (Tanita Corp., Tokyo, Japan). The mean of two readings taken in the morning after urination and a 15 min rest, with the child without shoes and fasting. All measurements were obtained at the schools by trained nurses.

STATISTICAL ANALYSIS

The distribution of continuous variables was checked for normality before the analysis. Continuous variables were expressed as mean \pm standard deviation for normally distributed continuous data. Categorical variables were expressed as n (%). Normal weight and overweight-obesity were defined according to the BMI cut-offs published for children and adolescents (25). ANOVA models were

estimated to test the differences in beverage intake variables by categories of SES (lower-lower/middle, middle, middle/upper-upper), adjusted for age, sex and CRF. The statistical analyses were conducted with the SPSS version 22 (SPSS Inc., Chicago, IL).

RESULTS

We studied 182 subjects with an average age of 10.04 ± 0.46 years, of whom 40.6% were girls. Table I shows anthropometric and body composition variables, socioeconomic characteristics and beverage intakes of the participants. Body fat percentage was higher in girls ($p < 0.001$), and cardiorespiratory fitness in boys ($p < 0.001$). Obesity prevalence was higher in boys ($p < 0.007$), and no sex differences were found with regard to their SES. Girls presented higher amounts in some categories, such as total beverage intake ($p = 0.041$), water from beverages ($p = 0.042$), water/kg weight ($p = 0.034$) and water as a beverage ($p = 0.020$). Conversely, diet drinks consumption was higher in boys ($p = 0.003$).

In table II, we analyzed beverage intake by SES categories. Energy intake (food and beverages) and energy from beverages were higher in middle status children, although differences were not significant. Also, beverage intake was higher in middle status children ($p = 0.037$) compared to the upper SES. In most of the water intake categories, there was a higher consumption in middle status children, although it was only significant when referring to water from beverages ($p = 0.046$). Regarding other beverages categories, middle status children consumed more soft drinks, diet drinks, fruit drinks, whole milk and milk drinks. In contrast, lower and lower-middle status children's consumption of fruit juices and skimmed milk was higher. All of these results did not show any statistical differences.

DISCUSSION

The current study analyzed beverage consumption by sex and SES in schoolchildren living in Cuenca's province. Overall, no differences by SES were observed, except for beverage intake, which is higher in middle status children than in those with an upper status, and consumption of fruit juices and skimmed milk intakes, which were higher in lower SES categories children. Girls drank more water from beverages and boys, more diet drinks.

FLUID INTAKE AND ENERGY FROM BEVERAGES

Nowadays, some studies have paid particular attention to families' socioeconomic gradients and their relationship with dietary habits (26-28). A recent study in Europe has shown that fluid intake is higher in middle SES children with significant differences with respect to children with other status (29). Similar data were drawn from our analysis.

Table I. Sex and parental socioeconomic status differences in body composition and beverage intake

	Total (n = 182)		Boys (n = 108)		Girls (n = 74)		p*
	Mean	SD	Mean	SD	Mean	SD	
Age	10.04	0.46	10.06	0.47	10.03	0.467	0.687
<i>Anthropometric and body composition</i>							
Height, cm	141.3	6.8	140.3	6.6	142.8	6.9	0.013
Weight, cm	37.6	7.1	37.5	7.7	37.8	6.1	0.773
BMI, kg/m ²	18.7	2.7	18.9	3.0	18.4	2.3	0.239
Normoweight, n (%)	131 (71.9)		70 (64.8)		61 (82.4)		0.007
Overweight-obese, n (%)	51 (28.1)		38 (35.2)		13 (17.6)		
Body fat, %	24.2	5.3	23.1	5.8	25.8	3.8	< 0.001
Fat free mass, %	28.2	4.1	28.4	4.2	27.9	3.9	0.370
Waist circumference, cm	67.4	7.4	67.8	8.1	66.8	6.4	0.357
<i>Cardiorespiratory fitness</i>							
Stage, n	3.9	1.8	4.4	1.9	3.1	1.2	< 0.001
<i>Socioeconomic status</i>							
Lower-lower/middle	40	21.9	23	21.3	17	22.9	0.984
Middle	55	30.3	34	31.5	21	28.5	
Middle/upper-upper	87	47.8	51	47.2	36	48.6	
<i>Beverage intakes</i>							
Energy from food and beverages, kcal/day	1,681.8	772.8	1760.2	898.3	1,567.5	525.1	0.070
Energy from beverages, kcal/day	265.5	145.2	259.4	158.6	274.5	123.5	0.471
Beverage intake, ml/ day	996.4	389.4	948.8	396.8	1,066.6	369.8	0.041
Water from food and beverages, ml/day	1,461.1	515.3	1,425.1	491.8	1,513.6	546.7	0.266
Water from beverages, ml/day	936.1	377.7	890.1	380.1	1,005.1	366.1	0.042
Water from food, ml/day	524.2	255.7	534.9	250.1	508.5	264.7	0.500
Water/kg weight, ml/kg	12.5	10.2	11.1	9.4	14.5	11.0	0.034
Water/kcal day, ml/kcal	0.35	0.47	0.32	0.56	0.38	0.30	0.355
Water as a beverage, ml/day	464.1	376.4	409.1	352.7	544.4	397.8	0.020
Soft drinks, ml/day	88.5	158.8	98.2	165.4	74.4	148.7	0.312
Diet drinks, ml/day	33.4	94.1	48.3	114.8	11.9	43.1	0.003
Fruit juices, ml/day	76.4	136.7	73.7	135.5	80.3	139.2	0.752
Fruit drinks, ml/day	35.8	78.8	28.1	71.6	47.2	87.7	0.124
Skimmed milk, ml/day	97.8	135.9	99.4	123.5	95.6	153.3	0.861
Whole milk, ml/day	137.8	143.3	134.1	149.5	143.3	134.7	0.666
Milk drinks, ml/day	56.8	95.5	53.7	92.9	61.4	99.7	0.600
Other beverages, ml/day	5.5	31.8	3.8	20.5	8.1	43.4	0.425

Values are means (standard deviations ± SD) and number and proportions (%) for categorical data. BMI: body mass index.

Table II. Mean differences between beverage intake and socioeconomic status in children adjusted for age, sex and cardiorespiratory fitness

	Parental socioeconomic status			p
	Lower-lower/middle (L) n = 40	Middle (M) n = 55	Middle/upper-upper (U) n = 87	
Energy from food and beverages, kcal/day	1,593.95 ± 547.21	1,816.40 ± 779.68	1,637.26 ± 849.85	0.291
Energy from beverages, kcal/day	280.71 ± 127.23	297.78 ± 165.51	238.19 ± 135.34	0.052
Beverage intake, ml/ day	956.77 ± 339.43	1,094.76 ± 393.25	952.55 ± 401.25	0.037*
Water from food and beverages, ml/day	1,422.37 ± 389.39	1,571.43 ± 506.16	1,409.10 ± 563.83	0.119
Water from beverages, ml/day	893.38 ± 324.47	1,028.14 ± 376.97	899.25 ± 394.54	0.046
Water from food, ml/day	529.00 ± 196.47	543.29 ± 233.72	509.85 ± 292.25	0.787
Water/kg weight, ml/kg	10.86 ± 8.32	13.45 ± 9.41	12.66 ± 11.43	0.284
Water/kcal day, ml/kcal	0.28 ± 0.24	0.34 ± 0.29	0.38 ± 0.62	0.533
Water as a beverage, ml/day	383.50 ± 296.11	505.58 ± 356.44	475.01 ± 417.77	0.188
Soft drinks, ml/day	96.74 ± 201.81	104.93 ± 167.29	74.34 ± 129.02	0.471
Diet drinks, ml/day	26.91 ± 7.02	44.25 ± 116.72	29.66 ± 85.87	0.522
Fruit juices, ml/day	58.87 ± 106.54	29.87 ± 72.58	29.03 ± 65.74	0.099
Fruit drinks, ml/day	83.84 ± 139.39	85.49 ± 147.46	67.24 ± 129.21	0.687
Skimmed milk, ml/day	110.29 ± 167.43	89.36 ± 119.24	97.49 ± 130.99	0.793
Whole milk, ml/day	145.91 ± 162.47	158.34 ± 151.70	121.24 ± 127.45	0.370
Milk drinks, ml/day	40.49 ± 79.02	73.56 ± 113.89	53.76 ± 88.98	0.258
Other beverages, ml/day	10.22 ± 46.88	3.37 ± 18.84	4.78 ± 30.03	0.583

*M > U. Differences between M vs U ($p = 0.048$).

Conversely, a study conducted on Mexican population reported that medium and high SES people's energy intake from unhealthy beverages was higher than in low SES (30).

SOFT DRINKS AND SWEETENED BEVERAGES

A recent study in Norway has shown that adolescents from higher SES families consume more fruit and vegetables and less soft drinks and sweets than their counterparts (31). This is in line with our data and those reported by other European studies (9), although in these countries soft drinks are more expensive than in our country and perhaps that is the reason why their consumption is lower than in countries where they are very cheap and easy to purchase. In general, in Europe, as in the ToyBox study (29), lower SES schoolchildren consume more soft drinks than their high SES peers; on the contrary, in Latin America (32), as well as in children from other regions such as Lebanon (13), a higher consumption of soft drinks and sweetened beverages in higher SES schoolchildren has been reported.

PLAIN WATER

According to our data, girls drank higher amounts of water than boys. Moreover, in most water categories, middle SES status

children drank higher quantities than children from other status. These data are different than those reported in preschoolers from other European countries, where a lower intake of plain water has been reported in lower SES (29).

FRUIT JUICES

Among our sample, those with low SES consumed more fruit juices than their high and medium status peers. This SES consumption pattern is different from those reported in other countries (13,32). In other analysis carried out on preschoolers, it is described that the consumption of fruit juices is higher in low income families (33), being these data more similar to ours. For example, in the United States it has been reported that children from racial/ethnic minorities and lower income groups (34) consume more 100% fruit juice, possibly because it replaces whole fruit, which is generally more expensive but nutritionally more complete. Moreover, until a few years ago, it existed a popular belief according to which fruit juice consumption was similar to eating a piece of fruit (35). However, this erroneous notion has been discarded, and thus, the current recommendations are to increase the consumption of natural fruits and to reduce the consumption of juices (36,37).

MILK CONSUMPTION

Both in Australia (14) and the USA (38), it has been reported that adolescents from high SES families consumed more dairy foods than their counterparts. Likewise, a similar pattern has been described in Mexico (32). According to the study in Lebanese children, those with a low SES had lower water intakes from milk (unspecified type). Our data confirm these findings, and not many significant differences were found.

LIMITATIONS

This study has some limitations that should be pointed out. First, our study had a cross sectional design, thus observational findings do not allow us to evaluate causal relationships among variables. Second, our sample size lacks enough statistical power to control some potential confounders. Moreover, the assessment of diet in children, either directly or by an adult proxy, has some methodological weaknesses. It has been suggested that 10-year-old children are not able to give valid responses to food frequency questionnaires covering periods longer than one day; however, in our study, the use of pictures in the YANA-C software helped children to remember not only the food eaten during the last 24 hours, but also the portion size.

CONCLUSION

In general, our study did not find a significant relationship between beverages consumption and SES, except for beverages intake and water from beverages categories, which were higher in children from middle-status compared to upper SES children. It is important to emphasize that data were collected before the Spanish economic crisis reached its peak, thus, supposedly, families had not limited their family food spending yet. It is true that most part of less healthy drinks, such as soft drinks and packaged juices, have often very low prices, affordable for people with limited resources. In addition, these products are also easily available to children due to vending machines in schools, hospitals, shopping centers or shops in the streets. For these reasons, the easy access to less healthy drinks should also be controlled for children, and perhaps the installation of free water sources in schools and streets should be considered, since it is shown that it increases their consumption (39). These and other policies can help improve the hydration habits of children in our country independently of socioeconomic status. Future research is needed to identify this complex relation between socioeconomic inequality and eating behaviors', in particular among children.

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