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Review Article

Low Glycemic Index Foods: A Resolution to Ameliorate Type 2 Diabetes

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Abstract

Type-2 diabetes (T2D) disorder is among non-communicable disease with increasing prevalence at a worldwide level. It results once the body doesn't create enough hormones or the body cannot use the hormone it produces to manage the blood glucose at normal range. The critical stage of diabetes results in health complication including heart diseases, stroke, nephrosis, blindness, nerve harm, leg and foot amputations and death. The danger factor for this disease include poor diet especially eating many refined foods, sugary snacks, less intake of fruits and vegetables, lack of physical activities, overweight and obesity. Changing the life-style towards healthy diets including low glycemic index foods, highly intake of fruits and vegetables, regularly physical activities, control of overweight and obesity will greatly crop your probabilities of obtaining this sickness. Therefore to stop this condition, promptly action should be taken seriously concerning the modifiable factors that influence its development like lifestyle and dietary habits. This review summarizes the list of low glycemic index foods which may be employed by T2D patients to mitigate the consequences and reduce the death rate.

Keywords: Low glycemic index foods; Lifestyle; Non-communicable diseases; Type-2 diabetes

Introduction

Diabetes type-2 (DT2) is one of the foremost non-communicable and fastest growing public health problems within the world, could be a condition difficult to treat and expensive to manage. It has been estimated that the quantity of diabetes sufferers within the world will double from this value of about 190 million to 325 million during the following 25 years [1-3]. Individuals with T2D are at a high risk of developing a spread of debilitating complications like disorder such as peripheral vascular disease, nephropathy, changes to the retina and blindness that may result in disability and premature death. It also imposes important medical and economic burdens to the relations and Government. Genetic susceptibility and environmental influences seem to be the foremost important factors to blame for the event of this condition. However, a drastic increase of physical inactivity, overweight, obesity, and T2D has been recently observed the actual fact indicates that obesity and physical inactivity may constitute the most reasons for the increasing burden of diabetes within the developed world [4-10]. Fortunately, because environmental factors are modifiable, disease manifestation from these factors is essentially preventable. Diet is one amongst the key factors now linked to a large range of diseases including diabetes. The quantity and sort of food consumed may be a fundamental determinant of human health. Diet constitutes a vital aspect of the management of diabetes, which can involve diet alone, diet with oral hypoglycemic drugs, or diet with insulin [11-15]. Little relation has been found between total carbohydrate intake and also the risk of T2D [16]. Diet is individualized looking on age, weight, gender, health condition, and occupation etc. The Low Glycemic Index foods are proposed during this critical review to help those who are suffering with T2D to regulate the amount of blood sugar in addition as preventing the diabetes-related complications.

Factors which influence type-2 diabetes

There are number of factors which are attributed to the event of T2D such as sedentary lifestyle [17], physical inactivity [18], smoking [19] and alcohol consumption [20]. The epidemiological studies revealed that obesity is that the most vital risk factor for T2D, which can influence the event of insulin resistance and disease progression [21]. The study by [22] revealed that more than 90% of DT2 attributed by overweight and obesity. Likewise, overweight and obesity are strongly inherited [23]. Obstructive sleep apnea (OSA), as a treatable sleep disorder is prevalent among overweight and obese adults has become a novel, modifiable danger factor relevant to insulin resistance and glucose intolerance and may influence on the development of pre-diabetes

(20%-67%) and T2D (15%-30%), independent of shared risk factors [24-26]. Several studies have indicated that OSA in T2D patients is much more prevalent (36%–60%) than in the general population [27, 28]. Additionally, diet is taken into account as a modifiable risk factor for T2D. Studies have shown that a low-fiber diet with a high glycemic index is positively related to a better risk of T2D [29] and specific dietary fatty acids may affect insulin resistance and therefore the risk of diabetes in varying degrees [30]. Total and saturated fat intake is related to an increased risk of T2D independently of BMI, but higher intake of polyunsaturated fatty acid has the alternative effect, especially among leaner and younger men [31]. Frequent consumption of processed meat, but not other meats, may increase the chance of T2D after adjustment for BMI, prior weight change, alcohol and energy intake [31]. Soft drinks have also been bounded up with increased risk of T2D [32] and metabolic syndrome [33], because they're directly related to BMI [34].

Symptoms of type 2 diabetes

The basic signs and symptoms of diabetes like polyuria, polydipsia and polyphagia show up many times in T2D with very high levels of hyperglycaemia. Severe weight loss is common solely in T2D if remains undetected for a protracted period. Unexplained weight loss, fatigue, restlessness and body pain also are frequent signs of undetected diabetes. Symptoms that are mild or have gradual improvement should also continue to be unnoticed. Other signs include waterlessness, delayed wound healing, genital areas and decreased vision, impotence or impotency, reactive hypoglycaemia, burning, ache numbness on feet, acanthoses nigricans-the presence of velvety dark patches of the neck, arm pit, groin which is an indicator of insulin resistance, itching, tract infection and irritability.

Complications associated with type 2 diabetes

Having a T2D can contribute to short and long term complications such as macrovascular ailments (hypertension, hyperlipidemia, heart attacks, coronary artery disease, strokes, cerebral vascular disease, and peripheral vascular disease), microvascular diseases (retinopathy, nephropathy, neuropathy) and cancers.

Cardiovascular disease

The sickness may additionally be a principal reason in the back of mortality and morbidity in each prediabetes and T2D, the possible mechanism that is oxidative stress that has essential effects on atherogenesis and will make contributions to Low Density Lipoprotein (LDL) oxidation [35]. Prevention of premature cardiovascular events involves complex interactive treatments with antihypertensive, lipid-lowering agents, and routine low-dose aspirin administration [36]. The subsequent listed are CVDs risk factors:

- Established atherosclerotic cardiovascular disease
- Hypertension (blood pressure ≥ 140/90 mmHg or on hypertension therapy)
- High Density Lipoprotein (HDL) cholesterol < 35 mg/dL
- Triglyceride level > 250 mg/dL
- Low Density Lipoprotein (LDL) cholesterol > 70 and calculated 10 year cardiovascular event risk > 7.5 or on lipid lowering therapy

Diabetic nephropathy

Diabetic nephropathy is one amongst the foremost important microvascular complications, whose earliest manifestation is the presence of minute amounts of urinary protein (micro-albumin) which can't be detected in routine urinalysis, but is detectable by specific testing. If the detection will be worn out the sooner phase, the progression of nephropathy will be prevented. This is however, frequently disregarded due to the unawareness that the events urinalysis lacks sensitivity in detecting microalbuminuria [36]. Sexual dysfunction commonly takes place in young-aged diabetic sufferers due to the fact of oxidative stress in cavernous tissues [37].

Diabetic retinopathy

The retina is that the most vascular vicinity inside the body, because it desires excessive oxygen to convert mild into electricity inside the rods and cones. Chronic hyperglycemia can also motive microvascular damage to the retinal vessels, leading to edema and/or hemorrhage into the retina or the humor due to vascular permeability. In fact, dysglycemia often happens prior to the analysis of diabetes patients, because nearly 20% of newly identified diabetes sufferers exhibit proof of retinopathy [38].

Cancers

Epidemiologic proof has validated that diabetes may elevate the risk of most cancers like colorectal cancer [39], liver sickness [40], bladder most cancers [41-42] kidney most cancers [43], which varies having a bet on the sub sites of unique cancers. Mechanisms underlying the association of T2D with cancer threat are as follows: firstly T2D and cancers normally share many danger factors like age, obesity, sedentary lifestyle, smoking, higher consumption of saturated fats, sophisticated carbohydrates, and a few psychology elements [44]. Secondly, hyperinsulinemia is one in every of the foremost characteristics of T2D. Meanwhile it would promote carcinogenesis directly [43] because it may promote the proliferation of colonic tumors in vitro and in experimental animals [45]. Besides, hyperinsulinemia may increase the amount of IGF-1 which has mitogenic and antiapoptotic actions on cancer cells [46] and also the plasma or serum level of IGF-1 is additionally positively correlated with the danger of cancers [47,48].

The role of low glycemic index foods in preventing type 2 diabetes

Glycemic Index (GI): The glycemic index (GI) is one of the nutritional devices that can rate the exceptional trendy of carbohydrates we eat. The index measures how rapidly the carbohydrates throughout a unique meals influence your blood glucose. GI is defined as the location under the glucose response curve after consumption of fifty g carbohydrate from a test food divided by way of the world below the curve after consumption of fifty g carbohydrate from a manipulate meals (either white bread or glucose) [49,50]. It is a classification of the blood glucose-raising achievable of carbohydrate ingredients relative to glucose or bread [51]. Generally, there are three categories of foods supported their GI values: The high-GI foods (> 70), intermediate-GI foods (>55 - < 70) and low-GI foods (< 55) [51]. By choosing low glycemic index foods, the matter of raising glucose is going to be minimized. Additionally, the consumption of high glycemic index food will increase glucose more significantly. It may also cause a higher post-meal blood glucose reading.

Glycemic Load (GL): GL accounts for the way lot of carbohydrate is within the food and the way every gram of carbohydrate within the food raises glucose levels. GL is assessed as: low (< 10), intermediate [49, 53-61] and excessive (> 20). GL may want to be a metric used as a foundation for weight loss, or diabetes control [53].

Mathematically

$$GL = \frac{GI \times \text{available carbohydrate (g)}}{100}$$

Where available carbohydrate = total carbohydrate – dietary fiber.

One unit of GL approximates the glycemic effect of 1 g of glucose. Typical diets comprise from 60-180 GL units per day. Dietary glycemic overload should sooner or later end in increased threat of diabetes and obesity [53]. The GL of a food relies on 2 factors: the GI of the food and therefore the serving size and intrinsically, increases or decreases in GL is often achieved by varying either or both terms. Therefore, a low GL food is achieved by either decreasing the GI of the food or by eliminating most of the carbohydrates from the diet [49].

Low Glycemic index foods: The Glycemic index and glycemic load provide data about how foods have an effect on blood glucose and insulin. The decrease a food's glycemic index or glycemic load, the less it influences glucose and insulin levels. Find the list of the glycemic index and glycemic load for over one hundred frequent meals that it may be consumed and ameliorate T2D. Table 1 under incorporates a listing of varied foods with their respective glycemic index, serving size and glycemic load per serving. From this listing humans ought to pick low glycemic index foods to stop or control type2 diabetes Table 1.

FOOD	Glycemic index (glucose = 100)	Serving size (grams)	Glycemic load per serving
BAKERY PRODUCTS			
Banana cake, made with sugar	47	60	14
Banana cake, made without sugar	55	60	12
Sponge cake, plain	46	63	17
Vanilla cake made from packet mix with vanilla frosting (Betty Crocker)	42	111	24
Apple, made with sugar	44	60	13
Apple, made without sugar	48	60	9
Waffles, Aunt Jemima (Quaker Oats)	76	35	10
Bagel, white, frozen	72	70	25
Baguette, white, plain	95	30	15
Coarse barley bread, 75-80% kernels, average	34	30	7
Hamburger bun	61	30	9
Kaiser roll	73	30	12
Pumpernickel bread	56	30	7

50% cracked wheat kernel bread	58	30	12
White wheat flour bread	71	30	10
Wonder bread, average	73	30	10
Whole wheat bread, average	71	30	9
100% Whole Grain bread (Natural Ovens)	51	30	7
Pita bread, white	68	30	10
Corn tortilla	52	50	12
Wheat tortilla	30	50	8
BEVERAGES			
Coca Cola, average	63	250 mL	16
Fanta, orange soft drink	68	250 mL	23
Lucozade, original (sparkling glucose drink)	95±10	250 mL	40
Apple juice, unsweetened, average	44	250 mL	30
Cranberry juice cocktail (Ocean Spray	68	250 mL	24
Gatorade	78	250 mL	12
Orange juice, unsweetened	50	250 mL	12
Tomato juice, canned	38	250 mL	4
BREAKFAST CEREALS AND RELATED PRODUCTS			
All-Bran, average	55	30	12
Coco Pops, average	77	30	20
Cornflakes, average	93	30	23
Cream of Wheat (Nabisco)	66	250	17
Cream of Wheat, Instant (Nabisco)	74	250	22
Grape nuts, average	75	30	16
Muesli, average	66	30	16
Oatmeal, average	55	250	13
Instant oatmeal, average	83	250	30
Puffed wheat, average	80	30	17
Raisin Bran (Kellogg's)	61	30	12
Special K (Kellogg's)	69	30	14
GRAINS			
Pearled barley, average	28	150	12
Sweet corn on the cob, average	60	150	20
Couscous, average	65	150	9

Quinoa	53	150	13
White rice, average	89	150	43
Quick cooking white basmati	67	150	28
Brown rice, average	50	150	16
Converted, white rice (Uncle Ben's)	38	150	14
Whole wheat kernels, average	30	50	11
Bulgur, average	48	150	12
COOKIES AND CRACKERS			
Graham crackers	74	25	14
Vanilla wafers	77	25	14
Shortbread	64	25	10
Rice cakes, average	82	25	17
Rye crisps, average	64	25	11
Soda crackers	74	25	12
DAIRY PRODUCTS AND ALTERNATIVES			
Ice cream, regular	57	50	6
Ice cream, premium	38	50	3
Milk, full fat	41	250mL	5
Milk, skim	32	250 mL	4
Reduced-fat yogurt with fruit, average	33	200	11
FRUITS			
Apple, average	39	120	6
Banana, ripe	62	120	16
Dates, dried	42	60	18
Grapefruit	25	120	3
Grapes, average	59	120	11
Orange, average	40	120	4
Peach, average	42	120	5
Peach, canned in light syrup	40	120	5
Pear, average	38	120	4
Pear, canned in pear juice	43	120	5
Prunes, pitted	29	60	10
Raisins	64	60	28
Watermelon	72	120	4

BEANS AND NUTS			
Baked beans, average	40	150	6
Black eye peas, average	33	150	10
Black beans	30	150	7
Chickpeas, average	10	150	3
Chickpeas, canned in brine	38	150	9
Navy beans, average	31	150	9
Kidney beans, average	29	150	7
Lentils, average	29	150	5
Soy beans, average	15	150	1
Cashews, salted	27	50	3
Peanuts, average	7	50	0
PASTA AND NOODLES			
Fettucini, average	32	180	15
Macaroni, average	47	180	23
Macaroni and Cheese (Kraft)	64	180	32
Spaghetti, white, boiled, average	46	180	22
Spaghetti, white, boiled 20 min, average	58	180	26
Spaghetti, whole meal, boiled, average	42	180	17
SNACK FOODS			
Corn chips, plain, salted, average	42	50	11
Fruit Roll-Ups	99	30	24
M & M's, peanut	33	30	6
Microwave popcorn, plain, average	55	20	6
Potato chips, average	51	50	12
Pretzels, oven-baked	83	30	16
Snickers Bar	51	60	18
VEGETABLES			
Green peas, average	51	80	4
Carrots, average	35	80	2
Parsnips	52	80	4
Baked russet potato, average	111	150	33
Boiled white potato, average	82	150	21
Instant mashed potato, average	87	150	17

Sweet potato, average	70	150	22
Yam, average	54	150	20
MISCELLANEOUS			
Hummus (chickpea salad dip)	6	30	0
Chicken nuggets, frozen, reheated in microwave oven 5 min	46	100	7
Pizza, plain baked dough, served with parmesan cheese and tomato sauce	80	100	22
Pizza, Super Supreme (Pizza Hut)	36	100	9
Honey, average	61	25	12
Source: [62].			

Table 1: List of various foods their glycemic index, serving size and glycemic load per serving.

Conclusions

The T2D and its associated issues impose heavy fitness burdens global and have an effect on people economically, socially and politically. There are some elements which attributable to the illnesses like bodily in-activities, unhealthy diets and other factors like smoking. It is evident that diabetes can be averted among pre diabetic individuals by upgrades in physical endeavor and weight-reduction plan habits. Such strategies will forestall improvement of diabetic issues to a good extent. The mix of healthful diets especially low glycemic index ingredients is positive when used as mono therapy. Good life-style (healthy foods and exercise) related to negative effects, like weight gain, hypoglycemia, gastrointestinal outcomes or disorder. Hopefully humans will change their life-style towards healthy ingredients collectively with workout to ameliorate continual ailments such as T2Ds.

Recommendations

- High fiber foods are recommended such as whole wheat bread, brown rice, whole cereals, fruits and vegetables, legume and pulses, etc.
- All refined sugars such as glucose, sucrose, and their products (soft drinks, sweets, toffees, etc.) and honey should be avoided, except during severe illness or episodes of hypoglycemia. These foods contain simple sugar, which is easily absorbed causing rapid rise in blood sugar.
- Animal fat such as butter, lard, egg yolk, and different meals excessive in saturated fatty acids and cholesterol need to be decreased to a minimum and be changed with vegetable oils and fish oils in particular polyunsaturated fats.
- Salt should be reduced whether hypertensive or not.
- Protein (fish, meat, beans, crab, crayfish, soya bean, chicken, etc.) and salt are constrained for those with diabetic nephropathy.
- Cigarette smoking need to be prevented through diabetic patients.
- Alcohol has to be taken solely in moderation.
- The items allowed for free consumption include: Water, green leafy vegetables, tomatoes, onions, cucumber, aubergine, peppers, and vegetable salad besides cream. Any company of tea, coffee, or drinks that incorporate very low or no calories.
- For patients too sick to devour stable food, a fluid or semi-solid diet be substituted (papaya, soya bean, custard, etc.).
- Patients handled with insulin or certain oral hypoglycemic agents, e.g., sulfonylureas need to be suggested to eat usually and often to stop hypoglycemia- three ingredients a day plus appropriate snacks in between, e.g., clean fruits.
- Small ingredients spaced over the day, as an alternative than 1 or 2 large meals, are useful in averting post-pyramidal peaks in blood sugar.
- Physical things to do such as walking, riding a bicycle, dancing, running, jumping etc. have to be severely conducted every day in order to manipulate physique weight
- Low Glycemic Index meals must be chosen amongst the sorts' current in the table 1 so as to forestall blood glucose elevation and other ailments related to T2Ds.
- Natural fruit juices are mostly recommended than commercial juices because contain low glycemic index and glycemic load.

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