

Sugar and diabetes; international recommendations

Alejandro Sanz París, Diana Boj Carceller, Isabel Melchor Lacleta and Ramón Albero Gamboa

Endocrinology and Nutrition Service. Nutrition and Dietetics Unit. University Hospital Miguel Servet. Zaragoza. Spain

Abstract

Nutrition in the diabetic patient is not just a mere nutrient but his treatment is based. In fact, international scientific societies have called “medical nutrition therapy” to give it the emphasis it deserves. Nutritional recommendations of scientific societies have been changing in recent years with evidence-based medicine. Regarding the consumption of sugar, most believe it does not affect metabolic control if it is replaced by other carbohydrates, but does not indicate a specific amount.

Nutr Hosp 2013; 28 (Supl. 4):72-80

Key words: *Diabetes. Sugar. Nutritional recommendations.*

AZUCAR Y DIABETES; RECOMENDACIONES INTERNACIONALES

Resumen

La nutrición en el paciente diabético no es sólo un del mero aporte de nutrientes sino que es la base su tratamiento. De hecho, las sociedades científicas internacionales lo han denominado “tratamiento médico nutricional” para darle el énfasis que se merece. Las recomendaciones nutricionales de las sociedades científicas han ido cambiando en los últimos años con la medicina basada en la evidencia. Respecto al consumo de azúcar, la mayoría considera que no afecta el control metabólico si éste se sustituye por otros hidratos de carbono, pero no se indica una cantidad concreta.

Nutr Hosp 2013; 28 (Supl. 4):72-80

Palabras clave: *Diabetes. Azúcar. Recomendaciones nutricionales.*

Abbreviations

DM: Diabetes mellitus.
DM 1: Diabetes mellitus type 1.
DM2: Diabetes mellitus type 2.
IBG: Impaired basal glucose.
GIT: Glucose intolerance (GIT).
GIX: Glucose index. ADA: American diabetes association.
MNT: Medical nutrition therapy.
HbA1c: Glycated haemoglobin.
CH: Carbohydrates.
IG: Glycaemic index.
SoFAS: (solid fats and added sugars).

Introduction

Diabetes mellitus is one of the most prevalent endocrinological processes in the general population.

Corresponding author: Alejandro Sanz París.
Hospital Universitario Miguel Servet.
Consultas externas de Nutrición.
C/ Padre Arrupe, 2.
50009 Zaragoza. España.
E-mail: asanzp@salud.aragon.es

It is currently estimated that 366 million people suffer from DM (8.3%). 95% of these cases are mellitus type 2 (DM2). In 2003, it is estimated that 552 million people will suffer from this chronic illness (9.9%)¹.

In two decades, the number of adults with DM in developed countries will have increased by 20%, but the increase will take place especially in developing countries, where the predicted figure is 69%. This spectacular change is related to the ageing population, and more specifically the current obesity epidemic².

In Spain, the most recent figures³ show that the prevalence of DM is at 13.8%, although approximately half of these patients (6.0%) do not know they have DM. In terms of pre-diabetic conditions, impaired basal glucose (IBG) is at 3.4%, and glucose intolerance (GIT) is at 9.2%. 2.2% have both conditions.

The objectives of nutritional treatment of DM, apart from its aetiology, are the following:

1. Reach and maintain:
 - a) Plasma levels of glucose within normal limits, or as near to them as feasibly possible, while observing safety.
 - b) A lipids profile that reduces the risk of cardiovascular illness, while observing safety.

- c) Artery pressure levels within normal limits, or as close to them as feasibly possible, while observing safety.
 - d) An adequate weight for the prevention of obesity development, or treatment of existing obesity, especially the visceral presence type.
2. Prevent or at least slow down the development of chronic complications of DM by modifying nutrient intake and lifestyle.
 3. Meeting individual nutritional needs, taking the patient's personal and cultural preferences into account, so that recommendations are followed in the long term.
 4. Improve general health, by promoting healthier food options and adequate levels of physical activity.

The nutritional approach in patients with DM is much more than just providing nutrients, because it forms the basis of their general treatment. The nutritional treatment is included within a physical exercise program, and goes alongside the pharmacological treatment. The American Diabetes Association (ADA)⁴, The Canadian Diabetes Association⁵, The American Dietetic Association⁶ and the American Association of Clinical Endocrinologists⁷ have called it "Medical Nutrition Therapy" (MNT) to give it the importance it requires. MNT is not just intervening in the control of glucose; it affects the whole metabolic system, and furthermore, it prevents the appearance and development of diabetes and related problems.

Review of recommendations made by various scientific associations

In spite of international recognition of the importance of MNT, it is not yet fully established. Recommendations made by scientific associations have changed substantially from the publication of the first ones by the European Society for the Study of Diabetes⁸ up to the latest recommendations presented by Diabetes UK⁹ and by the German Nutrition¹⁰ in the light of evidence based medicine.

In this review we will look at the most important and recent recommendations in terms of carbohydrate (CH) intake. The DAFO method will be used for the case of sugar consumption.

Table I shows the recommendations that carry most evidence from the five most important scientific societies, grouped in terms of category for ease of comparison.

The first thing to notice is that MNT does not appear in the European Society's recommendations from 2004. However, the ADA's "position statement"¹¹ does appear for the first time. From then on, all the societies have adopted it, and they now recommend it to a higher level than the ADA⁴ itself.

The diet is the fundamental basis for the treatment of DM, because it can reduce glycated haemoglobin (HbA1C) by up to 2%. In spite of that, there is no special diet for diabetic patients.

The current trend is to follow recommendations made for the general population such as a healthy diet as recommended by the Canadian guidelines⁵. The factor that makes DM different is that individualisation is key. Every individual diabetic patient has specific needs in terms of calories, according to their age, sex, weight, levels of physical activity etc.

The distribution of macronutrients depends on lipid profile, renal function, timetable, lifestyle, dosage of relevant glucose-lowering medication, and above all, personal, family and cultural preferences must always be considered.

Carbohydrates have historically been seen as the energetic substrate that has most impact on blood sugar. The total amount of carbohydrates taken in is the main factor in reactions after food consumption, although other factors exist such as the type of carbohydrate, the amount of fibre, the way of cooking, the ripeness of the fruit etc. Furthermore there are other factors apart from CHs that also influence blood sugar after food consumption, such as blood sugar before eating, distribution of macronutrients throughout the whole meal, glucose lowering treatments and the patient's insulin tolerance. Because of this, the majority of scientific associations recommend individual treatments, in conjunction with pharmaceutical treatment and based on diet in portions.

There is a lot of controversy surrounding the usefulness of slow-release CHs with a low glycaemic index (GI). The GI of foods is a concept that was developed in order to compare reactions after eating a fixed amount of foods rich in CH. This is defined as an increase in blood sugar with respect to fasting basal glucose in an area below the curve of two hours after eating a set amount of that food (usually equivalent to 50g of CH) divided by the response to a reference food (usually glucose or white bread).

The European Diabetes Association⁸ had already made an A grade recommendation in favour of foods rich in CHs, but with a low GI, in 2004. That recommendation was upheld by the UK Diabetes Association⁹ in 2011. However the American Diabetes Association⁴, the American Dietetic Association⁶, and the Canadian Diabetes Association⁵, have taken years to join with the European associations, and although they still have some misgivings, they concede that this type of diet may produce a modest benefit of control over blood sugar after food consumption, with a B grade recommendation.

Aside from these scientific arguments, all agree unanimously that a diet should provide CH in the form of fruit, cereal, pasta, pulses, vegetables and root vegetables (such as potatoes), which are all foods with low GI.

Table I
Nutritional recommendations from different diabetic societies

	<i>European Diabetic Association* (2004)</i>	<i>American Association of Clinical endocrinologists* (2007)</i>	<i>American Diabetic Association† (2008)</i>	<i>American Diabetics Association* (2010)</i>	<i>British Diabetics Association* (2011)</i>
<i>Nutritional Medical treatment</i>	This concept did not exist when these guides were written.	MNT is an essential component in any program for the treatment of DM (A).	Both for patients with DM and with pre-DM should receive MNT (B). Dietary advice should be sensitive to individual needs and their capacity to be able to change (E).	MNT reduces HbA1c between 0.25-2.9%, depending on the type and duration of the diabetes. Lipids, blood pressure, and weight also improve, less need for pharmaceuticals and a reduction in the risk of comorbidities progression (A).	MNT is effective in DM and at high risk of developing DM2, when integrated in educational and clinical care (A).
<i>Nutrients distribution</i>	It is not justified to recommend very low-carbohydrates diets in diabetes (B).	There's no specific diet for DM according to this Association (D). Fat intake < 30% and saturate fats < 10% of the total caloric consumption; increase fibre to > 15 g/ml kcal (A). Diet customization according to weight, drugs, meal preferences, life-style and lipidic profile (A).	Both low-carbohydrates diets and low-fat diets can be effective for reducing weight (A).	Must be based on the recommendations for a healthy diet. There is no ideal percentage for the energy distribution (A).	To achieve an optimal glycaemic control in DM2 it is important to manage the total amount of energy intake and not its composition in macronutrients (A).
<i>CH consumption</i>	The carbohydrate contribution depends on the metabolic characteristics of the patient (A).	The total CH contribution should be 45-65% of the total calories unless otherwise indicated (D).	Monitoring the intake of carbohydrates through the exchange method is a key strategy in order to maintain glycaemic control (A). De DM1 patients treated with fast action injected or pumped insulin should adjust their previously taken insulin doses to the amount of carbohydrates intake (A).	For patients with fixed doses of insulin or hypoglycaemic the CH intake should be the same every day (A). For patients that adjust their insulin doses with each meal, this will depend on the CH content (A). The total amount of contribution total (proteins and fats) should be considered.	For DM1 the CH content is the main nutritional factor for Glycaemic control (A). For DM1 that use multiple insulin doses or an insulin pump, it is beneficial to adjust the insulin doses to the quantity of CH ingested (A). In DM1 with fixed insulin doses, it is beneficial to ingest a daily fixed amount of CH (C). In DM2 that total quantity of HC consumed is a strong predictor of the total amount of CH ingested through exchanges and is the key strategy in order to achieve glycaemic control (A).
<i>Glycaemic Index GI</i>	Foods rich in CH but with a low GI are advisable (A).	No reference made.	The use of the glycaemic index can bring a small additional benefit, but higher than if we just consider the contribution of total carbohydrates (B).	There are contradictory results regarding its effectiveness due to the different definitions of high or low GI (B).	In DM2 diets with a low GI can reduce HbA1c > 0.5% (A).

Table I (cont.)
Nutritional recommendations from different diabetic societies

	<i>European Diabetic Association* (2004)</i>	<i>American Association of Clinical endocrinologists³ (2007)</i>	<i>American Diabetic Association⁶ (2008)</i>	<i>American Diabetics Association⁶ (2010)</i>	<i>British Diabetics Association⁹ (2011)</i>
<i>Fibre</i>	The diet of the DM patient, both type 1 and type 2, should include vegetables, pulses, fruits and wholegrain cereals. When CH intake is high, it is important to choose foods rich in fibre and with a low GI (A). It recommends the consumption of natural high fibre foods (A). The dietetic fibre should be >40g/day, half of which soluble. Benefits have been observed even with lower fibre contributions (A).	At least 25-50 g/day Of fibre should be consumed per day or 15-25 g/1,000 calories (A).	Individuals with a high risk of contracting DM2 should have a high fibre diet (14 g/1,000 kcal) and wholegrain foods (B). It is recommended that the dietary carbohydrates come from fruit, vegetables, wholegrain foods, pulses and skimmed milk (B). As for the general public, the consumption of high fibre foods is recommended, but no more than that of the general population (B).	There are no definitive conclusions regarding the effects of a diet rich in fibre and glycaemic control (A) but there are regarding total cholesterol (A). The intake of fibre recommended for patients with diabetes is similar to that of the general population (14 g/1,000 kcal) Diets with 45-50 g/day have improved their glycaemic control, but with doses more typical in real life (24 g/day) do not show any effects. It is recommended for people with DM to consume foods that contain 25-30 g of fibre a day (7-13 g soluble).	Diets with a low GI and a high fibre and wholegrain content protect against the apparition of type 2 diabetes (B).
<i>Non nutritional sweeteners</i>	There are no specific recommendations.	No reference made.	Polyalcohol and low calorie sweeteners are safe when consumed within the limits established by the (A).	Non nutritional sweeteners do not have an effect on glycaemic control. Although we should take into account that some products that contain these nonnutritive sweeteners also contain carbohydrates (C).	Sweeteners without calories are safe when consumed in moderation and can reduce HbA1c when taken as part of a low calorie diet. (Without being a recommendation).
<i>Consumption of sugar</i>	Moderate intake of sugar (50g/day) can be incorporated into the diet of patients with both type 1 and type 2 diabetes if the glycaemic control is satisfactory (A).	No reference made.	Foods that contain sugar can be substituted for other CH in the diet plan and if added, it must be taken into account in both hypoglycaemic pharmaceuticals and in the risk of increasing energy contribution (A).	The patient with diabetes can consume foods that contain sucrose, but always substituting them for others that are rich in carbohydrates. An intake of 10 to 35% of the total intake of this type of food does not alter glycaemic or lipid control when substituted for an isocaloric quantity of other carbohydrates (A).	In DM1, the consumption of sugar does not affect glycaemic control differently to other types of CH. Patients that consume a variety of sugars do not show a different glycaemic control if the total carbohydrate contribution is similar (Without constituting a recommendation). Fructose can reduce the postprandial blood sugar level, when substituting sugar (Without constituting a recommendation).

*In brackets the strength of recommendation.

With regard to fibre in diets, foods that are rich in fibre like fruit and vegetables are still recommended, especially wholegrain cereals. The recommendation for effective use of fibre for improvement of lipid metabolism and the glycaemic system is graded A or B depending on the scientific association. The negative aspects are their secondary effects on digestion, and their palatability means they cannot be used in large quantities. Generally, the consumption of foods that are rich in fibre is recommended to the general public, and there is no need to increase the amounts of fibre for diabetic patients.

Regarding non caloric sweeteners, most guides do not provide relevant information. They are simply considered to be safe in small quantities within the context of a low calorie (hypocaloric) diet.

Sugar consumption, using the DAFO model

Threats

Social and scientific environments can play a negative role in sugar consumption in the diets of patients with DM, as well as the competition of sweetening products aside from sugar.

Sugar consumption by diabetics has been roundly criticised, with its prohibition seen as fundamental to the treatment of diabetes. The popular definition of diabetes is “sugar in the blood”, so the connection between sugar and blood sugar plasma in diets is well recognised.

The first problem to be tackled is the diverse nature of the diabetic population in terms of the underlying understanding. In other words, DM2 has an important component of insulin resistance, whilst DM1 has to do more with insulinopenia (insulin deficiency). In the first case, the goal is to combat weight excess by reducing the total calorie intake, while the second case works by controlling CH intake and insulin deficiency.

Another important aspect is the lack of agreement between scientific associations in terms of recommendations on sugar consumption in diets amongst patients with DM, as well as the degree of evidence. In 2004, 50 g of sugar per day was seen as acceptable to the European Association⁸, with an A grade recommendation. The ADA was even more liberal with regard to sugar consumption, with the only limitation being its substitution for other foods that are rich in CH, with as much as 10-35% of total calorie intake per day according to the Dietetic Association⁶. On the other hand, the Canadian Association has a maximum limit of 10% with a B grade recommendation, and the American Association of Clinical Endocrinologists⁷ and UK Diabetes⁹ do not make explicit reference to this.

In the USA, following the publication of the Dietary Guides for the general population in 2010¹², there has

been a reduction in the consumption of drinks containing added sugars from 2000 to 2008, although energy drink consumption levels have stayed the same. The intake of these drinks may provide from 5 to 15% of the recommended total energy consumption¹³.

There are also artificial sweeteners such as fructose and polyols (low calorie sugar replacers / sugar alcohols). Fructose produces a weaker reaction in blood sugar after food consumption than sucrose, which is why it has been used so often in sweet foods, such as turrón (Spanish nougat) or cakes, for diabetic patients. Polyols also produce a weaker reaction in blood sugar, and they are often used in chewing gum and sugar-free sweets.

Lastly, the existence of a safe commercial alternative to artificial sweeteners has meant that diabetic patients use it in coffee instead of sugar. The ADA⁴ see them as a way of reducing CH consumption, and the North American Cancer Institute¹⁴ has not found any evidence that they increase the risk of cancer.

Weaknesses

Sugar alternatives that limit or reduce consumption amongst DM patients show the following characteristics (Fig. 1).

The GI of sugar is high, therefore historically its consumption has always been avoided in diets created for diabetic patients. In hospitals, the “sugar-free” term has always been used to describe low GI food diets.

The consumption of dietetic sugar produces a fast blood sugar reaction disproportionate to the amount of CHs taken in. This fact has been linked to states of endogenous hyperinsulinism (high internal levels of blood sugar), which stimulates the physiopathological process of DM2.

Sugar is always the first food that is removed from diets for slimming or losing weight. Obesity and DM2 are linked in the majority of cases, which is another reason for its restriction in diets for these patients. Sugar is usually added to other foods such as milk, juice or soft drinks, enriching them with calories that are easily absorbed and not very filling, so they are not usually included in records of how much has been consumed in one day.

There are some foods, such as industrially produced bread rolls, that like “sweet” foods are associated with sugar. However, there is a high amount of invisible fats in their makeup. These are fats that increase calorie concentration, because sugar alternatives only add 4kcal/g to the diet, whilst fats provide 9 kcal/g. Furthermore, these are usually saturated fats, with a very negative effect on lipid metabolism.

Finally, it must be mentioned that they are often associated with the appearance of cavities in the general population and also amongst DM patients. Although a clear link has not been demonstrated

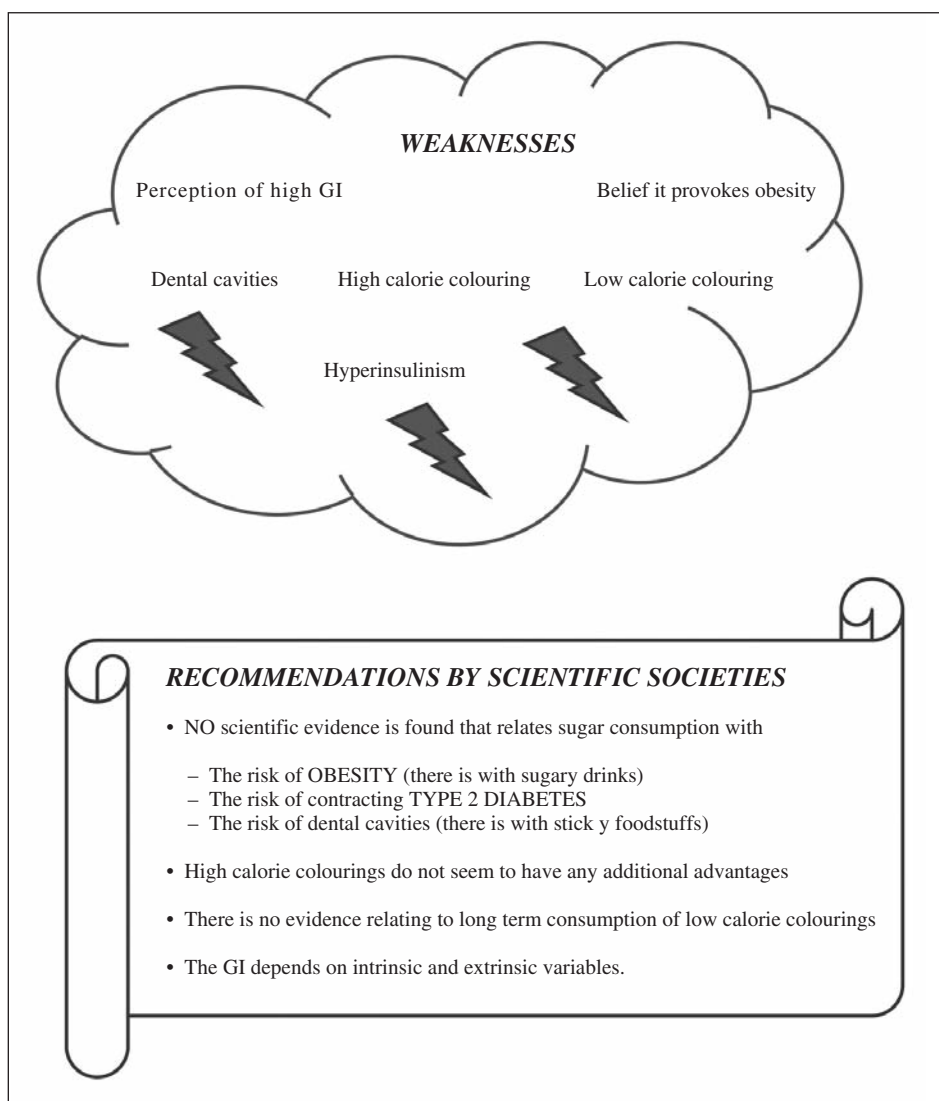


Fig. 1.—Strengths and weaknesses.

between sugar consumption and the appearance of cavities, it is true that foods that have a sticky consistency are related to bad dental habits.

Strengths

There are some strong points in favour of sugar consumption amongst patients with DM, due to the characteristics of this food.

The most important scientific societies have changed dietary recommendations based on evidence in order to help DM patients follow their diet correctly.

Sugar's main virtue is its quality as a sweetener, which has no comparison in other products, with calories or without. This means that other sweeteners are known as "sugar alternatives", but sugar still has public preference.

Sugar intake provides energy that is absorbed quickly and used easily by the nervous system so it is a

necessary food to overcome a spontaneous or a drug induced hypoglycaemia.

Sugar is added to other foods which are strongly related to social situations, such as having a coffee or having a drink. In many situations, DM patients consume it during social meetings, and need to remember their condition, ensuring that they do not have sugar, or they ask for a sweetener that does not contain calories. However it is quite common these days that a healthy population worried about weight consumes "diet" or "sugar free" food. Puddings such as cakes or tarts are consumed in special situations such as birthdays, and it is very difficult for DM patients to say no.

When a food is prohibited and removed from a diet, the patient longs for it, and this makes it harder for them to follow the diet recommended to them. When sugar consumption is permitted, DM patients adhere to the diet far better. In a Spanish study of 876 patients with DM by Muñoz Pareja et al.¹⁵ the parallels between

intake and the recommendations made by the European and American Diabetes Associations are appreciated. Only 3.4% follow the recommendations on fibre (by default). 10% follow the sugar recommendations (by excess) and 25.5% in terms of CHs (by default). It is noticeable that DM patients behave in the same way as people without DM, and adherence to the Mediterranean diet is only 57%. They consume large amounts of typical Mediterranean food, such as olive oil, fruit and vegetables, or fish, but they also have typical foods contained within a Western diet like meat products rich in saturated fats, and sugars instead of complex CHs. It is also worth pointing out that the best concordance with dietary recommendations is associated with better blood glucose control, especially within the Mediterranean diet.

It is important that children and teenagers with DM have the same diet as the rest of their family. Total prohibition of sweets and treats is very unlikely to be successful. It is better to accept that they can have these in moderation or within the context of special occasions, or mixed with other foods to reduce the GI.

Another special situation is Christmas sweets and *turrón* (Spanish Christmas nougat). “Diabetic *turrón*” is not recommended; it is better to have high quality *turrón*. Special food gives the patient a false sense of security which makes them eat larger amounts, so the end result is greater weight gain.

Opportunities

Nutritional recommendations by the different scientific associations, based on scientific evidence, state that sugar alternatives do not increase blood sugar any more than other CHs in isocaloric amounts (low in fat and carbohydrates) under certain conditions (Table I). Special attention is given to DM2 patients with obesity, so they calculate sugar intake according to how many calories it provides. With DM1 patients, sugar consumption is calculated within the context of total amount of CHs and its coordination with daily insulin intake and dosage. In general, patients with any kind of DM should have achieved a high level of knowledge on diabetes and good control of metabolism so that consumption of sugar alternatives does not have any negative effects.

The German Nutrition Society¹⁰ did not find any scientific evidence to suggest that sugar consumption is related to obesity in their review from 2012. However, it did find that it is probable that high consumption of sugary drinks is linked to a greater risk of obesity, depending on amounts. This is based on a meta-analysis by Mattes et al.¹⁶ which states that added consumption of 250 kcal (about 600 ml) of sugary drinks over the course of 3 to 12 weeks may lead to a weight gain of 0.2 kg. With regard to children and teenagers, there are several meta-analyses with contra-

dictory results, but the review by Mattes et al. shows that there is a link, especially amongst those who were obese or overweight beforehand.

None of the scientific associations found a link between sugar consumption and the risk of contracting DM2, and the German Nutrition Society¹⁰ found that there is probably no link between sugar consumption and the risk of DM2. However, this same review found that it is possible that sugar consumption is linked to high GI, based on the meta-analysis by Barclay et al.¹⁷

The power and variety of glucose lowering drugs available allows us to be free to consume sugar, as long as it does not increase the total calorie intake. There are oral drugs like repaglinide, and drugs administered by injection like insulin analogues, with a very fast initial effect, that allows us to control blood sugar after eating. The limitation is that the patient needs to know the amount of drug to take, depending on the amount of CH that they need to take in, and the calories that will need to be removed from other foods as a result of this intake.

Regarding GI, the total amount of CH consumed is usually the main factor that determines blood sugar response after eating, but the type of CH also affects this. There are several intrinsic and extrinsic variables that influence the effect of CH content in a food on blood sugar response.

The variables include the type of food consumed, the type of CH in the food, the method of cooking, the ripeness or maturity, and how much the food has been processed. In the case of sugar, the intrinsic variables do not provide a great variety of blood sugar responses, because it is a pure food, it only contains sucrose. With respect to processes, not many differences exist either in terms of effect on blood sugar, because the only types are white sugar and refined sugar, with fibre, or brown caramelised sugar.

The extrinsic values are the patient’s blood sugar levels before eating, the distribution of macronutrients in the food that they consume, the availability and chemical makeup of the insulin administered, and the level of insulin tolerance. These variables are of special interest in this review because we can modify them so that sugar consumption does not have negative effects on the DM patient. We have already mentioned most of these in this paper (absence of obesity, controlled blood sugar before eating, and coordination with insulin treatments). One important aspect from a practical point of view is reducing sugar’s GI when it is consumed with other foods of a low GI or after a meal, mixed with fats, proteins and other CHs. The most common example is sugar in coffee after lunch, which can be consumed almost without any effect on blood sugar after eating, whilst a coffee with sugar consumed mid-morning can have a direct effect on blood sugar.

All other sweeteners with calories such as fructose and polyols (low calorie sugar replacements / sugar alcohols) do not appear to bring any additional advan-

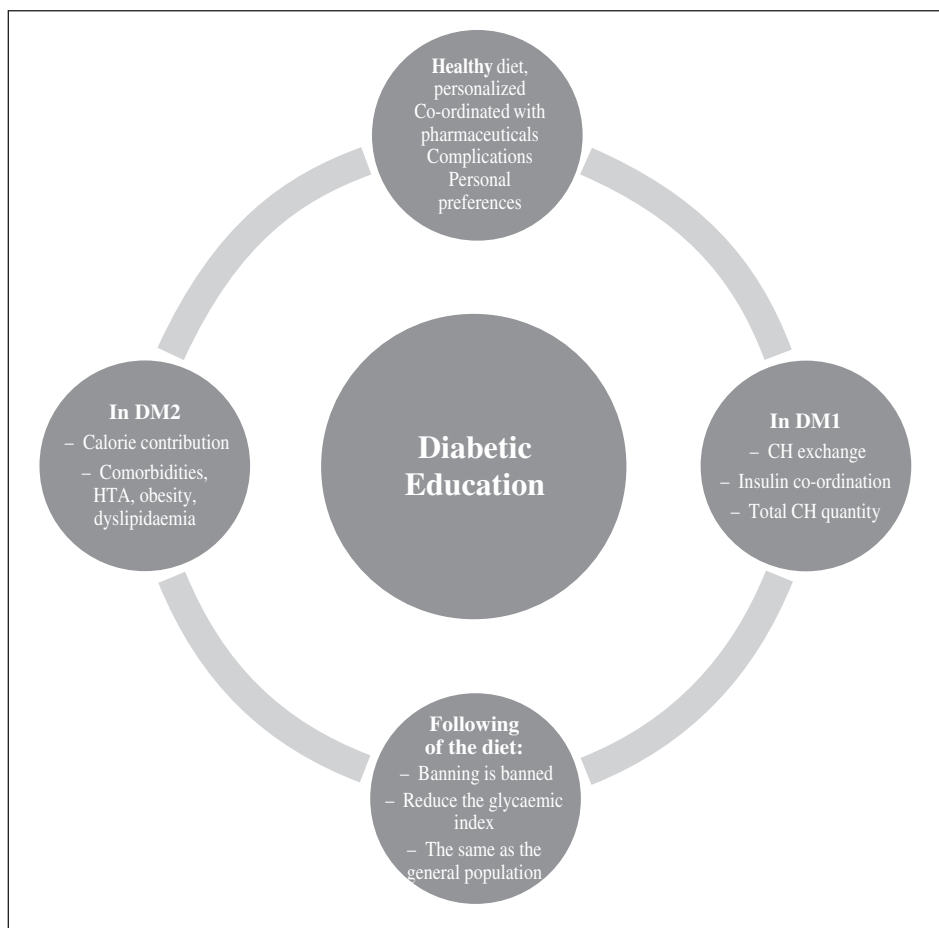


Fig. 2.—Diabetic education.

tages. In the case of fructose it is only advised to be consumed as a component of natural foods but not as a sweetener due to its side effects on lipid plasma. In a meta-analysis by Livesey and Taylor¹⁸ it was observed that the ingestion of more than 250 g a day of fructose produces an increase in the level of plasmatic triglycerides.

Sugar alcohols provide 2 kcal/g, so these could be of interest in low calorie diets, although they may cause diarrhea if too much is taken, especially with children.

Regarding no-calorie sweeteners, the consensus is that they do not damage health, but there is no evidence that they improve control of blood sugars in the long term.

Recommendations

Currently sugar consumption is not prohibited for any kind of DM, but it should be consumed under certain conditions:

- Its value in terms of calories must be considered so it can be substituted for another CH and therefore an increase in total daily calories can be avoided.

- Its consumption must be organised around routine and doses of insulin.
- The DM patient who is going to consume it must gain good control over blood sugar beforehand.
- There must not be any associated obesity.
- In order to reduce GI, it must be consumed after a meal, mixed with fats, proteins and other CHs.
- The patient must be well educated about diabetes so that they can manage and control these parameters (Fig. 2).

Regarding the amount of sugar allowed in a DM patient's diet, most societies neglect to give a specific figure. The only one that does is the European Association, which believes 50 g per day is appropriate. Other societies allow consumption, but do not give a specific amount.

Given the lack of specific recommendations, we can value what has been recommended to the general population. The American Institute of Medicine¹⁹ recommends that total sugar intake does not exceed 25% of total energy, and in that way it ensures that enough essential micronutrients are provided, which are often not present in foods with added sugar. The American Heart Association²⁰ limited the consumption of sugar to <100 kcal/day for women and <150 kcal/day for men.

In 2011 the World Health Organization²¹ limited the intake to <10% of the total energy amount and the United States government through its “Choose My Plate”²², advised against “SoFAS” food (solid fats and added sugar). They especially advised against drinks with added sugar, such as soft drinks, sports drinks or fruit juice and advised the consumption of fresh fruit, fresh fruit juice, water, skimmed milk and coffee or tea without sugar.

Conclusions

The consumption of sugar in a DM patient has been liberalized at the current time. This is due, in part to strong and versatile hypoglycaemic drugs. What’s more, the scientific societies have published recommendations based on evidence that dispels some myths.

For its adequate consumption “diabetic education” plays a fundamental role. Patients should know the amount of calories, the ration exchange and how to reduce their GI.

References

1. International Diabetes Federation. Diabetes and impaired glucose tolerance: global burden: prevalence and projections, 2010 and 2030. International Diabetes Federation Website. <http://www.idf.org/diabetesatlas/5e/the-global-burden>. (9 April 2012, date last accessed).
2. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010; 87: 4-14.
3. Soriguer F, Goday A, Bosch-Comas A, Bordiú E, Calle-Pascual A, Carmena R, Casamitjana R, Castaño L, Castell C, Catalá M, Delgado E, Franch J, Gaztambide S, Gibés J, Gomis R, Gutiérrez G, López-Alba A, Martínez-Larrad MT, Menéndez E, Mora-Peces I, Ortega E, Pascual-Manich G, Rojo-Martínez G, Serrano-Rios M, Valdés S, Vázquez JA, Vendrell J. Prevalence of diabetes mellitus and impaired glucose regulation in Spain: the Di@bet.es Study. *Diabetología* 2012; 55 (1): 88-93.
4. Nutrition Recommendations and interventions for Diabetes. A position statement of the American Diabetes Association. *Diabetes Care* 2008; 31 (Suppl. 1): S61-S78.
5. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Canadian Journal of Diabetes* 2008; 32 (Suppl. 1): S40-S45.
6. Franz MJ, Powers MA, Leontos C, Holzmeister LA, Kulkarni K, Monk A, Wedel N, Gradwell E. The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. *J Am Diet Assoc* 2010; 110: 1852-89.
7. Rodbard HW. AACE Diabetes Mellitus Clinical Practice Guidelines Task Force. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the management of Diabetes Mellitus. *Endocr Pract* 2007; 13 (Suppl. 1): 47-9.
8. Mann JI, I. De Leeuw A, Hermansen K, Karamanos B, Karlström B, Katsilambros N, Riccardi G, Rivellese A, Rizkalla S, Slama G, Toeller M, Uusitupa M, Vessby B. and Diabetes and Nutrition Study Group (DNSG) of the European Association for the Study of Diabetes (EASD). Evidence-based nutritional approaches to the treatment and prevention of diabetes mellitus. *Nutr Metab Cardiovasc Dis* 2004; 14: 373-94.
9. Diabetes UK 2011. Evidence-based nutrition guidelines for the prevention and management of diabetes. www.diabetes.org.uk.
10. Hauner H, Bechthold A, Boeing H, Bronstrup A, Buyken A, Leschilk-Bonnet E, Linseisen J, Schulze M, Strohm D, Wolfram G. Evidence-Based Guideline of the German Nutrition Society: Carbohydrate intake and prevention of nutrition-related diseases. *Ann Nutr Metab* 2012; 60 (Suppl. 1): 1-58.
11. American Diabetes Association. Nutrition Principles and Recommendations in Diabetes. Position Statement. *Diabetes Care*. 2004; 27 (Suppl 1): S36-S46.
12. US Department of Agriculture. US dietary guidelines for Americans 2010. Available from: <http://www.cnpp.usda.gov/dietaryguidelines.htm>
13. Welsh JA, Sharma AJ, Grellinger L, Vos MB. Consumption of added sugars is decreasing in the United States. *Am J Clin Nutr* 2011; 94 (3): 726-34.
14. National Cancer Institute. National Cancer Institute fact sheet: Artificial sweeteners and cancer. <http://www.cancer.gov/cancertopics/factsheet/Risk/artificialsweeteners/> print. Updated 2009. Accessed November 21, 2011.
15. Muñoz-Pareja M, León-Muñoz LM, Guallar-Castillón P, Graciani A, López-García E et al. The Diet of Diabetic Patients in Spain in 2008-2010: Accordance with the Main Dietary Recommendations- A Cross-Sectional Study. *PLoS ONE* 2012; 7 (6): e39454. doi:10.1371/journal.pone.0039454.
16. Mattes RD, Shikany JM, Kaiser KA, and Allison DB: Nutritively sweetened beverage consumption and body weight: a systematic review and meta-analysis of randomized experiments. *Obes Rev* 2011; 12 (5): 346-65.
17. Barclay AW, Petocz P, McMillan-Price J, Flood VM, Prvan T, Mitchell P, Brand-Miller JC: Glycemic index, glycaemic load, and chronic disease risk – a meta analysis of observational studies. *Am J Clin Nutr* 2008; 87: 627-37.
18. Livesey G, Taylor R: Fructose consumption and consequences for glycation, plasma triacylglycerol, and body weight: meta-analyses and meta-regression models of intervention studies. *Am J Clin Nutr* 2008; 88: 1419-37.
19. Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids. Washington, DC: National Academies Press; 2002/2005.
20. Johnson RK, Appel LJ, Brands M, Howard BV, Lefevre M, Lustig RH, Sacks F, Steffen LM, Wylie-Rosett J; American Heart Association Nutrition Committee of the Council on Nutrition, Physical Activity, and Metabolism and the Council on Epidemiology and Prevention. Dietary sugars intake and cardiovascular health. A scientific statement from the American Heart Association. *Circulation* 2009; 120 (11): 1011-20.
21. World Health Organization. Global strategy on diet physical activity and health. http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf. Updated 2002. Accessed April 16, 2011.
22. US Department of Agriculture. Inside the pyramid, discretionary calories. What are “added sugars”? http://www.Choosemyplate.gov/foodgroups/empty-calories_sugars.html. Accessed December 13, 2011.