Importancia de algunas frutas, verduras y hortalizas en la prevención de la diabetes mellitus tipo II

The Importance of some fruits and vegetables in the prevention of diabetes mellitus type II

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Resumen

Los vegetales y frutas son extremadamente importantes en la nutrición humana como fuente de nutrientes y para la reducción de riesgo a desarrollar ciertas enfermedades crónicas.

Dentro de este grupo de enfermedades se encuentra la diabetes mellitus, la cual es una enfermedad de origen multifactorial, caracterizada por un grupo de desórdenes metabólicos que dan origen a la hiperglicemia crónica, uno de los síntomas característicos de esta enfermedad.Históricamente, para el tratamiento se han empleado diversos medicamentos, pero recientemente se ha hecho evidente la importancia de la dieta en el control y la prevención de esta enfermedad.

Son varias las especies vegetales recomendadas por la medicina tradicional que forman parte del consumo común en la dieta de la población mexicana y que además de sus efectos hipoglucemiantes, son ricas en vitaminas y minerales necesarios para una nutrición adecuada.

En este trabajo se discutirán las propiedades de algunos de estos alimentos que les permiten tener un efecto en la disminución de la concentración de glucosa sanguínea.

Palabras clave: Diabetes mellitus, hipoglucemiantes, hiperglicemia, plantas medicinales, índice glicémico.

Abstract

Vegetables and fruits are extremely important in human nutrition as a source of nutrients and to reduce risk of developing certain chronic diseases.

Within this group of diseases include diabetes mellitus, which is a disease of multifactorial origin, characterized by a group of metabolic disorders that give rise to chronic hyperglycemia, one of the characteristic symptoms of this disease.

Key Words: Diabetes mellitus, hypoglycemic, hyperglycemia, medicinal plants, glycemic index.

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Introduction

Diabetes mellitus is classified in the group of chronic degenerative disease is multifactorial in origin and characterized by a group of metabolic disorders such as chronic hyperglycemia, which is caused by an absolute or relative deficiency of insulin, a key hormone in maintaining normoglycaemia (Sjöholm, 1996), and which is produced exclusively by the beta cells of the pancreas.

Worldwide, there are over 347 million people with diabetes and according to the World Health Organization (WHO), an estimated 1.3 million people died in 2008.

Particularly for the region of North America and the Caribbean, the International Diabetes Federation in 2012, indicates that the prevalence of the disease was 10.5%, ie 1 in 10 adults have diabetes in this region.

Historically, the treatment have been used various drugs, but recently the importance of diet in the control and prevention of this disease has become evident.

Several plant species recommended by traditional medicine as part of commonly consumed in the diet of the Mexican population, which in addition to its hypoglycemic effects, are rich in vitamins and minerals needed for proper nutrition.

The purpose of this paper is to describe the effects of some of these vegetables commonly consumed in the diet of the Mexican population, and their role in the prevention of diabetes mellitus.

DIABETES AND INSULIN SECRETION

The endocrine cells are organized into highly vascularized and innervated microorganos scattered throughout the pancreas called islets of Langerhans (Guz, Nasir & Teitelman, 2001). The 60-80% of these structures comprise the β cells, which are responsible for producing insulin, the only hormone in the body that lowers blood glucose.

The integration of the mechanism within the beta cells in the islets of Langerhans is responsible for the release of insulin in response to stimulation with glucose and insulin in turn stimulates glucose utilization in peripheral tissues such as skeletal muscle and liver. Any alteration of this mechanism may lead to developing glucose intolerance or diabetes mellitus (Herchuelz, Diaz-Horta & Van Heylen, 2002, Navarro-Boards, Fiordelisio, Hernández-Cruz & Hiriart, 2007).

Diabetes mellitus type II (non-insulin-dependent), is characterized by insulin resistance (Edlund, 2001). This disease is considered the result of the combination of several factors such as genetic predisposition, environmental factors including nutrition and exercise. (Rossini, Mordes, Greiner & Stoff, 2001). It is the condition with the highest incidence in individuals of middle to older age, of which 80% are obese.

DIETARY FIBER AND GLUCOSE METABOLISM

Dietary fiber is a complex group of substances that can be described as non-digestible carbohydrates and lignin that are not degraded in the (Weickerth & Pfeiffer, 2008) upper gastrointestinal tract, can be found in vegetables, fruits, cereals, grains and seeds. It is recommended that good nutrition includes a daily intake of 20-40 g of fiber.

Lack of dietary fiber may be a factor of type II diabetes mellitus (Montonen, Knekt, Järvinen, Aromaa, & Reunanen, 2003), recent research indicates that consumption of

dietary fiber contributes to a number of independent metabolic effects of unexpected changes in body weight, which include increased sensitivity to insulin (Gary et al. 2004), modulation of some intestinal hormones, and effects in several metabolic and inflammatory markers associated with metabolic syndrome (Steyn et al. 2004).

The content of soluble dietary fiber has been shown to provide food texture and viscosity, this has implications for the inhibition of uptake of macronutrients such as starch, regulates blood glucose levels and postprandial beneficially influences some blood lipids. (Brennan, 2005).

INDEX AND GLYCEMIC LOAD: FROM CARBOHYDRATE DIET

Within the diabetes prevention, diet plays a role (WHO, 2003). The quality of ingested carbohydrates is extremely important to determine the ability of these molecules to increase the levels of glucose, which depends heavily on its influence on the gastrointestinal transit and absorption rate of nutrients and the risk of developing diabetes (Salas-Salvado, Martínez-González, Bulló & Ros, 2011).

A useful method for classifying foods based on the impact of available carbohydrates in food is the glycemic index (Jenkins, AL, Jenkins DJ, Zdravkovic, Wursch, Vuksan, 2002) method.

The glycemic index values are determined in glucose tolerance and are a useful tool in determining the rate at which dietary carbohydrates are digested and absorbed as glucose. Individuals who require a high level of blood glucose immediately after ingestion should select foods with high glycemic index.

The data recorded in Table 1 indicate that the source of carbohydrates have an important role in the overall glycemic impact of food, often high glycemic index values relate to weight gain and some consumers seek to avoid the intake of carbohydrates and replace it with foods rich in protein or fat.

Table 1 and glycemic glycemic load of some foods consumed in Mexico (Noriega, 2004) index.

Food	GI	CG
Tortilla de harina de trigo	30	8
Tortillla de maíz	52	12
Pan dulce	67	17
Pan integral	71	9
Arroz	55-64	18-23
Camote	61	17
Papas	74-92	15-26
Frijoles pintos	14-18	1-4
Frijoles negros	30	7
Frijoles bayos	38	12
Garbanzos	28	8
Lentejas	29	5
Alubias	38	12
Chícharos	48	3
Nopales	7	0
Zanahoria	47	3
Elote	53	17
Calabaza	75	5
Manzana	38	6
Pera	38	4
Fresa	40	1
Naranja	42	5
Durazno	42	5
Uvas	46	8
Mango	51	8
Plátano	52	12

Papaya	59	10
Piña	59	7
Melón	65	4
Sandía	72	4
Dátiles	103	42

GI, glycemic index. CG, glycemic load.

Low GI (slow) <55; IG moderate 56-69; High glycemic (fast)> 70

Foods with low glycemic index are useful for consumers who wish to reduce the availability of glucose in order to maintain or reduce weight (Jimenez-Cruz, Seimandi & Bacardi-Gascon, 2003), but the full response to the blood glucose is determined not only by the glycemic index of a food, but for the amount of carbohydrates (Hu, van Dam & Liu 2001), for which the term has evolved glycemic load (GL), which differs from that glycemic load glycemic refers to the impact that the total food consumed in the diet have on glucose production, taking into account the relative amount of carbohydrate (Torres, Palacios-González, & Noriega-Lopez Tovar-Palacio, 2004).

MEXICAN DIET AND DIABETES MELLITUS

Diabetes is the leading health problem in Mexico, according to data compiled by the Mexican Social Security Institute (IMSS), in 2009 a daily average of 477 cases were reported, positioning the country in sixth place worldwide, with more than 6.4 million cases.

Although the lifestyle is mainly responsible for the high levels of obesity and diabetes among Mexicans, there are other important considerations such as inheritance of thrifty genes, indicating that the risk of diabetes is a result of intergenerational mechanisms (Martorell, 2005).

The Mexican diet is rich in carbohydrates, a recent study found that the amount of carbohydrate present was 75 to 80% of total caloric intake, based mainly starch. Only 6% of total calories derived from simple sugars, crude fiber intake was high, 18 to 21 g per day. The diabetes prevention through the inclusion of foods rich in complex carbohydrates and dietary fiber is the most likely to reduce the growth of the epidemic (Aguilar-Salinas &

Gómez-Pérez, 2006) form. An example of this is the diet of the Tarahumara Indians, composed mainly of beans and corn, which provide a high intake of complex carbohydrates, low in fat and cholesterol, indicating high nutritional value and is antiatherogenic considered (Cerqueira, MT, McFurry , FM & Connor, WE, 1979).

THESE PLANTS IN MEXICAN FOOD DIET AND PREVENTION OF TYPE II DIABETES MELLITUS

Some plants and plant used by the Mexican population for the prevention and treatment of diabetes mellitus type II are oral infusions taken during the day or are also fruits and vegetables as summarized in Table 2 This has a special importance as it goes linked to two basic factors for the control of DM: feeding and medication. A menu that includes such edible plants could somehow in diabetic patients improve their diet and thus control their disease by reducing the dose of hypoglycemic drugs (Alarcon-Aguilar et al, 1995;. Andrade-Cetto et al ., 2004, Revilla-Monsalve et al, 2007)..

Table 2 edible plants and fruits studied in the traditional treatment of DM.a

Scientific name	**Comun name**	**Structure**	**Preparation**[b]
Allium cepa L. (Liliaceae)	Cebolla	Bulbo	Decocción, cruda
Allium sativum L. (Liliaceae)	Ajo	Bulbo	Decocción
Ananas comosus (L.) Merr. (Bromeliaceae)	Piña	Fruta	Juice
Annona glabra L. (Annonaceae)	Anona silvestre	Fruta	Jugo, infusión
Annona muricata L. (Annonaceae)	Guanabana	Fruta	cruda
Brassica oleracea L. (Cruciferae)	Col de brusselas	Hojas	Jugo

Brassica oleracea L. var. *Botrytis* (Cruciferae)	Coliflor	Inflorescencia	Jugo
Byrsonima crassifolia (L.) Kunth. (Malpighiaceae)	Nanche	Fruta , corteza	infusión
Citrus aurantifolia (Christm.) Swingle (Rutaceae)	Limón	Fruta	Jugo
Citrus limetta Risso (Rutaceae)	Lima	Fruta	Fruit
Coriandrum sativum L. (Apiaceae)	Cilantro	Partes aereas	infusión
Cucumis sativus L. (Cucurbitaceae)	Calabaza	Fruta	Jugo
Cucurbita ficifolia Bouche (Cucurbitaceae)	Calabaza	Fruta	Jugo
Cucurbita maxima Duchesne (Cucurbitaceae)	Calabaza	Fruta	Jugo
Cucurbita mexicana Damm (Cucurbitaceae)	Calabaza, Melón	Hojas y fruta	infusión y jugo
Daucus carota L.	Zanahoria	Raíz	Jugo

(Apiaceae)			
Eucalyptus globules Labill. (Myrtaceae)	Eucalipto	Hojas	infusión
Scientific name	**Comun name**	**Structure**	**Preparation**[b]
Lactuca sativa L. var. *Romana. (*Compositae)	Lechuga romana	Hojas	Jugo
Mentha piperita L. Lamiaceae	Hierbabuena	Hojas	infusión
Nasturtium officinale R. Br. (Brassicaeae)	Berro	Partes aereas	infusión
Nopalea cochenillifera (L.) Salm-Dyck (Cactaceae)	Nopal	Tallo	cruda
Opuntia ficus-indica (L.) Mill. (Cactaceae)	Nopal	Tallo	cruda
Opuntia imbricata (Haw) DC. (Cactaceae)	Xoconostle	Tallo y fruta	cruda
Opuntia	Nopal	Tallo	cruda

streptacantha Lem. (Cactaceae)			
Opuntia streptacantha Lemaire. (Cactaceae)	Nopal	Corteza	Jugo
Petroselinum crispum (Mill.) Nyman ex A.W. Hill. (Apiaceae)	Perejil	Partes aereas	infusión
Phaseolus vulgaris L. (Fabaceae)	Frijol	Fruta	infusión
Physalis philadelphica Lam. (Solanaceae)	Tomate	Fruta	tostadas
Piper sanctum (Miq.) Schltdl. ex C. DC. (Piperaceae)	Hierba Santa	Hojas	infusión
Portulaca denudata Poelln. (Portulacaceae)	Verdolaga	Partes aereas	Infusión
Scientific name	**Comun name**	**Structure**	**Preparation**[b]
Portulaca oleracea	Verdolaga	Partes aereas	Infusión

L. (Portulacaceae)			
Prunus serotina subsp. capuli (Cav.) McVaugh. *(*Rosaceae)	Capulín	Fruta	Infusión
Prosopis juliflora (Sw.) DC. (Fabaceae)	Mezquite	Fruta	cruda
Psidium guajava L. (Myrtaceae)	Guayaba	Fruta	Cruda e infusión
Sechium edule (Jacq.) Sw. (Cucurbitaceae)	Chayote	Fruta	Cruda
Solanum verbascifolium C.B. Wright. (Solaneceae)	Berenjena	Partes aereas	Infusión
Spinacea oleracea L. (Chenopodiceae)	Espinaca	Hojas	Jugo
Tamarindus indica L. (Fabaceae)	Tamarindo	Fruta	Cruda y pulpa
Zea mays h.(Poaceae)	Maíz	Pelos de elote	Infusión

a. In 1993 the classification voucher was deposited in the Herbarium of the IMSS.

b. Decoction of 132 g of dried plant boiled in 1 L of water / 10 min. Infusion 12 to 15 g of dried plant to which is added 1 L of boiling water.

Within the Mexican diet consumed more vegetables and possess hypoglycemic properties are maize, beans, tomato and onion (Jasso & Villezca Martinez Becerra, 2003).
The fruit of the bean plant (Phaseolus vulgaris L.) is one of the most widely used traditional remedies against diabetes due to its high fiber content and its inhibitory effect on α-amylase, which can be effective in preventing or decrease in glucose levels in diabetes mellitus type II (Helmsädter, 2010).

Meanwhile tomato (Physalis philadelphica Lam.) As well as being a great source of fiber, has lycopene, which causes a dose-dependent decrease in glucose levels, increased insulin concentration and increased activity some antioxidant enzymes (CAT, SOD and GPx), as well as an improvement in the serum lipid profile (Ali & Agha, 2009)

The onion has known hypoglycemic effects, recently the S-methyl cysteine sulfoxide (SMCS) one sulfur containing amino onion isolates showed antihyperlipidemic and antidiabetic effects by controlling blood glucose levels and serum lipids and tissue altering activity hepatic hexokinase, glucose-6-phosphatase HMG CoA reductase to normal levels, showing comparable glibenclamide and insulin (Kumari & Augusti, 2002) effects.
Inhibitors of aldose reductase (AR) have considerable therapeutic potential against diabetic complications and do not increase the risk of hypoglycemia, this has been demonstrated by Tae Hyeon Kim et al in (2013) experimenting with products isolated from purple corn (Zea mays L.), wherein one of the 12 compounds isolated, the hersutrina demonstrated potent inhibitory capacity of AR activity, in addition to inhibiting reduction in lens galactose to galactitol and rat erythrocytes, indicating that indeed hersutrina can prevent osmotic stress state of hyperglycemia, and may mean that the hersutrina, purple corn derived may be a potential therapeutic agent for diabetic complications.

Conclusion

According to the information submitted, a diet that includes adequate intake of fruits and vegetables is very important for the availability of dietary fiber, one of the most important in the prevention of diabetes mellitus factors.

The plants used in Mexican traditional medicine have obvious hypoglycemic effects and its use may have beneficial effects in diabetic or prediabetic patients may help better control of glucose levels and use insulin.

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