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Low glycemic index foods: A way to enhance healthy lifestyle and disease management

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Abstract

The current research discusses the health advantages of foods with a low glycemic index such as pulses. Nutritional variables may have an important impact in health and illness. Being an aspect of a healthy way of life, a low-fat, high-carbohydrate diet is typically suggested. The article discusses the potential benefits of incorporating low GI ingredients and modified starches into food products to improve consumer health. Low GI foods have been shown to prevent a wide range of health disorders and are becoming increasingly popular as a new trend in food. The GI concept is based on the difference in blood sugar response after consuming the same amount of carbohydrates from different foods and the potential implications for health, performance, and well-being. There is a significant body of evidence indicating that using low GI foods can have a significant impact on improving metabolic disturbances observed in diabetics. While weight loss can be achieved through various methods of energy restriction, the challenge is to achieve sustainable weight loss and prevent weight 'creep' without increasing the risk of chronic disease. The limited success of low-fat diets has led to research on alternative dietary strategies, including high protein diets and low GI diets.

Keywords: Glycemic index, diabetes mellitus, almonds, nutrition

Introduction

The GI is a numerical value that represents a carbohydrate food's potential to boost blood glucose levels. It is stated as a possibility of the progressing area under the reaction to glucose (AUC) inspired by a piece of meal containing 50 g accessible carbohydrate in comparison to the AUC inspired by a typical point of reference food comprising 50 g glucose or white bread within the same subject. With a global pandemic of T2DM on the rise, particularly in developing countries⁷, it is now known that GI food-based intervention is a crucial instrument in the treatment and prevention of T2DM.⁸ Ironically, in areas of everything where T2DM is prevalent, (Christiani Jeyakumar Henry *et al.* 2021) ^[1]. The significance of carbohydrates in health promotion has long been debated. While some studies have found a relationship between aggregate carbohydrates intake and the risk of succumbing to type 2 diabetes, the glycemic index (GI) has become popular as a potentially valuable tool in the management and prevention of diabetes, lipid disorders, cardiovascular disease, and some forms of cancer. However, there is some controversy regarding the possibility that this emphasis on the GI is justified, particularly in the context of diabetes management and prevention (Chinedum Ogbonnaya Eleazu, 2016) ^[2]. It is also worthwhile to note that the GI rating of fruit can vary depending on its maturity. The starch in a fruit gets converted to sugar when it ripens. Because starch has a greater GI than sugar, as the fruit evolves, its GI decreases. Some foods' glycemic index (GI) can be changed by changes in size or structure. Mashing a potato, for example, can boost the GI value of a 1-inch chunk by 25. Inhaling whole apples, apple the liquid, or apple juice may additionally lead to substantial differences in glucose and insulin opinions. While protein-rich diets can enhance insulin production without changing glucose levels much, the link between sugar and insulin thoughts is not always proportionate. For example, as the total quantity of a carbohydrate diet consumed increases, so may the proportion of insulin released. As a result, albeit the rise in blood glucose can predict the insulin consequence, it is not necessarily a reliable prediction. Insulin responses can rise quicker than glucose responses. Individuals who had diabetes were formerly advised to avoid sucrose consumption since it was expected to considerably boost blood glucose levels. Using white bread as a benchmark, we now know that sucrose has a comparatively low GI (65) as distinguished from glucose (97), fructose (23), and lactose (46).

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Certain components, liked ginger or bread made with sourdough, may engage in substantial impact on GI and hypoglycemia participation. The GI has gained popularity as an important tool for not just planning diabetic meals, but also for general diet planning. But also for the general population's prevention of dyslipidaemia, coronary artery disease, and some forms of cancer. (Pi-Sunyer, F. X. (2002) ^[2] Current therapies for disorders such as bulimia nervosa (BN) and binge eating disorder, also referred to as BED, are ineffective, with only around half of people attaining total abstinence from binge eating by the conclusion of therapy and a 68% abstinence rate after 9 months. Low glycemic index meals, on the other hand, have been demonstrated to reduce insulin resistance, whereas food products with a high g have the reverse impact. A low GI diet has been linked to a lower risk of a variety of health issues, including heart attack, type 2 diabetes, diabetes-related complications, and some malignancies, according to epidemiological research A MEDLINE search Using multiple search phrases, researchers discovered a modest-to-weak link between a high glycemic load diet and the chance of getting cancer, albeit this link was stronger in North American studies and among women. Furthermore, a high glycemic index was linked to a greater probability for every type of cancer in men but not in women, but a high glycemic load was linked to a decreased chance of developing cancer in both men & women. (Janet Treasure *et al.*, 2017; Zeinab Faghfoori *et al.*, 2017) ^[3,4] To summarise, current therapies for the bulimia nervosa (BN) & binge eating disorder, or BED for short, are only somewhat successful, with up to 50% of persons attaining total abstinence via binge eating at the conclusion of therapy. A low glycemic index (GI) diet, on the other hand, has been shown to improve insulin resistance and is linked to a lower risk during heart disease, diabetes, and insulin resistance, alongside a condition called metabolic syndrome, and it also has a lower risk of certain cancers like endometrial, bone, with ovarian cancer. A MEDLINE search using the expressions glycemic index / glycemic load in conjunction with various forms of cancer revealed a slight to weak link between a diet with elevated blood sugar rise (high GI) and the possibility of acquiring cancer, in particular for North American studies among

women. High GI was linked to an increased risk for general cancer in males but not in women. Whereas a high glycemic load (GL) has been correlated to a lower risk of the whole cancer in both men & women, especially those about a lowered body mass index (BMI). Subgroup analysis revealed that the raised cancer risk correlated with high GI was exclusive to men & women with a high BMI, whereas the reduced cancer put at risk associated with increased GL was restricted to men & women with a low BMI. Finally, meta- analyses revealed that having a high GL and a high GI was connected with an elevated risk of bone cancer. Risk factors for breast carcinoma are known to change based on the malignancy's hormone receptor expression. However, there is little research on the links between healthful carbs, glycemic index (GI), as well as glycemic load (GL) and receptor-defined diabetes. According to the previously reported meta-analyses, oestrogen receptor status had no effect on the link between BC risk & healthy GI and GL.

How the Scale Works

The glycemic index (GI) is an index used to quantify how fast and how significantly a carbohydrate-containing diet elevates blood sugar levels compared to just glucose. The GI values carbohydrates on a scale between 0 to 100, via pure glucose constituting the reference value at 100. However, the load of the glycemic index (GL) is an original idea that takes into consideration not just the GI of a dish but also the number of carbohydrates that are present in a normal serving. The GL is computed by doubling the GI of an item by the kilograms of carbs in the portion and multiplying by 100 The GL offers a more realistic representation of a food's influence on the level of glucose in the blood than the GI individually. Low-GL foods suffer from an evaluation of 1-10, platform-GL meals have a level of 11-19, and dense-GL diets have an achieve of 20 or more. It's crucial to remember that although the GI & GL may be valuable tools for stabilising the level of glucose in your blood, they ought not to constitute the only parameters addressed in a balanced diet. Other essential considerations are the vitamin composition, Fibre content, and general equilibrium of the diet.

Table 1: Intervention studies assessing the acute effect of low GI foods or meals

Food	Composition	Effect of health	Reference
Vegetable			
Cauliflower	Mineral Carb Protein Fat Vitamins	Not too healthy for our digestive system Eating the cauliflower during pregnancy and nursing Cauliflower and sugar sugar regulation Antioxidant overload May trigger adverse responses	(Paramita Bhattacharjee <i>et al.</i> , 2018) ^[6] (Mrs.Keya Adak <i>et al.</i> , 2020) ^[8]
Lettuce	Calories Fat Vitamin C Iron Vitamin B6, D Protein	Cardio-protective impacts Anti-cancer harm Anti-adversely affect Immunomodulatory effect Antioxidant qualities	(Min Shi <i>et al.</i> , 2022) ^[10]
Cabbage	Vitamin C Fibre Potassium,	It's filled with antioxidants It's helpful for inflammation It may benefit your heart	(Šamec D <i>et al.</i> ,2016) ^[11]
	Magnesium Vitamins A and K	May protect keep cancer ahead It may help reduce type 2 diabetes	
Mushroom	Protein Fiber Minerals While poor in fats Vitamin B1, B2 B12, C and E	Antimicrobial activity Anticancer action Antioxidant activity Antimutagenic activity	(Anmut Assemie <i>et al.</i> , 2022) ^[12]

Onion	Protein Fiber Carb Fat Vitamin C, B6, Folate B9 Minerals	Antioxidants chase free radicals Related to reducing the danger of cancer Cardiovascular diseases. Defensive action versus coronary heart disease	(Muhammad Sajid Arshad <i>et al.</i> , 2017) [13]
capsicum	Protein Fiber Vitamin C, B6, K1, E A Minerals	Anticancer substance Ant obesity agent Cardiovascular impact Dermatological potential Gastrointestinal qualities Overweight control	(Talia Hernandez Perez <i>et al.</i> , 2020) [14]
Spinach	Protein Fat Carbohydrate Vitamins K, C, A, E Minerals	Lipid-lowering qualities Antioxidant intervention Hypoglycaemic event Anti-inflammatory components Anticancer factor Ant obesity agent	(Joseph L Roberts <i>et al.</i> , 2016) [15]
carrot	Carbohydrates Fat Protein Fibers Vitamin b1,b2,b3,b6	Anti-inflammatory & anti-cancer promise of purple vine Anti- obesity as well as the cardio protective talent of purple carrot Anti-diabetic ambition of the purple carrot	(Hina Rasheed <i>et al.</i> , 2022) [16]
Soya beans	Protein Fat Diatribe Folate Ze Ca Fe	Abdominal physical cholesterol Cancer consequences Osteoporosis Menopausal Cardiovascular disease	(Pingxu Qin <i>et al.</i> , 2022) [17]
Lentils	Protein Fiber Fat carbohydrate Vitamin	Anti-diabetic action of chickpeas Antioxidant ambition of lentils Anti- obesity undertaking of lentil Cardioprotective	(Kumar Ganesan <i>et al.</i> , 2017) [18]
	Minerals	Impact of lentils Antimicrobial activeness of lentils Anticancer athleticism of lentils	
Kidney bean	Protein Fatty acids Dietary fibers Vitamins C Minerals Carbohydrates	Anti-Obesity and Cardioprotective Activity Anti-Diabetic Activity Anti-Oxidant Activity Anti- Mutagenic and Anti-Carcinogenic Activity	(Balwinder Singh <i>et al.</i> , 2016) [19]
Cherries	Protein Carb Fibers Vitamin c Potassium Copper Manganese	Stress, anxiousness, mood, stored information and cognitive features Arthritis and related risk factors Risk characteristics for diabetes and heart attack disease Oxidative stress Exercise generated discomfort, muscle injury, and recovery Inflammation	(Darshan S. Kelley <i>et al.</i> , 2018) [20]
Plum	Carbs Fibers Sugars Vitamin A, C, K. Potassium Copper Manganese	Antioxidant as an anti- inflammatory inflammation Cognitive enhancement Cardiovascular disease chance factors Laxative effect Anti- allergy and antibacterial properties	(Ezinne O. Igwe <i>et al.</i> , 2016) [20]
Grapefruits	Calories Carbs Protein Fiber Vitamin C, A Folate Potassium Ma	Anticancer action Antioxidative activity Anti-inflammatory activity Bone health boosting activity	(Wei-Lun Hung <i>et al.</i> , 2017) [21]
Peach	Carbohydrate Protin Fat fiber	Antimicrobial and anti- parasitic action Antidiabetic occurrence Anti-inflammatory residences Cardiovascular diseases	(Catarina Bento <i>et al.</i> 2020) [22]

	Fatty acid Amino acid Minerals Vitamins	Neurodegenerative diseases Cancer	
Apricots	Carotenoids Phenolic Fat Carbohydrate Fiber Sugars Protein Potassium Vitamin A	Hepatoprotective properties Antibacterial benefits Beneficial adverse effects on the arterial profile Anticancer responses	(Farida Benmeziene-Derradji <i>et al.</i> , 2019) ^[23]
Hummus	Fat Protein Fiber Manganese Iron Vitamin B6	Type 2 Having diabetes Health Factors Cardiovascular Condition Risky Factors Weight Management Hummus to support Healthy Dietary Patterns	(Evan J. Reister <i>et al.</i> , 2020) ^[24]
Peanuts	Fat Protein Carbohydrates Fibre Sugar Magnesium Folate Vitamin Copper	Weight executives Waist curvature Anti Reduce inflammation Antitumor	(Banafsheh Jafari Azad <i>et al.</i> , 2019) ^[25]
Cashew	Protein Fibre Fat Magnesium Iron Carbohydrate	Cardiovascular disease (CVD) High density lipoprotein-cholesterol Systolic blood pressure	(Mohammad Jalali <i>et al.</i> , 2019) ^[26]
Walnuts	Protein Fiber carb iron Vitamin Mineral	Antioxidant Xenophobic-inflammatory Cognition and brain problems Brain illnesses and chronic conditions Type 2 obesity Cardiovascular diseases Body weight	(Abha Chauhan <i>et al.</i> , 2020) ^[27]
yoghurt	Carb Protein Fat fibre Sugar Vitamin B12 Calcium Riboflavin	Cardiovascular illness Hypertension Cancer Diabetes Anti- inflammatory properties Increased immune cell infiltration into metabolic areas	(Ruisong Pei <i>et al.</i> , 2015) ^[28]

Low glycemic foods

Oats

Porridge oats feature a low glycemic index (GI) index of 55, thus offering a healthy morning cereal alternative. This is as they have beta-glucan, a kind of fibre that has various health advantages. One of the primary advantages is its potential for healthier blood cholesterol levels. Additionally, beta-glucan might help consumers feel fuller for longer. Steel dice and oatmeal forms of oats tend to be the finest alternatives since they give the greatest medical advantages and have a good GI score. On the flip hand, fast and instant oats require extensive processing thus presenting a higher GI assessment. Overall, ingesting beta-glucan fibre in porridge oats may be a healthful supplement to one's diet. (Zhang K *et al.*, 2021) ^[29] Beta-glucans, which comprise between a. 73-5.70% during oat grains on an empty stomach, can be identified in their cell's walls of the reproductive tissue and aleurone regions of oats. These beta-glucans endure a good influence on regulating glycemic consequences, and dietary proteins may also play a vital part in this process. Proteins may assist manage the

concentration of glucose by slowing down stomach emptying, boosting insulin production, and influencing carbohydrate digestion. Oatmeal represents not only a pleasant food in its own right but a rich supplier of omega-3 oils & dietary fibre, supplying 4 grams of fibre in each one-cup serving. It is also rich with important minerals including potassium, calcium, magnesium, and iron. As fibre plays a crucial role in digestion, particularly for people with diabetes, including oats into the diet might be an ideal option for a satisfying and heart-healthy breakfast. One may also try utilising oats in dishes like fat-free oat cookies, oat toast, or submitting it in the turkey burger meatloaf. (J Jonnoson *et al.* 2021) ^[30]. Consuming dietary fibre may inhibit the digestion of carbohydrates in the body, which can be helpful in reducing rises in insulin as well as blood glucose levels. For those with diabetes, ingesting fibre-rich meals such as oatmeal periodically every step of the day can assist with retaining regular glucose levels. However, it is crucial to remember that although this may be a beneficial adjunct to other good diabetic practices, proficiency in may not be insufficient on its own in order to restore the glucose levels

in the blood to conventional levels. This material was noted in a review undertaken by (Granfeldt, Y *et al.*, 2000) [31].

Chickpea

Chickpea is a good compiled of protein and fibre, with 11.8 which is grams and 10.6 g per mug, independently. Furthermore, they contain crucial nutrients, exactly the same just like calcium potassium, and vitamin conversely- 9, which is generally called the amino acid folate Chickpeas or garbanzo sap are low GI legumes, along with a score of 28 on capacity. People can implement chickpeas as a cover for potatoes or as rice, which has high GI scores. Pestered chickpeas provide a fast simple snack (Bruso J *et al.*, 2022) [32] chickpeas, also identified by garbanzo sap, are appropriate thanks to adding extra protein and other crucial nutrients to detail reflections. Actually, they are fantastic sources of dietary fibre, iron, phosphorus, as zinc, potassium, magnesium, folate, which is thiamine, and riboflavin in addition to vitamin B- 6. These sap may lower with more details threat for cancer, cardiovascular complaint as well as diabetes, likewise as which restrict increases in glucose situations after reflections. The paragraph outlines the nutritional advantages of chickpeas, which includes their high fibre composition and plenty of antioxidants and minerals comprising iron, phosphorus, zinc, & potassium. It also adds that ingesting chickpeas may lessen the chance of various health conditions such as cardiovascular diseases, cancer, and diabetes. The chapter also includes knowledge regarding the level of carbohydrates in chickpeas and how to assess their influence on blood glucose levels, especially for persons with diabetes. The article states that although chickpeas do include carbs, they also contain beneficial fibre that may help manage blood sugar levels. The glycemic index regarding chickpeas is also discussed, which suggests that they have a modest influence on update-meal electrolyte levels when juxtaposed with high-glycemic meals. Finally, the citation cites a study that it contends consuming a meal that involves chickpeas rather than systems wheat could contribute to lower assign-meal levels of blood sugar and also insulin aspects. Overall, the paragraph emphasises the nutritional advantages of chickpeas and recommends that they may be a healthy supplement to a balanced diet.

Carrots

Carrots are an alternate option for consumers seeking to earn a low-sugar content snack to dip inside hummus. They are also a fantastic source of powerful antioxidants, which may protect the health of body cells from harm. Carrots are adaptable and may be cooked or roasted to be incorporated as a side vegetable in just about any meal. They are recognised for having an acceptable amount of carotenes, particularly carotene, as well as other pigments such as nascent & gamma carotenes. This pigment has been dependent on a decreased incidence of coronary artery diseases and stroke. Baby carrots qualify as a fantastic snack and may be chopped through to add evaluation to meals Shredded carrots may also be used in many recipes, such as a sauce for spaghetti, muffins, and pasta. Glucose, commonly known as glucose levels, originates from the nutrients that you consume and is required by the organism for energy. However, having excessive carbs in the blood may create difficulties and raise the risk of acquiring type-2 diabetes or exacerbate the illness. For persons managing diabetes who are controlling their glucose levels in their blood, carrots are a healthful and nutritious alternative, since they belong to the

category of vegetable products that are not and have an insulin resistance score of 39. As well, tiny portions of carrots may additionally become valued by consumers soon after the ketogenic, or intentionally keto, diet. The glycemic index assesses the amount to which a specific meal may boost the level of glucose in your blood, and because carrots suffer from a relatively low rating, these individuals are a healthy dietary option. Perhaps carrots are a healthy and flexible vegetable that may be eaten in many ways and give multiple health advantages. This Glycaemic Index (GI) belongs to a statistic that illustrates how rapidly a meal may boost the amount of sugar in bloodstream fluid compared to consuming glucose, which has a score of 100. Carrots achieve a GI track of 39, which defines them as an acceptable glycaemic food. This indicates that these substances do not spike your glucose levels as rapidly as other meals with a larger gastrointestinal (GI) score. However, while you cook or are ready for carrots along with cellulose like honey, their GI score might fall. Despite the above, carrots are abundant in cellulose, which slows reduce the duration at which sugar escapes into circulation. Contrary to common root vegetable species consisting of vegetables, carrots suffer from a lower GI assessment. Besides from the GI performance, another significant metric to examine relates to the Glycaemic Level (GL). The GL accepts into consideration the quantity of each serving of a meal and its GI measurement, offering a full picture of its influence on plasma glucose levels. Consuming low-GI meals in significant amounts might elevate the GL. For example, two tiny carrots in raw form have a GL of roughly 8, which defines them as an appropriate glycaemic the load diet. It's crucial to remember that consuming a range of low-GI meals in moderation will assist sustain normal levels of glucose in the blood, particularly for persons with diabetes or anyone controlling their carbohydrates levels. (Dansinger M *et al.*, 2022) [34].

Kidney beans

Beans are a good source of fibre and protein, with each having 13g particularly 11g per cup, consequently Additionally, these beverages are low adhering fat and exceptionally rich in potassium. Kidney beans, in particular, are an excellent partner to meat-based and vegetarian chilli, since they are high in fibre and help lower blood pressure, and then also encourage healthy eyes and skin. Beans are a flexible cuisine that may be used in numerous meals such as stews, soups, or salads, or perhaps as a breakfast on an individual basis. Black beans, for instance, may be served on a fulfil-this-role-grain pita tortilla shell with avocado, or paired with maize kernels and scallions to make filled bell jalapenos. Canned kidney beans may be put to a slaw with squash, fresh corn, onions, and peppers, then mixed with oil and cider vinegar made from apples for a wonderful and healthful lunch. While kidney beans might be toxic when eaten raw or cooked incorrectly, when done correctly, legumes like beans may prove to be a nutritious addition to a diet that is balanced. Beans come in a range of colours and motifs, that involve white, cosmetics, black, red, purple, identified, arranged in stripes, and mottled. From a nutritional standpoint kidney beans are mostly constituted of carbs and soluble fibre, but they additionally act as a good source of protein, boasting over 9 grams of amino acid for every 3.5 oz. (100 grams) of boiling kidney beans. This quantity of protein contributes to 27% of the overall calorie value of kidney beans. Furthermore, 67% of the kidney lentils' materials remain in the water, thus rendering them a nourishing food choice. In conclusion, beans,

especially those made from kidney beans, are a healthy and diverse dietary option that delivers a variety of health advantages. They are a fantastic source of both fibres as well as protein while residing low for fat and rich in k. With an assortment of colours and designs, they may be utilised in many meals and are a perfect complement to a nutritious meal.

Almonds

Almonds have significant health advantages, especially for persons with specific medical issues. Research has demonstrated that incorporating nuts in the diets of persons with diabetes who have type 2 significantly improved glucose levels and lowered the risk of heart attack and stroke. Nuts are additionally believed to lower the amount of LDL cholesterol and raise the quantity of good cholesterol, or HDL, which may avoid the clogging of arteries. They are heart-friendly nuts and may be readily included in a number of suppers, such as salads as well as a garnish for yogurt. However, it is critical to use unsalted almonds in limited amounts while these nuts are filled with fat, which include cholesterol, and calories. Blood pressure, or hypertension, is a key sign of an individual's wellness, and it may be checked by utilising a simple and uncomplicated process. This method includes inflating an inflatable cuff on the armpit to compress the major artery briefly, which prevents blood flow. Once the tension is released, the pressure that is now displayed against the outer layer of the artery gets expressed in two number systems: the systolic level and the pressure at the diastolic valve level. A normal result should be fewer than 120/80 centimetres of mercury, while a systolic value over 120 indicates excessive blood pressure. Installing almonds to one's dietary habits is a convenient means to reap all the advantages of protein from legumes and heart-friendly fatty acids, which are also able to assist reduce elevated blood pressure. However, given that almonds are dense in calories given their high-fat material, it matters to consume them when in limited amounts. Almonds have a low glycemic index, and this is an indication of how carbohydrates impact glucose levels. Consuming foods that have a high glycemic index might impair one's capacity to manage glucose levels, possibly leading to illnesses such as diabetic and metabolic syndrome. Integrating almonds into a person's meals has no significant impact on blood sugar levels, thus rendering them a nutritious and secure choice. Consuming roughly 1 ounce or a quarter of a cup of nuts per day may give health advantages such as potassium, sodium, magnesium, and cellulose, which can help decrease blood pressure levels. In summary, almonds provide a beneficial to the heart and nutritious food option for persons with different medical problems, but it is necessary to eat them in proportion to prevent extra fat and calorie consumption.

Walnut

In an investigation conducted in 2018, scientists studied the association between walnut intake and an increased likelihood of developing type 2 diabetes in a population of 34,121 adults. They discovered that people who had eaten hazelnuts during the preceding thirty minutes were just as probable to develop insulin compared to those who had not taken any nuts throughout this time period. Regardless of being loaded with calorie intake, walnuts haven't got any major effect on weight or substance. They have comparable health advantages as most tree nuts, comprising plant oils known as omega-3 fatty acids, antioxidant vitamin E, magnesium, a mineral folate, and fibre,

which means beneficial to the heart polyunsaturated as well as monounsaturated fats and phytosterols. While these foods have many advantages for heart wellness, it is essential to consume them according to limited amounts due to their high cholesterol and calorie content. The smallest serving of walnuts ought to weigh roughly the size of the palms of one's hand, which contains about 200 calories. Diabetes is a frequent health disorder defined by excessive glucose levels. According to current estimates, the number of diabetes in India is anticipated to reach 98 million people by the year 2030. A well-balanced diabetic diet ought to contain rich in fibre from food, and nuts and seeds constitute an excellent snack choice for those with diabetes. Walnuts, just in specific, have been discovered to help lower the incidence of Type-2 diabetes by establishing insulin resistance, managing the levels of sugar in the blood, and supplying dietary fibres that guarantee the gradual introduction of sugar into the circulation. They likewise possess a low blood sugar level, thereby making them perfect for a diabetic diet. To add walnuts to an obesity-friendly diet, one should get help from a healthcare specialist to identify the optimal portion size. Walnuts are adaptable and may be used in numerous dishes, such as dishes like salads, shakes, and ingredients for cereals. Mixing walnuts with other insulin-dependent-friendly nuts such as nuts and pecans may produce a delightful and healthy trail mix. Overall, combining walnuts into regular meals can be profitable for people with diabetes until later, given that they are enjoyed in moderation.

The glycemic index and weight management

The GI, also known as the glycemic index, is an assessment of how rapidly carbohydrates in meals are broken down and utilised by the body's tissues, which may affect blood sugar levels. Consuming carbohydrate-rich meals with a lower GI may aid with weight control via numerous methods. (Radulian G *et al.*, 2022) ^[35] Research has demonstrated that having a low-GI eating plan may lead to greater energy utilisation at rest as well as post-weight reduction compared to a standard high-GI diet. This implies that the human organism burns calories more frequently at rest while ingesting low-GI meals, which may aid with weight management. Likewise, consuming a digestibility index meal before vigorous exercise had been laid out that it results in a larger percentage of fat being decomposed for vitality juxtaposing them to a relatively high-GI meal. (Aston L *et al.*, 20006) ^[36] This is simply because meals break down and absorb more slowly, giving a continuous flow of energy over an extended amount of time, while high-GI foods may create a quick increase in blood glucose levels followed by a fall, which can result in feelings of exhaustion and a dependency on carbs for energy. Overall, including a number of lower items in the eating plan may be helpful for preserving weight through the promotion of elevated calorie expenditure at rest in addition to movement, and decreasing the dependencies on substances for energy. However, it's necessary to bear in mind that weight administration is complex and calls for a holistic strategy that includes an adequate diet and regular physical activity. Small changes in underlying materials oxidation, or the technique of transforming food into passion, have been laboratory-tested and proven for foreseeing future weight gain. Low glycemic index (GI) carbon dioxide items, which break down and absorb with greater caution, might boost feelings of fullness, decrease appetite, and lessen future food consumption. On the other side, high GI meals have been associated with hunger stimulation and increased calorie

consumption. Meta-analyses of clinical studies have demonstrated that low GI diets may be useful for weight reduction, controlling diabetes, including improving lipid profiles. In a recent research, Ebeling *et al.* discovered that a low glycemic rate diet, which contained more low GI carbs and greater fat consumption, was more feasible and beneficial for patients with higher than normal 30-minute insulin responses following a glucose test. This group achieved quicker body fat reduction over six years and totally avoided weight return over the next 12 months. Surprisingly, no benefits have been reported for individuals alongside a low 30-minute glucose response to insulin. This diet-phenotype connection may help explain conflicting outcomes in other research and emphasise the significance of individualised nutrition methods. In summary, integrating low GI carbs into the diet may boost feelings of fullness, decrease appetite, and improve shedding pounds results. However, customised techniques that investigate factors such as blood sugar levels may be required to attain optimal results

Tips for following a low-GI diet

Low glycemic index (GI) meals may help a broad spectrum of patients, including those coupled with type 1 and second-generation diabetes, overweight or obesity, pregnancy-induced diabetes, polycystic ovary disorder (PCOS), liver illness, and excessive cholesterol levels. Additionally, people who have become overweight and are participating in a weight loss diet will improve compared to swallowing low GI foods as they constantly keep them fuller for a prolonged amount of time. Adjusting to a nutritious diet doesn't require it to be complex. One might start by getting familiar with the GI of different meals and progressively replace high GI items with low GI ones. It is not essential to totally avoid high GI items; one may still take them in conjunction with food that has a low to decrease the primary GI value associated with the meal. To integrate more low-GI products into your eating plan, start by selecting complete, unprocessed commodities such as vegetables, legumes, fruit, and whole grains. These foods possess a lower GI partially because of their dietary fibre enthusiasm, which slows ceaselessly the breakdown and assimilation of carbohydrates. Additionally, integrating healthy protein and fatty acids into meals may contribute further minimise the overall digestive system value. It is crucial to remember that the GI rating of a product may change based on numerous aspects such as whether they are rip cooking style and processing. Therefore, it gets helpful to speak with a dietitian who is certified in creating a customised meal plan. In summary, including more low GI items in the diet may give a variety of health advantages for persons with different health concerns, that includes diabetes, the condition PCOS, cirrhosis of the liver, and high cholesterol. By selecting unprocessed foods that are nutritious and include healthy fatty acids and proteins, one may gradually adjust to a low GI diet while maintaining flavour or diversity. (S. Hatekar M *et al.*, 2022) ^[37] Not all foods with high fibre content have an elevated glycemic index, for instance, as solely items with water-soluble fibre like oats or apples have had an elevated index value. Given that whole wheat bread is more beneficial than white bread, both have practically the same glycemic index score (differing very slightly), along with the identical is true for pasta made with whole wheat and regular spaghetti. This is simply because fibre that is insoluble does not impede digestion as soluble material does, while foods are crushed finely, it may elevate blood

glucose levels comparable to refined items. Any element possessing a GI level of 55 or lower is regarded to possess a low level of glycemic index, whereas anything beyond has been regarded as moderate to high. To fulfil your sweet desires without boosting your blood fructose levels, try switching delicacies like pastries and cookies with yogurt topped and accepting muesli and fruits. Similarly, consider switching sugary beverages with fruit smoothies, meaning that are more satisfying and do not substantially spike glucose levels. Instead of nibbling on fries & potato chips, go for veggies dipped in hummus. You may also try switching processed grains for unpolished whole grains, which includes quinoa, for lunch.

Risk considerations Factor

Factors that is able to boost the likelihood of diminished gastrointestinal bleeding belong to aging, overuse of non-steroidal anti-inflammatory agents which may irritate the intestinal wall of the digestive tract, continuous constipation characterised by straining and haemophilia, and a medical record of conditions that damage the lining of the intestines comprising inflammatory bowel illness, blood or bleeding-related conditions, or a family history involving these disorders. Lower GI bleeding generally comes from bleeding from the stomach and may lead to serious problems such as anaemia in children, respiratory difficulty, heart failure, pneumonia, shock, and eventually death. Therefore, it is most important to obtain medical attention if you encounter any inexplicable blood in the faeces or vomit, as it may suggest a condition that calls for prompt treatment.

Effect of GI

To examine the long-lasting impacts of glycemic indexes (GI) on malnutrition, research studies have been undertaken where the participants were given eating or diets with varying GI values for a duration that ranged from 4.5 days to a whole year. Subsequently, during the duration of this fast, fasting biological indicators, proteolysis responses in established suppers, or biological consequences including the body weight being evaluated. Research by (Radulian G *t al.*, 2022) ^[38] analysed seven studies on the effect of different types of GI on nocturnal glycemia in 98 patients with type 1 diabetes, with from 8 to 20 participants per study. All seven trials found significant changes in blood glucose phases, with low-GI meals and nutrients eliciting reduced glycemic reactions. In addition, three investigations revealed that low-GI meals had a decreased risk of moderate hypoglycemia relative to high-GI foods, however, the time of the events was not documented. Nevertheless, a single experiment claimed that foods with decreased GI are less probable to cause prior hypoglycemia, with each doubling of units in GI retarding hypoglycemia by a minute or so. This conclusion fits perfectly with the generally lower levels of glucose with low-GI food items and meals. In summary, research has indicated that low-GI nourishment and meals elicit lower glycemic reactions and may have a decreased risk of moderate hypoglycemia in comparison to high-GI foods. Interestingly, the exact sequence of the incidents of hypoglycemia may be determined by the nutritional value of the product in question. These results emphasise the potential advantages of introducing low- GI items into the dietary regime for persons with insulin-dependent diabetes. (Jenkins D *et al.* 2002) ^[39] The impact of a food's glycemic index (GI) across tolerance for glucose was tested in healthy participants who were fed breakfasts with varied GI values. The research

indicated that ingesting low GI breakfasts involving pasta and a fibre-rich combined barley meal contributed to considerably reduced glucose response while lunch compared to regard a bite to carbohydrate-rich bread. Moreover, the pasta breakfast referred to significantly reduce the insulin reply at lunch. Contrary to expectations, no significant difference was detected at dinner cereal for breakfast combined with mild chicken ginger. The online increase in glycemia before beginning lunch in this instance of pasta and even barley early morning meals was an indicator of a chronic submersion in water. The GI score may be altered by several elements such as the site of comprehending, including anecdotage, diligence, dressing, and type of bounce. For instance, healthier carbs tend to be associated with higher GI scores, whereas applying an acidic spice like vinegar may reduce a meal's GI score. Amylose additionally comprises a lower GI achieved than a substance known as Recognising the GI of meals is vital for regulating the level of glucose in the blood and treating illnesses such as diabetes. (Östman E *et al.*, 2005) [40].

Measuring the GI

The glycemic index, also known as the GI, is an indicator of how rapidly meals elevate the level of sugar in the blood after ingestion. To assess an agricultural GI, 10 healthy people are served a measured quantity comprising 10-50 grams of carbs after a fast for an entire day, and fluid samples are obtained at 15-30 minutes periodically for the following two hours. The GI value is computed by dividing the area over the curve of the blood glucose responses to the meal by the area beneath the curve of the exact same regard to a reference food, generally, dextrose or white bread, which has a gastrointestinal (GI) index of 100. The less high the GI rating of a meal, the slower the increase in insulin levels and the greater period it requires for your body to process the carbs in the food. (Chalicha E *et al.*, 2022) [41]. The substitute meal impact, commonly referred to as the 2nd meal implementation, is a phenomenon where ingesting a lower-GI meal for the morning leads to better glucose tolerance during the next meal. This impact has been tested in healthy participants fed breakfasts varied in GI characteristics. In research, the impact of various cereal brunches on the tolerance for glucose at an equivalent lunch taken 4 hours subsequently was examined in healthy participants. The investigated meals had a GI through the spectrum of 52-64 and comprised of pasta, an optic- rich combined barley meal, or toast with ginger. A breakfast including carbohydrate original amount of bread was utilised as a reference. In the situation of spaghetti and a grass-grounded breakfast, the lunch generated only 60-70% of the comparable glycemic area after the reference breakfast. The spaghetti breakfast also considerably decreased insulin sensitivity at lunch. However, nothing significant was noted in food in the circumstance of having a bite with light dump ginger. This data would imply that in conjunction with low GI meals, the existence of a difficult glycemic attack may induce an alternative meal impact. The location of processing, the quantity of reused carbs, and the type of cooking may all alter a food's GI score. Foods that undertake a greater amount of processing tend to be given higher GI ratings. The glucose in fruit snaps is destroyed as the fruit matures. Which raises its GI score. The heating procedure may break down carbs, which can also boost the food's GI score. Nevertheless, using an acidic seasoning, like a solution of vinegar may decrease an agricultural GI score. Moreover, foods featuring amylose tend to carry a better GI achievement

than those that included amylopectin. (Brand-Miller J *et al.*, 2022) [42]. Seven studies have studied the influence of GI on supper glycemia in 98 patients with diabetes who have type 1 diabetes, with an average of 8- 20 participants in each study. All seven investigations found significant changes in blood glucose quantity, with low-GI meals eliciting reduced glycemic reactions. Three investigations revealed that the incidence of brief hypoglycemia is more common with low-GI diets than with expensive-GI foods, nonetheless, the exact sequence of the hypoglycemic episodes was not documented. One research found that low-GI meals are more probable to trigger early hypoglycemia, finding a link between GI time and exposure towards hypoglycemia, with each additional unit in GI prolonging hypoglycemia by approximately one minute. This is compatible with the lower total glycemic impact of low-GI meals. To investigate the longer- term impact of GI on nutritional deficiency researchers have provided test subjects meals or diets that varied GI values for lengthy durations that range from 4.5 days to a complete year. Afterwards, they evaluated fasting biomarkers, postprandial effects of standardized meals, or responses to stress, involving body weight. In one research, the impact of a variety of cereal meals on glucose tolerance during a lunch taken four hours later was examined in healthy study subjects. The lunch generated only between sixty percent and seven of the comparable glycemic area after the corresponding meals in the situation of the noodles and a barley- grounded (Slama G *et al.*, 2006) [43].

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