Consumption patterns and recommended intakes of sugar

Joan Quiles i Izquierdo

Abstract
Sugars are sweet-flavoured carbohydrates that provide energy to the body. The adult brain uses about 140 g of glucose per day, amount which can represent up to 50% of the total number of carbohydrates consumed.

In our country the sugar in food consumption pattern remains constant, while the consumption of soft drinks has increased in the past four years. According to the national survey of dietary intake of Spain (ENIDE) (AESAN, 2011) 20% carbohydrate intake comes from the so-called sugar (sugar, chocolate and derivatives, non-dairy beverages and miscellaneous). Sugar consumption has been associated with various pathologies (diabetes, obesity, tooth decay, cardiovascular disease) but these relationships are not consistent enough.

Food information through nutritional labeling, including sugars present in food, pretend to protect the consumer health and to guarantee their right to information so they can make their own decisions with criterion.

In view of different appraisals and existing studies, and above all, in the absence of a solid scientific evidence that concrete data on which make recommendations, the best nutritional advice for the general population could be a diet varied and balanced with food and nutrients from different sources, combining such a diet with exercise and physical activity.

More specifically in terms of moderate consumption of sugar in the previous context of varied and balanced diet is perfectly compatible.

Key words: Consumption. Frequency. Recommendations. Labelling.

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Resumen
Los azúcares son hidratos de carbono con sabor dulce que proveen energía al organismo. El cerebro adulto utiliza aproximadamente 140 g de glucosa al día, cantidad que puede representar hasta el 50% del total de hidratos de carbono que se consumen.

En nuestro país el patrón de consumo de azúcar en alimentos permanece constante, mientras que el consumo de bebidas refrescantes presenta un aumento en los últimos cuatro años. Según la Encuesta Nacional de Ingesta Dietética de España (ENIDE) (AESAN, 2011) un 20% de la ingesta de los hidratos de carbono proviene de los denominados azúcares (azúcar, chocolate y derivados, bebidas no lácteas y miscelánea). Se ha asociado el consumo de azúcar con diversas patologías (diabetes, obesidad, caries, cardiovasculares) si bien estas relaciones no presentan consistencia en las evidencias encontradas. La información alimentaria a través del etiquetado nutricional, incluida la relativa a los azúcares presentes en los alimentos, facilitada al consumidor persigue proteger la salud de los mismos y garantizar su derecho a la información para que puedan tomar decisiones con criterio.

A la vista de las distintas valoraciones y estudios existentes y sobre todo, en ausencia de una evidencia científica sólida que arroje datos concretos sobre los que realizar recomendaciones, el mejor consejo nutricional para la población general podría ser llevar una dieta variada y equilibrada con alimentos y nutrientes procedentes de diversas fuentes, combinando dicha dieta con el ejercicio y la actividad física. De manera más concreta, un consumo moderado de azúcar (<10% de la energía total) en el anterior contexto de dieta variada y equilibrada, es compatible.

blockade of the French trade-lines during the sugar cane. Sugar beet did not receive attention until 1747, who demonstrated that the sweet-tasting crystals obtained from beet juice were the same as those from sugar cane. Sugar beet did not receive attention until a blockade of the French trade-lines during the Napoleonic wars. In 1806, cane sugar had virtually disappeared from European shops. In 1811, French scientists presented Napoleon with two loaves of beet sugar, impressed he ordered that 32,000 hectares of sugar beet be planted and contributed to the establishment of factories.

Nowadays cane and beet sugar are produced in more than 130 countries. Global cane sugar production is two and a half times higher than beet sugar. As far as the consumption per country is concerned, India, China Brazil, the USA and Russia stand out as they represent 45.2% of global consumption for the 2010/11 sugar cycle. India and Russia showed the greatest increases in demand 8.5% and 3.3%, respectively, for that cycle.

There are six sugar-consuming regions in the world. The first of these, is found in Asia (comprised of 36 countries), with a deficit (between production and consumption) of 6.3 million tonnes and an annual consumption of 14.9kg per capita. The region with the second highest consumption comprises the 12 countries of the former Soviet Union, with a deficit of 4.8 million tonnes. In third place is North Africa with a sugar consumption deficit of 3.9 million tonnes. In fourth and fifth place are North America and Europe with a deficit of 2.8 and 2.4 million tonnes, respectively. In North America the deficit region is comprised of two countries, Mexico and the USA, with a population of 422 million inhabitants, who maintain a high sugar intake, compared to their production levels, in per capita terms the sugar consumption deficit in this region increases to 2.8 million tonnes.

The world's main sugar exporters are: Brazil, Thailand, Australia, the 27 states of the European Union (EU-27) and Guatemala, which represent 79.4% of total exports for the 2010/11 cycle. For its part, during this period Brazil exported 67.2% of its produce while Thailand maintained 79.4% of total exports for the 2010/11 cycle. For its part, during this period Brazil exported 67.2% of its produce while Thailand and Mexico exported close to 25%.

The world's main sugar importers (by population size and/or economy) that consume more than they can produce are the USA, India, Indonesia, Russia and China, who, as a whole, purchase 29.6% of global imports. Of these countries, the USA took 6.3 of the total during 2010/11, followed by the EU with 6.0% and Indonesia with 5.8%.

For more than ten years, there has been a growth trend in global sugar production, with a recorded Average Annual Growth Rate (AAGR) of 2.3% (between the 2000/01 and 2010/11 cycles). World sugar consumption trends have remained stable from the 2000/01 to the 2010/11 cycle, showing an AAGR of 2.0% for this period. The recorded global consumption during the last sugar cycle was 158.6 million tonnes. Global sugar consumption for the 2009/10 and 2010/11 cycles increase by 2.4%, lower than recorded global production.

Abbreviations

AESAN: Spanish Agency for Food Safety and Nutrition.
EC: European Community.
EEC: European Economic Community.
DRI: Daily Recommended Intake
EAR: Estimated Average Requirement.
ENIDE: Spanish National Survey on Dietary Intake.
FAO: Food and Agriculture Organisation of the United Nations
FAOSTAT: Statistics Division of the Food and Agriculture Organisation of the United Nations.
FEN: Spanish Nutrition Foundation.
FSA: Food Standards Agency.
IOM: Institute of Medicine of the National Academies.
MAPA: The Spanish Ministry of Agriculture, Fisheries and Food.
WHO: World Health Organisation.
RDI: Recommended Daily Intake.
SENC: Spanish Society of Community Nutrition.
AAGR: Average Annual Growth Rate.
EU: European Union.
UL: Tolerable Upper Intake Level.

Introduction

The term sugars has traditionally been used to refer to mono- and disaccharides. Sugars are used as sweeteners, because of their sweet taste, to make food and drinks palatable, to preserve foods and to bestow certain characteristics to foods, such as viscosity, texture, body and the ability to add flavours or a brown colour to them.

Although the main sources of sugar are sugar cane and sugar beet, other sugars are obtained from plants rich in starch, such as high fructose corn syrup, produced in the USA, and sugars produced in Japan from potatoes.

Sugar cane has been known to man for more than 2,500 years. Originally from Bengal and Southern China, it emerged in Europe as a result of the conquest of Persia by Alexander the Great. The Arabs introduced the plant to the Iberian Peninsula, initially reserving it for use as a condiment for flavouring stews along with salt and pepper. Later on, apothecaries reserved this condiment for preparing formulas and remedies, and soon its use became widespread, replacing honey in many cases.

The first milestone in the history of sugar beet was marked by the German scientist Andreas Marggraf in 1747, who demonstrated that the sweet-tasting crystals obtained from beet juice were the same as those from sugar cane. Sugar beet did not receive attention until the
As a food, in our country sugar is consumed in roughly the following proportions: 30% domestic consumption and the remaining 70% industrial consumption. In total terms, Spain consumes around 1,300,000 tonnes of sugar per year, of which 300,000 are imported.

In Spain daily sugar intake per capita is 29.8g. However, this ‘intake’ refers to the purchase of sugar for use at home, and therefore does not include sugars contained in foods (it is based on ‘purchased’ not ‘ingested’ sugars). In this analysis, sugar consumption was greater in populations with higher socioeconomic status, in areas where there were less than 100,000 inhabitants, home workers and the elderly (> 65 years)3.

According to the National Survey of Spanish Dietary Intake (ENIDE) (AESAN, 2011) 20% of carbohydrate intake comes from so-called sugars (sugar, chocolate and its derivatives, non-dairy and miscellaneous beverages) 4.

Nutritional information for consumers

Information is one of the best methods of involving consumers so that they can understand and deal with the nutrient content of food and drinks.

Regulation (EC) no. 1924/2006 of the European Parliament and of the Council, of 20th December 20066, on nutrition and health claims made on foods came into force to bring order to a situation which had actually been consolidating itself: the marketing of an increasing number of products with nutritional messages and healthy properties in the labelling and advertising. To some extent, the new Community Regulation has sought to address the absence of legal references in the advertising and labelling of those foods which, in addition to nourishing us, have specific scientifically proven health benefits.

The purpose of this Regulation is intended to guarantee a high level of consumer protection, by introducing scientific assessment as a necessary prerequisite to be able to make nutritional or health claims, maintaining the general principles of Community legislation in terms of the labelling, presentation and advertising of foodstuffs, generally prohibiting the use of information which could mislead the purchaser or attribute preventative or curative properties to foods.

In the same vein, it’s necessary, as a general condition, that the average consumer understand the beneficial effects as they are expressed in the declaration. It’s important to encourage consumers to carefully read the labels of products in their shopping baskets.

This standard applies to nutritional declarations and health claims made on any kind of commercial communication (labelling, presentation and advertising) for foods which are delivered as such to the end consumer, intended for supply to restaurants, hospitals, schools and mass caterers.

It also affects the following forms: packaged foods, non-prepackaged foodstuffs (fresh produce, fruit, vegetables, bread) on sale to the end customer or caterer and products packaged at the point of sale at the purchaser’s request or pre-packaged with a view to immediate sale.

The nutritional claims and conditions regarding sugars are laid down in the Annex of this Regulation and are defined as follows:

‘Low sugar’

A claim that a food is low in sugar, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 5 g of sugar per 100 g for solids or more than 2.5 g of sugar per 100 ml for liquids.

‘Sugar free’

A claim that a food is sugar free, and any claim likely to have the same meaning for the consumer, may only be made where the product contains no more than 0.5 g of sugar per 100 g or 100 ml.

‘With no added sugars’

A claim stating that sugars have not been added to a food and any claim likely to have the same meaning for the consumer may only be made where the product does not contain any added mono- or disaccharides or any other food used for its sweetening properties. If sugars are naturally present in the food, the following indication should also appear on the label: “Contains naturally occurring sugars”.

Regulation (EU) no 1169/2011, of 25th October on the provision of food information to consumers, with the aim of pursuing a higher level of health protection for consumers and to guarantee their right to information, was published in 2011 so that they could make informed decisions and make safer use of food, with particular regard to health, economic, environmental, social and ethical considerations7. The text has reinforced and updated two areas of legislation on labelling: general food products, covered by Directive 2000/13/EC, and nutritional labelling, the objective of Directive 90/496/EEC.

As far as compulsory nutritional labelling is concerned, the elements which are mandatory are: energy, fats, saturated fats, carbohydrates, sugars, proteins and salt, which should all be presented in the
same visual field. Information must be declared per 100 g or per 100 ml, to enable the products to be compared; the declaration may also include, on a voluntary basis, the amounts per portion consumed. This information can be voluntarily supplemented with the values of other nutrients such as: monounsaturated and polyunsaturated fatty acids, polyalcohols, starch, dietary fibre, vitamins and minerals.

In this regulation sugars mean “all mono- and disaccharides present in foods, excluding polyalcohols”. For those foods which contain sugar or added sugars and a sweetener or sweeteners authorised under Regulation (EC) no. 1333/2008, the following additional wording should appear on the label: “with sugar(s) and sweetener(s) that accompany the name of the food. It also states, in reference to ingredient names, that the food category which corresponds to “all types of sugars” should be called “sugars”.

The energy value and the amounts of nutrients can be expressed, as appropriate, as a percentage of the reference intakes that are referred to in Annex III as 2,000 kcal, 260 g of carbohydrates and 90 g of sugars (Table I).

From 13th December 2016, according to Regulation (EU) no. 1169/2011 nutritional labels will be mandatory, irrespective of whether or not foodstuffs carry nutritional declarations or health claims. The new regulation also allows the energy value and the amounts of nutrients to be specified using other forms of expression (pictograms or symbols), provided that they meet certain criteria, such as they can be understood by consumers and they don’t create unnecessary barriers for the free movement of goods.

**Weaknesses**

Assuming the data from the Ministry of Agriculture and Food refer to the declaration of purchases in and out of the home (hotels and catering) and not consumption, and having this data as the sole reference, it can be said that added sugar consumption in Spain has evolved over the past few years (2005-12) and there has been a decrease of around 0.5kg per person per year, which even though it was very pronounced between 2005 and 2008, has stabilised during the past five years at approximately 4 kg/person/year, as seen in figure 1.

As far as soft and fizzy drinks are concerned (Fig. 2), they behave differently. It is generally observed that the consumption of this kind of drink is increasing. In 2011 consumption was 46.5 litres per capita, which represents an increase of 1.9% compared with the previous year and 21.3% compared with 2004, the consumption in 2005 was 40.5 litres per person per year.

The FAO (FSTAT) Food Balance Sheet shows the potential availability for human consumption which

<table>
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<th>Reference intake</th>
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<tr>
<td>Total fats (g)</td>
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<td>Saturated fatty acids (g)</td>
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</tr>
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<td>Sugars (g)</td>
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<td>Proteins (g)</td>
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<tr>
<td>Salt (g)</td>
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</table>

![Fig. 1.—The evolution of sugar consumption in Spanish households 2005-2012.](image-url)
corresponds with supply sources. It’s advisable to draw attention to this information on sugar availability, a figure that tends to be higher than the actual consumption, because it doesn’t take sugars that are intended for non-food use, into consideration or the volume of sugars, declared in FAOSTAT data, which are exported out of the country, in the form of ingredients in processed foods. From this data we can see that for the period of 2000–2009 there has been a decrease in availability from 32.9 kg/person per year to 25.5 kg/person per year (Fig. 3). Recent data implies availability of around 70g per person per day, which would mean 11.2% of the total energy for a diet of 2,500 kilocalories.

From a nutritional point of view, sugars are not essential nutrients, as glucose can be synthesised by the body, however they are significant within the framework of a healthy diet. The lower limit of dietary carbohydrates compatible with life is apparently zero (but a minimum of 120 g per day is advised), provided that adequate amounts of proteins and fat are consumed so that the body can synthesize it ‘de novo’ from them. There are traditional populations (Masaii) that ingested a high fat, high protein diet containing only a minimal amount of carbohydrate for extended periods of time, and in some cases (Alaska and Greenland Natives, Inuits, and the indigenous people of the Pampas) for a lifetime after infancy.

Other circumstances that could be considered a weakness with regard to their consumption, is the so-called glycaemic index. This concept, devised by Jenkins in 1981, is an approach to quantify the glycaemic response of a food that contains the same amount of carbohydrates as a reference food. The glycaemic index of sucrose is intermediate. It has been proposed that a high GI diet leads to an increase in serum glucose and insulin and this could cause certain pathologies. Even though this theory has not yet been proven.

![Fig. 2.—The evolution of soft and fizzy drink consumption in Spanish households 2005-2012.](image1)

![Fig. 3.—Food availability of sugar in Spain for the period 2000-2009 according to the FAO food balance sheets.](image2)
Threats

Sugars have been considered a nutritional element whose abuse could lead to the displacement of micronutrients in the diet1.3. Despite the fact that there is currently no definitive data, increased sugar consumption can be associated with having various medical disorders2, a relationship which was discussed in detail in another article in this very magazine.

In spite of everything, some publications and media propose that a surcharge be introduced through special taxes as a way of reducing the excessive consumption of certain sugary foods and drinks (like sugary fizzy drinks, other drinks sweetened with sugar such as juices, sports drinks, chocolate milk and sugary cereals)13.

Canada and some European countries have introduced additional taxes on certain sweetened foods. However Denmark, for example, who had already taken this step for high-fat products, recently withdrew this surcharge, basing their decision on protectionist arguments such as the increase in food prices that had resulted in a reduction in sales within their territory and a rise in food purchases from other countries, resulting in job losses. Most countries choose to promote nutritional education.

Strengths

However, the consumption of sugars also has its advantages that should not be overlooked. Their pleasant flavour encourages the consumption of other foods. The sweet flavour is associated with pleasure. Nutritionally, sugars are a major source of energy for human beings, with a nutritional value of 3.7-4 kcal/g depending on the compound, however, compared to other nutrients (lipids) or related substances (alcohol) they provide less energy.

Carbohydrates are important for our bodies to function, the brain needs an almost constant supply of glucose from the blood stream. It is estimated that an adult brain uses approximately 140g of glucose per day; an amount that could represent up to 50% of the total carbohydrates consumed. The cells of the central nervous system need glucose as a metabolic fuel, although they can adapt to use fat derivatives. It is also needed by those cells that depend on anaerobic glycolysis, such as erythrocytes, white blood cells and renal medulla cells.

Opportunities

In a healthy or balanced diet all kinds of carbohydrates should be represented, mono- and disaccharides or simple sugars (10%) as well as complex sugars or polysaccharides (90%). Simple sugars enable normal blood sugar levels to be achieved rapidly which, in relatively healthy individuals and normal concentrations in the diet, helps to prevent hypoglycaemia and satisfies immediate energy requirements. On the contrary, polysaccharides, such as starch, enable blood sugars to gradually be stabilised without causing spikes in it.

Recommendations

The WHO/FAO report: Diet, nutrition and the prevention of chronic illnesses of 2003 states that the following ration for total carbohydrates is 55%-75%, the percentage of total energy available after fat and protein consumption has been taken into consideration, hence the breadth of the range, and in reference to free sugars, defined as all mono- and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally found in honey, syrups and fruit juices, would be less than 10% of total energy4. However, the same document, recognises that a figure of 10% of total dietary intake is ‘controversial’.

In an annex to this report, the situation regarding the scientific evidence between ‘free sugars’ and certain illnesses is summarised, and confirms what the FAO had previously said, in that there is no convincing correlation between sugar intake and a series of non-communicable chronic illnesses including obesity, type 2 diabetes, cardiovascular disease, cancer and osteoporosis, pointing out instead a convincing relationship between free sugars and tooth decay, in the same way that this correlation exists with starch intake.

In 2005, the report Dietary Reference Intakes for Energy, Carbohydrate, Fibre, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids (Macronutrients) of the National Academy of Sciences established10 that the recommended daily intake (RDI) for adults and children over 1 year of age is 100g of carbohydrates per day as an estimated average requirement (EAR) and 130g/day as a reference daily intake (RDI).

The DRI committee concluded that there was insufficient evidence to establish a tolerable upper intake level (UL) for total or added sugars (IOM, 2005). However, it was suggested that sugar intake level should be a maximum of 25% of total energy. This suggestion was based on data which shows that people who were on diets that were above this level of sugars were more likely to have poor intakes of certain macronutrients. It is also recognised that hypertriglyceridaemia can occur with increases in total sugar intake (intrinsic and added), so the total sugar intake should be moderate in terms of added sugar intake as sugars
present in milk, dairy products and fruit are also regularly consumed. In 2006 the American Heart Association recommended that the consumption of foods and drinks with added sugars should be minimised. In 2009 a proposal was put forward to set an upper limit (UL) for added sugar intake in the daily diet of the American population. It was established that women should not consume more than 100 kilocalories of added sugar per day (25 grams), and for men no more than 150 calories (around 37.5 grams). This level is proportional to the daily energy required for a person to maintain a healthy weight. 

The Spanish people’s nutritional goals established by the Spanish Society of Community Nutrition (SENC) reflect the existence of a major controversy over whether the energy percentage from sugars should be measured and suggest that, rather than measuring the intake limit for sugars and sugary foods, qualitative guidelines should be issued. In line with the etiopathogenesis of tooth decay, it was decided that sweets and dessert consumption should be limited to four or less times a day (intermediate objective) and three times a day as a final objective, suggesting as a final objective that they should not exceed 6% of total energy intake.

In reference to soft drinks, SENC and the Nutrition and Physical Activity Observatory (2008) subscribed to the ‘Zaragoza Declaration’ on water, health and hydration which considered five groups of drinks and placed carbonated and non-carbonated soft drinks, sweetened with sugar or fructose in group 4. In the healthy hydration pyramid (SENC) they were only recommended for consumption once a week.

The publication of the 2011 ESFA document on ‘The Opinion on Dietary Reference Values for Carbohydrates’ states that, with the current level of evidence, it is not possible to establish a threshold for the dietary reference intakes for sugars in the context of preventing a range of conditions, with specific reference to obesity.

Conclusions

In view of the different assessments and existing studies, and above all, in the absence of solid scientific evidence that provides concrete data on which recommendations to make, the best nutritional advice for the general population would be to eat a balanced and varied diet with foods and nutrients that come from different sources, combining this diet with exercise and physical activity. In this context moderate consumption of sugar could be considered.

References


