

Millets: A Relief for Diabetics

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ABSTRACT

Diabetes mellitus, a very prevalent disorder of carbohydrate metabolism, in which the body loses its ability to produce or respond to hormone insulin and thereby becomes weak in maintaining proper levels of sugar (glucose) in the blood. Diabetes is a major cause of morbidity and mortality throughout the world. People with type 2 diabetes can control blood glucose levels by taking insulin injections or oral medications. Many studies suggest that this disease can be controlled through diet and exercise. For people with prediabetes and diabetes, dietary choices make important to maintain optimum blood glucose levels and good overall health. Millet is a whole grain which is lower on the glycemic index (GI) than many other grains. That means it raises our blood sugar slowly and gradually instead of in quick spikes. High-fiber, low-GI foods keep blood sugar steady, lower cholesterol, and help us lose weight. In this article various information are collected to find out the effect of millets on lowering the blood sugar level and easing the stress of diabetes through introduction of various millets in our diets.

Keywords: Diabetes, glycemic index, insulin, Millet,

INTRODUCTION

Diabetes mellitus, a very prevalent disorder of carbohydrate metabolism in which the body loses its ability to produce or respond to hormone insulin and thereby becomes weak in maintaining proper levels of sugar (glucose) in the blood. Diabetes is a major cause of morbidity and mortality throughout the world. Though these outcomes are not due to the immediate effects of the disorder. They are instead related to the diseases that develop as a result of chronic diabetes mellitus. These include diseases of large blood vessels (macrovascular disease, including coronary heart disease and peripheral arterial disease) and small blood vessels (microvascular disease, including retinal and renal vascular disease), as well as diseases of the nerves. Type 2 diabetes is far more common than type 1 diabetes, accounting for about 90 percent of all cases. Most patients with type 2 diabetes are adults, often older adults, but it can also occur in children and adolescents. either type of diabetes can occur at any age. It is estimated that there will be a 51% surge in diabetics globally by 2045, from 463 million in 2019 to 700 million in 2045 (1) with type 2 diabetes accounting for about 90% of the total. Preventing acute complications and reducing risk of the disease can be accomplished with medical support and education in patient self-management, as well as promoting beneficial lifestyle modifications, a healthy diet, physical activity and weight loss (2). Dietary interventions are an easy and cost-effective way to provide health benefits to people at risk and those who have been diagnosed with type-2 diabetes, in addition to improving their quality of life (3). People with type 2 diabetes can control blood glucose levels by taking insulin injections or oral medications. Many studies suggest that this disease can be controlled through diet and exercise. For people with prediabetes and diabetes, dietary choices make important to maintain optimum blood glucose levels and good overall health. Rice, wheat and maize are the major staple foods in Asia

and Africa. Of these, polished rice, which is inherently deficient in micronutrients, provides 80% of the energy intake (4) in high rice consuming countries. Grains like rice and wheat, a staple all over India, have high glycemic indices (GI), and are often restricted for people with high blood sugar levels. Consuming a diet primarily consisting of highly processed foods high in carbohydrates and saturated fats has been associated with insulin resistance. Insulin resistance is when the body's cells become less responsive to the hormone insulin, which can greatly influence dietary choices.

When we consume highly processed, high-carbohydrate foods, our body rapidly digests them, leading to a sudden spike in blood sugar levels. The constant surge in blood sugar can strain the body's insulin response, potentially contributing to the development of insulin resistance over time. Growing lifestyle diseases like type 2 diabetes make it imperative to explore dietary solutions that include nutrition and tackle major health issues. Diversifying diets by diversifying staples with the right nutritious and healthy foods can play a major role in reducing multiple health related burdens. Customizing it to the Food System is the Smart Food Triple Bottom Line, defining solutions (5) that in unison are good for human (nutritious and healthy), good for the planet (environmentally sustainable) and good for the farmer (resilient).

MILLETS

Millets are like whole grain; it has a layer of bran and germ. Their layer isn't striped to turn it into refined flour, so it is a whole grain and whole grain takes longer to digest, so it releases sugar slowly in the blood. Millets help keep blood sugar steady and prevent spikes after meals. Nutrition Millets are small-grained cereal crops that are highly nutritious and are hardy rainfed crops grown in less fertile and marginal lands with very low inputs. Compared with other grains, millets are generally more tolerant of poor soils and drought. They can withstand a range of harsh growing conditions and often need fewer inputs like fertilizers and pesticides. Most of the millets are native to India and nowadays it is called Nutri-Cereals. Choice of food is significant as foods with a high glycemic index (GI), like white bread, rice, and watermelon, can cause significant spikes in blood sugar levels. Whereas low glycemic index foods, like whole oats and avocado, digest slowly, resulting in a gradual and controlled increase in blood sugar levels. Based on its grain size and area under production it is categorized into 2 types, i.e., Major and Minor Millets. Ministry of Agriculture and Farmers Welfare has recognized the importance of Millets and declared Millets comprising of Sorghum (Jowar), Pearl Millet (Bajra), Finger Millet (Ragi/Mandua), Minor Millets i.e., Foxtail Millet (Kanngani/kakun), Proso Millet (Cheena), Kodo Millet (Kodo), Barnyard Millet (Sawa/Sanwa/Jhangora), Little Millet (Kutki), Brown top millet and two pseudo millets i.e., Buck-wheat (Kuttu), Amaranth (Chaulai) as "Nutri-Cereals" for production, consumption and trade point of view. Millets are composed of complex carbohydrates which digest slowly in the body.

Millets are gluten free and non-allergenic. Millet consumption decreases triglycerides and C-reactive protein, thereby preventing cardiovascular disease. All millets are rich in dietary fibre. Dietary fibre has water absorbing and bulking property. It increases transit time of food in the gut which helps in reducing risk of inflammatory bowel disease and acts as detoxifying agent in the body. Millets are superfoods that have the superpower of growing in arid regions with high temperatures and are widely used in managing diabetes for having relatively lower GI (20), (depending upon the type of millet and how it is prepared). Choice of food is significant as foods with a high glycemic index (GI), like white bread, rice, and watermelon, can cause significant spikes in blood sugar levels. Whereas low glycemic index foods, like

whole oats and avocado, digest slowly, resulting in a gradual and controlled increase in blood sugar levels There are over 13 varieties of millets grown, with the most common ones being: Jowar (sorghum millet), Bajra (pearl millet), Finger millet (ragi/nachni), Foxtail millet (kangni/kakum), Barnyard millet - Vari, Kuttu (amaranth), Proso (chena), Kodo (kodri/kodro/arikelu)

Here are the glycemic indices of a few millets (6):

| Millet | Glycemic Index | Glycemic Index Classification |
|--------------------------------------|----------------|-------------------------------|
| Jowar (Sorghum millet) | 77 | Medium |
| Bajra (Pearl Millet) | 55 | Low |
| Varagu/Vari (Barnyard millet) | 68 | Medium |
| Ragi (Finger millet) | 104 | High |
| Foxtail millet | 88.6 | High |

Millet is a good source of lignans, flavonoids, phenolics, beta-glucan, sterols, and inulin, biologically-active plant compounds that lower cholesterol, boost immunity, reduce inflammation and the risk of several diseases, including cancer, heart disease and diabetes.^{3,4} Benefits of Millets for Diabetes:

- Millets have a low glycemic index (GI) which means it slows down the absorption of sugar in the blood of the human body instead of rushing quickly as in the case of rice.
- It takes more time for digestion due to the presence of high dietary fiber.
- It keeps satiated for a longer time and doesn't feel a hunger pang between meals.

1. Foxtail Millet

(Kangni\Kakum):

people with type 2 diabetes who consumed a special diet enriched with foxtail millet had lower levels of blood sugar, cholesterol, and triglycerides. Another study found blood sugar levels dropped after eating foxtail millet instead of rice (7).

2. Kodo and Barnyard Millet

(Sanwa):

A recent study indicated the potential benefits of barnyard millet in the diet therapy of diabetics. It exerted positive impact on blood glucose and serum lipid levels in diabetic and non-diabetic volunteers after the dietary intervention study of 28 days (6).

3. Finger Millet

(Ragi\Nachni):

The polyphenols of finger millets were found to be major antidiabetic and antioxidant components. Finger millet-based diets have shown lower glycemic response due to high fiber content and also alpha-amylase inhibition properties which are known to reduce starch digestibility and absorption.

Finger millets are medium GI. As controlling of sugars with a particular grain purely depends on one's body type, one can try ragi and observe the sugars, as in the majority of cases we observed, had shown higher sugars.

4. Pearl Millet

(Bajra):

Pearl millet are known to increase insulin sensitivity and lower the level of triglycerides. It is also very effective for controlling diabetes because of its high fiber content. It gets digested slowly and releases glucose into the blood at a slower rate as compared to other foods. This effectively helps in maintaining the blood sugar level constant in diabetes patients for a long period of time.

5. Little and sorghum millet

(Jowar):

Little millet has medium GI. It gets digested slowly and releases glucose into the blood at a slower rate as compared to other foods. This effectively helps in maintaining the blood sugar level constant in diabetes patients for a long period of time.

STUDIES

Studies have shown that the GI of millets is lesser than white rice, it was also found that consuming millets for a long period of time lowered the fasting and post-meal blood glucose levels significantly in people with diabetes when they were added to well-balanced meals containing proteins and vegetables (8). A significant reduction was also seen in HbA1c levels among people with prediabetes who consumed millets for a long period. Minimally processed millets were more effective in lowering a meal's GI than white rice and refined wheat. Drawing on research from 11 countries, the study (8) shows that diabetic people who consumed millet as part of their daily diet saw their blood glucose levels drop 12-15% (fasting and post-meal), and blood glucose levels went from diabetic to pre-diabetes levels. The HbA1c (blood glucose bound to hemoglobin) levels lowered on average 17% for pre-diabetic individuals, and the levels went from pre-diabetic to normal status. These findings affirm that eating millets can lead to a better glycemic response.

A review published in August 2019 in the *Journal of Food and Nutritional Disorders* looked at the impact of millets on blood sugar levels in 130 healthy adults and 482 adults with type 2 diabetes. Researchers concluded that millets may reduce both fasting and post-meal blood sugar levels in healthy individuals as well as those with type 2 diabetes. (9)

Another study, published in October 2020 in the *Journal of Food Biochemistry*, looked at how flatbread made from millets impacted blood sugar control in 100 people with type 2 diabetes. Half the participants were randomly selected to eat the flatbread with millets for three months; this group had significantly lower blood sugar, cholesterol, and blood pressure at the end of the trial than the control group who didn't eat millets (10).

A previous study of people with prediabetes also found a link between millets and lower blood sugar. This study, published in February 2020 in the *Journal of Food Science and Technology*, found that people with prediabetes had lower fasting blood sugar levels and lower A1C levels after eating foods prepared with millets. (11)

Results of the latest study add to the earlier evidence suggesting that millets may play a role in preventing or managing type 2 diabetes, says Rattan Yadav, PhD, a plant genetics researcher at Aberystwyth University in the United Kingdom.

a small study in Mali found that thick porridges and couscous made from millet took twice as long to digest than similar products made from rice, potato or pasta, leaving study participants more satisfied. (12) Millet's slow digestibility is attributed to its high resistant starch and fibre content (13).

In 2021, researchers analysed 65 studies to get a more precise answer to millet's role in controlling blood sugar in pre and type 2 diabetes.⁷ They found that eating millet daily helped people with diabetes reduce their fasting and post-meal blood sugar levels by 12-15%, allowing them to revert from diabetes to prediabetes. In addition, people with prediabetes lowered their glycated haemoglobin (HbA1c or average blood sugar over two to three months) by 17% and went from prediabetes to normal blood sugar (14).

This systematic review of the studies published in scientific journals has proven that millets can keep blood glucose levels in check and reduce the risk of diabetes. It has shown just how well these smart foods do it," Seetha Anitha, PhD, a senior scientist at the International Crops Research Institute for the Semi-Arid Tropics in Patancheru, India and lead author of the study, said.

Gut health is crucial in preventing diabetes, and studies show that millet promotes gut health. Finger millet, in particular, contains prebiotics that feeds gut bacteria such as *Faecalibacterium* and *Eubacterium*, and probiotic *Bifidobacterium* and *Lactobacillus*, allowing them to generate short-chain fatty acids (SCFAs) with anti-diabetic properties. Finger millet also produces various antioxidants that stop the growth of harmful bacteria, such as *Shigella* and *Clostridium histolyticum*, reducing gut inflammation and the risk of diabetes (15).

CONCLUSION

India is celebrating 2023 as the 'Year of the Millets'. Currently, India is also the second-highest country in the world affected by diabetes. Diet plays an important role in management of diabetes and foods having low glycemic index are gaining more importance as they delay the release of glucose in the blood. Millets have complex carbs, which give satiety and the slow release of sugar keeps you full for a longer time, helping in weight loss too. Millet is a diabetes-friendly grain because it is rich in protein and promotes insulin sensitivity. It is an excellent source of fibre and helps slow the absorption of sugar into the bloodstream. millets play a huge role in controlling blood sugar levels and maintaining a healthy weight Millet's low-medium glycaemic index makes it valuable to reduce the risk of diabetes and to help people with diabetes manage their blood sugar levels. Current studies have found that consuming millets can be beneficial in managing and lowering the risk of diabetes. However, it is essential to note that different millets affect people differently. Millets are high in protein and it facilitates insulin sensitivity. This makes millets diabetes-friendly. Having millet-based meals regularly helps in the long term too. Modifications in the recipes using millets would enhance the taste buds leading to a healthy body and improved lifestyle.

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