

DIABETES ADVOCACY & CARE IN NIGERIA

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By:

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CHAPTER TWENTY-TWO

DIET AND DIABETES I

Glycaemic Indices, Glycaemic Load and Digestibility Index of Common Nigerian Meals

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Introduction

Diabetes has reached epidemic proportions in the world, with 382 million people affected worldwide. In Africa Nigeria has about 4-5 million affected people ranking it second only after Egypt in the sheer number affected. The management of this condition has focused more on drug management, with only recent efforts being placed on physical activity and diet. Diet had been an area where a lot of discordant recommendations have been made, especially in Nigeria. This paper attempts to look at glycaemic indices and glycaemic load of local food with a view to making it easier for dietitians and patients to have a good, well balanced healthy diet with local and commonly eaten foods without adversely affecting their DM control.

The diabetic diet: evolution and history

In the late 80's and 90's the DM diet of the Nigerian patient with diabetes mellitus revolved around a few food items purportedly due to the restrictions healthcare providers placed on their patients. This was based on the premise that there was a high carbohydrate content in our local food. Initially studies were limited to quantity of carbohydrates or calorie content of meals and their glycaemic indices. After this more nutrition indices of food like the glycaemic load and more recently digestibility index. Patients were "sentenced" to eating beans in its different preparations along with boiled or roasted plantain in most parts of the country. They were also allowed small quantities of plantain flour, foofoo and yam flour (amala). This was presented to all patients without sufficient scientific evidence to justify this practice. Studies later were conducted into the glycaemic index (GI) of different bean preparations and also other local meals like yam flour ("amala"), cassava ("garri", "eba") and rice to determine or confirm their suitability. Since then patients have had a little more carbohydrates in their diet. Today some studies have been done looking at GI of other legumes, GI of fruits, cereals and some tubers. Of recent other studies have widened the scope of diet by looking at the glycaemic load also. Unfortunately not much has been done on carbohydrate count, digestibility index and the effects of soups, spices on the GI and Glycaemic Load (GL) of the other staple foods.

Newer concepts in meal planning

To have a better grasp of how meals affect glycaemia several tools have been devised.

In the past decades food were generally classified into "good" or "bad" based mainly on the calorie content alone. Dietetics and nutrition have however advanced and it is now known that other factors like the glycaemic index, digestibility index, carbohydrate count and other aspects also matter. For a particular food may change its suitability based on how it is prepared, how it is eaten and with what it is eaten with.

In summary, there are several factors that affect the impacts of diverse meals in different patients. These include the glycaemic index, the glycaemic load, the digestibility index, the calorie content, the amount of spices and condiments and mode of preparation of the meal. Thus predicting the exact effect of a particular meal in a particular patient can at best be guessed but using these tools gives a better idea.

They will thus be discussed in following sections:

CALORIE CONTENT: Calorie (cal) is the appropriate amount of energy required to raise the temperature of one grain of water by 1°C. The large calorie kcal is the amount of 1kg of water by 1°C; calories have been used to define energy content of food. Food that has high fat content has the highest amount of calorie content, while protein and carbohydrate are similar.

GLYCAEMIC INDEX: Is a measure of how quickly blood glucose levels rise after a particular type of food. Glucose the defining factor has a GI of 100. GI is determined by the amount of digestible carbohydrate (total carbohydrate - fibre). It doesn't take into consideration the amount of carbohydrate consumed. Brown rice has a lower GI than white rice, while short grain white rice has a higher GI than long grain rice. Meals with GIs >69 are regarded as high, while those with GI 56-69 are medium, while those with GI <56 are considered low GI meals which are of great value in keeping blood sugar excursions low in DM and non DM persons alike.

GLYCAEMIC LOAD: Is derived by the GI multiplied by the carbohydrate content of the meal serving. Thus it is possible that a meal serving has a high GI but a low GL. Fresh fruits often have a high GI but low GL due to high water and fibre content.

$GL = GI/100 \times \text{Net Carbohydrate}$

(Net Carboydrate = Total Carbohydrate minus dietary fibre)

Meals with a GL of <11 are considered of low GL, while those with GL 11-19 are labelled medium GL and those > 19 have a high GL.

DIGESTIBILITY INDEX (DI): The digestibility index is a measure of how easily food can be digested. The digestibility index is affected by the physicochemical condition of the food for instance if the food has a high fibre content or if the food has a large amount of undigestible material this can affect the glycaemic index and the digestibility index. Such high fiber or low gistible food has a low digestibility index.

The method of preparation of each food item also affects the digestibility index. For instance when food is uncooked the digestibility index is lower and this in turn reduces the glycaemic index. Also unripened fruits or food have a lower digestibility index than ripened fruits. It is for this reason that most people with diabetes are told to take uncooked or unripened fruits. Some food items also have a lower digestibility index than others for instance proteins have a lower digestibility index than carbohydrates. Complex carbohydrates have a lower digestibility index than simple carbohydrates or sugars. Digestibility can be reduced by adding pectin, guar, fibre etc

CARBOHYDRATE COUNT - This is a method for patients to plan their meals. Helps to track how much carbohydrate is consumed. Typical meals have 45 - 60 grams of carbohydrates.

SPICES AND CONDIMENTS (pepper, Cinnamon, Garlic etc): These are food additives and also used to season meals. Spices also affect the glycaemic index of meals. These they do by various means. For instance peppers are known to reduce the glycaemic indices of meals by decreasing bowel transit time. Some other spices may have the opposite effect that is increasing bowel transit time. Spices and condiments are also known to improve taste of some meals leading to greater speed of consumption of the meal. It is well known that swallowing meals whole without chewing leads to a lower glycaemic index of the meal.

Modern day diet

Currently dieticians, nutritionists and endocrinologists have become more liberal in their food prescriptions with more food options being allowed due to better understanding of the dynamics and properties of food. Thus today the "diabetic diet" principle is being replaced with that of the healthy diet applicable not only to the DM patient but also to his/her family. This has helped to reduce the isolation or apparent discrimination patients felt at the dining tables. Thus there are very few exceptions of food consumed by the DM patient. These few exceptions are soft drinks, sweetened fruit juices, beers, refined sugar (except in minute quantities or when there is hypoglycaemia).

The ADA recommends high fibre, low GL and low GI meals, 3-5 servings of fruits/vegetables, low quantities of saturated and trans fats, 2g salt and minimal simple sugar.

Ironically this kind of meal is the same one the typical African hunter - gatherer consumed for decades in the past though the fruits servings in these people were less. Thus it is not surprising that people are now advocating the caveman or paleo diet which is based on nuts, seeds, vegetables, lean meat and fish. Dairy products are excluded in this type of diet which is believed to best prevent obesity, DM and other cardiovascular diseases.

Examples of healthy local African meals abound. The table will show some local foods and their GIs, GLs and other contents.

Table 22.1:

Food (100g)	Calories	G1%	GL	D1	Fat (g)	Carbohydrate (g)	Protein (g)	Fibre (g)
Apple	40-50	36	6		0.17	13.8	0.26	2.4
Plantain, ripe (half of a medium one is 100g)	122	60	-	-	0.4	31.9	1.3	2.3
Banana (one medium one is 100g)	90-100	75	12.2	-	0.3	12.4	1.09	2.6
Pawpaw, 1 large slices	150-220	86	6.6	-	-	37	2.32	6.8
Pineapple	40	64.5	11.9	-	0	15	0	1.0
Watermelon	25-30	72	3.6		0.15	7.55	0.61	0.4
Mango	80	51	12.8		0.27	17	0.51	1.8
Orange, tangerine	50-60				0.12	11.75	0.94	2.4
Pear	451	60-70				88.9		
Avocado	150				14.3	8.5	1.98	6.5
Grapefruit	40	25	2.8		0.14	10.66	0.77	1.6
Grapes, red/green	70-80				0.16	18.1	0.72	0.9
Cassava, cooked	160-200	60-90	41	-	0.28	38.27	1.5-2.5	1.8
Yam, cooked	118-200	51-80	42		1.53	17-27	4.5	4.1
Potato, cooked, peeled	86-120	50-90	25		0.1	20-25	1.5-2	1.8
Sweet potato, peeled, boiled	76-100	54 - 60	12		0.14	17-20	1.3-1.5	2.5
Sweet potato, mashed, one cup	249				0.46	58.12	4.49	8.2
Rice, white, cooked, 2 cups = 100g	130-150	73	33		0.28	20-30	2.6-2.8	0.4-1.3
Rice, brown, cooked	100-130	68	29		0.9	20-25	2.58	1.8
Kidney beans, cooked, 100g = ½ cup	120-140	24	7		0.5	20-24	8.67	6.4
Soya beans		16	1.4			40-45		
Cowpeas								
Chickpeas, boiled, no oil, ½ cup=100g	96	28	9		0.38	20-22	3.15	5

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Sphaghetti, cooked, 100g = 3/4 cup	150-200	49	16		0.9	30-35	5.78	1.8
Macaroni, cooked, 100g = 3/4 cup	150-200	64	30		0.9	30-35	5.8	1.8
Carrot	40-45	47-62	20		2.4	8	0.7	2.9
Instant Oats, 3 pouches = 90g	300-350	69	6.4		6	57	12	9
Pastry	380-450	59			22	30-40	7	1.3
White Bread, 4 slices = 100g	250-300	72-95	8.4		5.7	45-55	7.8	1.8
Brown bread, 4 slices = 100g	230-250				4.2	40-50	9.7	6.9
Coarse wheat bread	240-250	52	7.7		4.1	40-50	9.1	4.4
Porridge, cereal, dry, 100g = 3pkts	360-380	55-70	6.4		6.1	60-70	15-16	10.9
All Bran, Keebler, 100g = 1.5 cups	420	30-40	8		6	60		3.0
Raisin bran	380							
Corn flakes	400	70-80	23			90		14
Milk, full fat, 100g = 100ml	60	39	5		3.25	4.52	3.2	0
Milk, skimmed	35	37	4		0.18	4.85	3.4	0
Milk, Low fat 2%, 100g = 1/2 cup	56				1.98	5.49	3.95	0
Milk, soya	52	34	4		1.92	4.93	4.5	1.3
Cola drink, eg coca cola	140-160	63	25.2					
Acha Meal	360	35-50	18-24		3.1	74.6	10.5	3
Sorghum, tuwo dawa	360	85	40				4.2	1.25
Millet, tuwo gero	360	86	43				6.4	1.7
Rice meal, tuwo shinkafa	360	95	47					1.0
Semolina, semovita	360	95	47		1.05	70-75	12.68	1.26
Starch, cassava	300-350	98	49					2.25
Cassava, eba	300-350	82	41					2.15
Maize, agidi	350-400	92	46				5.6	1.75

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Peanuts	567	14	2		49.2 4	16.1	25.8	8.5
Rice whole grain	337		23		1.6	76.2	10.0	6
White bread toasted	309	60	9		2.3	61.3	9.3	0.4
White bread	261	75	8.4		2.0	51.7	7.7	0.3
Whole wheat bread	233	74	7.7		1.6	50.8	7.7	0.9
Whole wheat bread toasted	286				2.8	60.2	9.7	1.4
White corn	120-140*	52	20		3-4.2	20-25	3-4	1.9
Yellow corn, cooked	120-130	52	20		3.5-4.8	20-25	3-4	2.0

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