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A Study on the Nutritional Benefits of Millets in Reducing Obesity and Risk of Type 2 Diabetes in School-Going Children

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Abstract
Childhood obesity and Type 2 diabetes have emerged as major public health concerns globally, including in India. Unhealthy dietary patterns, sedentary lifestyles, and the widespread consumption of processed and sugary foods have increased the risk of metabolic disorders among school-going children. Millets, a group of ancient grains rich in dietary fibre, micronutrients, and bioactive compounds, have gained attention for their potential role in preventing and managing metabolic disorders. This study explores the nutritional composition of millets and evaluates their role in promoting healthy body weight, improving glycemic control, and reducing the risk of Type 2 diabetes among children. Evidence suggests that millets, owing to their low glycemic index, high fibre content, antioxidants, and diverse nutrient profile, contribute significantly to improved metabolic health. The paper highlights the importance of including millets in children's diets, the initiatives by national boards like the CBSE Sugar Board and FSSAI Oil Board, and the growing need for dietary awareness programs in schools. The findings emphasise that millet-based dietary interventions can serve as a sustainable, culturally appropriate strategy to combat childhood obesity and Type 2 diabetes.

Keywords: Millets, Nutritional benefits, Obesity, Type 2 diabetes, School going childrens.

INTRODUCTION

Childhood obesity and Type 2 diabetes have emerged as major global health concerns, posing long-term risks to the physical, metabolic, and psychological well-being of children. In recent years, the number of school-going children affected by excess body weight and early-onset metabolic disorders has increased at an alarming rate. This rise is largely attributed to rapid shifts in dietary patterns, lifestyle changes, and reduced levels of physical activity. The widespread consumption of calorie-dense, nutrient-poor foods—such as processed snacks, fast foods, sugary beverages, and refined grains—has contributed significantly to poor nutritional quality in children's diets. As a result, many children are experiencing early symptoms of insulin resistance, hypertension, abdominal obesity, and impaired glucose tolerance, conditions that were once considered adult health problems.

These trends highlight the urgent need for preventive nutritional strategies that can improve children's dietary habits and support metabolic health. Among various dietary interventions, the inclusion of

traditional whole grains has gained attention for their positive impact on overall health. Millets, in particular, stand out as a highly nutritious and culturally relevant food group that may help combat the growing burden of childhood obesity and Type 2 diabetes. Furthermore, millets are sustainable crops well-suited to diverse environmental conditions, making them an accessible and affordable dietary option, especially in developing countries like India. Their versatility in traditional and modern food preparations makes them suitable for incorporation into children's daily meals, school lunch programs, and public health nutrition initiatives.

Nutritional Profile and Health Benefits of Millets

Millets provide 320–370 kcal per 100 g, along with substantial amounts of fiber, protein, essential minerals (iron, calcium, magnesium), B-vitamins, and antioxidants. Their low glycemic index promotes sustained energy release, preventing sudden spikes in blood glucose levels and improving insulin sensitivity.

Bioactive Compounds in Millets:

Millets contain polyphenols, flavonoids, and dietary antioxidants that function as:

- Anti-inflammatory agents
- Immune modulators
- Detoxifying compounds
- Regulators of cholesterol and lipid metabolism

These properties contribute to reduced risks of cardiovascular diseases, diabetes, cancers, hypertension, and gastrointestinal disorders.

Glycemic Index of Millets:

The low GI of millets plays a crucial role in:

- Managing blood glucose levels
- Reducing insulin resistance
- Preventing obesity linked to high-GI refined foods

Grain (Millet/ Cereal)	Carbohy-drates(g)	Protein (g)	Fat (g)	Energy (Kcal)	Dietary Fibre (g)	Ca (mg)	Mg (mg)	Zn (mg)	Fe (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Folic acid (mg)
Sorghum	67.7	10.0	1.7	334.1	10.2	27.6	133.0	2.0	4.0	0.4	0.1	2.1	39.4
Pearl Millet	61.8	11.0	5.4	348.0	11.5	27.4	124.0	2.8	6.4	0.3	0.2	0.9	36.1
Finger millet	66.8	7.2	1.9	320.7	11.2	364.0	146.0	2.5	4.6	0.4	0.2	1.3	34.7
Kodo millet	66.2	8.9	2.6	331.7	6.4	15.3	122.0	1.7	2.3	0.3	0.2	1.5	39.5
Proso millet	70.4	12.5	1.1	341.1	-	14.0	153.0	1.4	0.8	0.4	0.3	4.5	-
Foxtail millet	60.1	12.3	4.3	331.0	-	31.0	81.0	2.4	2.8	0.6	0.1	3.2	15.0
Little millet	65.6	10.1	3.9	346.3	7.7	16.1	91.4	1.8	1.3	0.3	0.1	1.3	36.2
Barnyard millet	65.6	6.2	2.2	307.1	-	20.0	82.0	3.0	5.0	0.3	0.1	4.2	-
Wheat	64.7	10.6	1.5	321.9	11.2	39.4	125.0	2.9	4.0	0.5	0.2	2.7	30.1
Rice	78.2	7.9	0.5	356.4	2.8	7.5	19.3	1.2	0.7	0.1	0.1	1.7	9.3

Source: IIMR & Indian food composition tables, NIN – 2017

Health Benefits of Specific Millets:

Millets	Benefits of millets
Foxtail millet (kangani)	It helps specify mineral diseases such as osteoporosis and fractures because they are rich in calcium and proteins.
Sorghum (jowar)	It contains antioxidants that reduce the risk of heart problems and colon cancer. It contains highly soluble fibres that help to reduce type 2 diabetes.
Barnyard millet (sanwa rice)	Accelerates haemoglobin production and maintains healthy red blood cells because they are rich in iron.
Pearl millet (bajra)	Gluten-sensitive people use it. This millet is highly rich in Vitamin E, and it also helps to protect body tissues from free radicals.
Finger millet (ragi)	Helps to strengthen and develop bones and prevent anaemia because they are rich in calcium and polyphenols.
Little millet (sama rice)	It prevents to shoot up the blood glucose levels and helps to control diabetes and reduce the risk of heart disease.
Proso millet (Chena)	It controls depression, lowers blood pressure, and acts as an anti-inflammatory agent. This millet is the choice of cardiac patients because they are rich in thiamine.

Role of Millets in Reducing Obesity:

Millets contribute to weight management due to the following properties:

- High fiber promotes satiety and prevents overeating.
- Low glycemic index prevents fat accumulation.
- High protein increases metabolism and supports muscle development.
- Low fat content reduces overall calorie load.
- Rich micronutrient profile improves metabolic health.

Additionally, millets such as sorghum and pearl millet are rich in iron, preventing anemia and enhancing children's overall vitality.

Poor Dietary Patterns and Rising Childhood Diabetes:

Unhealthy eating habits such as frequent snacking, skipping breakfast, consumption of sugary drinks, and reliance on fast foods are significant contributors to childhood obesity. Increased consumption of sugars and unhealthy fats, accompanied by low physical activity, has led to early onset Type 2 diabetes among children—previously considered an adult disease.

Role of CBSE Sugar Board (2025):

The CBSE Sugar Board aims to raise awareness about the dangers of excessive sugar consumption. Key observations include:

- Children consume 13% (ages 4–10) and 15% (ages 11–18) of daily calories from sugar—far above the recommended 5% limit.
- Schools are advised to install Sugar Awareness Boards displaying sugar content in common foods and healthier alternatives.
- **The board's slogan is:**

"Say No to Sugar – Choose Health, Choose Life."

Role of FSSAI Edible Oil Board:

The FSSAI Oil Board promotes-

- The use of heart-healthy oils
- Reduced consumption of trans-fats
- Avoidance of reused cooking oils
- Awareness about balanced fat intake

This is crucial as the consumption of unhealthy oils contributes to obesity among children.

Millet Promotion in India: Role of IIMR

The Indian Institute of Millets Research (IIMR) under ICAR leads national programs on millet cultivation, research, and utilization. India is the largest global producer of several millets, providing a strong foundation for millet-based dietary interventions in schools.

Global Trends: Childhood Obesity (WHO, 2022)

- 390 million children aged 5–19 were overweight in 2022.
- Overweight prevalence increased from 8% in 1990 to 20% in 2022.
- 35 million children under age 5 were overweight in 2024.
- Nearly half of overweight children under 5 live in Asia, including India.

Discussion:

Evidence strongly supports the nutritional superiority of millets in managing metabolic disorders. Their low GI, rich nutrient composition, and bioactive compounds make them suitable for preventing obesity and Type 2 diabetes in childhood. When combined with awareness initiatives such as the CBSE Sugar Board and FSSAI Oil Board, millet-based dietary interventions can significantly improve dietary behavior among school-going children.

Recommendations:

1. Incorporate millet-based meals into school mid-day meal programs.
2. Create awareness boards on sugar and healthy fats in schools.
3. Conduct workshops for parents and teachers on millet nutrition.
4. Introduce millet-based snacks in school canteens.
5. Encourage agricultural, health, and educational departments to collaborate on millet promotion.

Conclusion

Millets, with their exceptional nutritional profile, offer a sustainable and culturally relevant strategy to combat the rising prevalence of childhood obesity and Type 2 diabetes. Their ability to regulate blood sugar, support healthy weight, and improve gut and metabolic health makes them ideal for inclusion in children's daily diets. Combined with strong public health initiatives and school-based awareness programs, millets can play a transformative role in improving the long-term health and well-being of school-going children.

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