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A Nutritional Food Recommendation Dataset For Diabetic Patients In Gujarat: A Region-Specific Approach To Dietary Planning

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Abstract
Diabetes, particularly Type 2 Diabetes Mellitus (T2DM), is becoming an increasingly serious public health issue in Gujarat. According to the National Family Health Survey (NFHS-5), the percentage of adults with high or very high random blood glucose levels (above 141 mg/dl) has more than doubled in recent years—rising from 5.8% to 14.8% among women and from 7.6% to 16.1% among men between 2015–16 (NFHS-4) and 2019–21 (NFHS-5). This sharp increase highlights the urgent need for region-specific dietary interventions that align with local food habits and cultural preferences. This research paper presents the development of a nutritional food recommendation dataset specifically curated for diabetic patients in Gujarat. The dataset incorporates a wide range of culturally accepted and nutritionally balanced food items that are suitable for diabetes management, emphasizing low glycemic index foods, high fiber content, and controlled carbohydrate intake. Grounded in clinical evidence and existing literature on dietary behavior in Gujarat, the dataset aims to support more personalized diet planning, improve patient adherence, and serve as a foundation for digital health tools such as mobile apps and AI-based dietary recommendation systems tailored to the Gujarati population.
Keywords: *Diabetes Mellitus, Type 2 Diabetes, Nutritional Dataset, Food Recommendation, Gujarati Diet, Dietary Planning, Glycemic Index, Regional Nutrition, Gujarat, Diabetes Management, Culturally Specific Diet, Public Health, Evidence-Based Nutrition, Indian Food Habits, Nutrition Informatics*

INTRODUCTION

Diabetes Mellitus, especially Type 2 Diabetes Mellitus (T2DM), poses a growing public health concern in India, with regional disparities necessitating tailored interventions. Gujarat, a western state with unique cultural and dietary practices, has seen a sharp rise in diabetic prevalence over recent years. The National Family Health Survey (NFHS-5) indicates that the proportion of adults with high or very high random blood glucose levels in Gujarat has more than doubled between 2015–16 and 2019–21. This epidemiological trend underscores the critical need for locally grounded, culturally sensitive nutritional planning. Dietary regulation is a cornerstone of diabetes management. However, most dietary guidelines are either generalized or imported from non-local contexts, often leading to poor patient adherence. To address this, our study focuses on creating a structured, evidence-based, region-specific food recommendation dataset that reflects the Gujarati diet. By classifying traditional and commonly available foods by their glycemic index (GI) and providing nutritional parameters such as carbohydrate, protein,

fat, fiber content, and total caloric value per serving, we aim to enhance the relevance and effectiveness of dietary recommendations for diabetic patients in Gujarat.

LITERATURE REVIEW

This study evaluates the effectiveness of the triglyceride-glucose (TyG) index and atherogenic index (AI) as alternative biomarkers for assessing glycemic control in patients with Type 2 Diabetes Mellitus (T2DM). Conducted in Gujarat with 200 diabetic patients, the study categorized participants based on HbA1c levels to assess the predictive utility of these indices. Results revealed that the TyG index significantly correlated with poor glycemic control and lipid imbalance, demonstrating high predictive accuracy (AUC 0.88). The authors suggest that due to its simplicity and cost-effectiveness, the TyG index can be an efficient substitute for conventional insulin resistance measures such as HOMA-IR, especially in settings with limited resources[1]

This population-based study investigates healthcare-seeking behavior among rural individuals with chronic conditions, including diabetes, across seven Indian states. Using data from over 51,000 individuals, the research identifies that socioeconomic status, insurance coverage, and state-specific health system quality significantly influence outpatient care utilization. It finds that nearly one-fourth of those with chronic conditions did not access outpatient services, and a large majority preferred private care due to perceived quality and accessibility. The study emphasizes the need to strengthen public health systems and insurance schemes to promote equitable access, especially for marginalized populations affected by non-communicable diseases like diabetes[2]

This comparative study conducted in Vadodara and Godhra districts of Gujarat assesses the prevalence of non-communicable diseases (NCDs), including diabetes, and identifies key risk factors. Through a survey of 351 adults, the study reports a higher diabetes prevalence in Godhra (19%) compared to Vadodara (12%). Key determinants of diabetes included high BMI, waist circumference, physical inactivity, smoking, alcohol use, and low intake of fruits and green leafy vegetables. The study underscores the urgent need for community-based surveillance systems and public health strategies to mitigate multiple overlapping risk factors for diabetes in semi-urban populations.[3]

This review article analyzes the global and Indian prevalence of diabetic retinopathy, a severe complication of diabetes affecting vision. The study explains how prolonged hyperglycemia leads to progressive damage in the retinal blood vessels, resulting in visual impairment and potential blindness. It discusses the stages of diabetic retinopathy, from mild swelling of blood vessels to proliferative stages causing retinal detachment. The paper integrates data from organizations such as the WHO, ADA, and IDF, revealing India as one of the most affected countries. It stresses the need for early detection, continuous glucose monitoring, and awareness initiatives to mitigate vision-related complications in diabetic populations.[4]

Although focused on breast cancer prevention, this study offers valuable insights into nutrition-related knowledge, attitudes, and practices among women in Surat, Gujarat, which are relevant to chronic disease prevention more broadly, including diabetes. The cross-sectional survey of 101 women reveals that while knowledge about antioxidant-rich foods is high, actual dietary practices are insufficient. The study highlights a gap between awareness and implementation, indicating the need for behavior-change communication and nutrition education. This work reinforces the role of dietary behavior in non-communicable disease prevention and the importance of culturally adapted nutrition strategies[5]

The study by **Patel et al. (2024)** explores the dietary habits and adherence challenges among Type 2 Diabetes Mellitus (T2DM) patients in a district of western India. It highlights that while patients demonstrate good practices such as avoiding alcohol and processed meats, adherence to recommended dietary modifications remains poor for high-GI foods and sugar-sweetened beverages. Importantly, this study identifies a perception-practice gap, especially around fruit and rice consumption, suggesting that educational interventions must be rooted in local dietary culture to be effective.[6]

The **STARCH study by Joshi et al. (2014)** provides a comprehensive analysis of carbohydrate consumption patterns among Indian diabetics. It concludes that a significant portion of caloric intake still comes from carbohydrates—especially complex carbs, which formed 89.5% of total CHO intake

among diabetics. Despite the higher intake of complex carbohydrates, the total carbohydrate consumption remains well above international recommendations, highlighting the urgent need for culturally specific dietary guidelines in diabetes management.Factors Associated with Consumption of Diabetic Diet Among Type 2 Diabetic Subjects from Ahmedabad, Western IndiaFactors Associated with Consumption of Diabetic Diet Among Type 2 Diabetic Subjects from Ahmedabad, Western IndiaFactors Associated with Consumption of Diabetic Diet Among Type 2 Diabetic Subjects from Ahmedabad, Western India[7]

Patel et al. (2012) conducted a cross-sectional study on T2DM patients in Ahmedabad, Gujarat, focusing on the factors associated with diabetic diet adherence. The study reveals that although 73% of patients report following a diabetic diet, only 35% achieve glycemic control (HbA1c <7%). Educational level, visits to dieticians, and consumption of low-fat dairy emerged as key factors in adherence, underscoring the value of personalized dietary counseling and the role of healthcare systems in providing it.[7]

The pan-India randomized cluster study by **Nagarathna et al. (2020)** delves into the dietary patterns associated with diabetes prevalence and glycemic control. The study finds a strong association between poor dietary choices—such as frequent intake of milk, meat, junk food, and low fiber—and elevated fasting and postprandial blood glucose levels. These findings emphasize the need for high-fiber, plant-based diets and limiting animal products and processed foods in diabetic meal planning.[8]

In their international comparative study, **Heald et al. (2005)** examine the impact of migration and dietary transitions on the insulin-like growth factor (IGF) system. The research compares Gujaratis in India and the UK and finds that increased fat intake correlates with elevated IGF-I and IGFBP-3 levels, potentially increasing diabetes and cardiovascular risk. This study underscores how environmental and dietary changes post-migration significantly affect metabolic health markers.[9]

Mitra (2007) provides a broad epidemiological overview of rising diabetes prevalence in India, especially in rapidly urbanizing regions. The study attributes this trend to a shift from traditional diets to Westernized food habits rich in fats and refined carbohydrates. It warns of the dual burden of over- and under-nutrition and calls for public health measures tailored to both rural and urban populations with an emphasis on preventing lifestyle diseases through diet.[10]

The study by **Tripathy et al. (2018)** investigates the nutritional status of sedentary employees in Gujarat and reports a high prevalence of obesity and poor dietary patterns among them. The research reinforces the idea that sedentary lifestyles and improper food habits, even among educated populations, are fueling the rise of non-communicable diseases including diabetes. This highlights the need for dietary awareness and lifestyle interventions at the workplace level.[11]

Hentschel et al. (2017) take a human-centered approach to understand how urban Indian households manage diabetic diets. Their qualitative research uncovers that food choices are heavily influenced by cultural beliefs, familial roles, and limited access to consistent medical guidance. The study argues for the co-design of culturally aligned digital tools to improve diabetes management, rooted in everyday lived experiences of patients.[12]

Mani (1998) explores rural-urban differences in dietary patterns and their implications for diabetes prevalence in Gujarat. The paper finds that urbanization has led to greater adoption of fast foods and a decline in traditional, fiber-rich diets. It advocates for retaining aspects of traditional food practices, such as whole grains and legumes, in diabetes diets, given their nutritional benefits and lower glycemic impact.[13]

The **DASH study and NFHS-5 data** referenced in various papers highlight a worrying trend: the prevalence of diabetes has grown significantly across urban centers in Gujarat. These surveys suggest that awareness about the complications of diabetes and its dietary management remains low, and that regional dietary behavior plays a critical role in this trend. This supports the argument for a culturally contextualized dietary dataset tailored to Gujarati food habits to help bridge the perception-practice gap in diabetes care[1]

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Nutritional Food Dataset for Diabetic Patients in Gujarat (Classified by Glycemic Index)

🔵 **Low GI Foods (GI ≤ 55) — Recommended for Regular Consumption**

Food Item	Portion Size	Carbs (g)	Protein (g)	Fat (g)	Fiber (g)	Calories	Remarks
Bajra (Pearl Millet) Roti	1 roti (60g)	27	3.6	1.7	2.5	140	High fiber, local staple
Moong Dal (boiled)	1 cup (150g)	20	14	1.2	2.8	130	Protein-rich legume
Chana Dal	1 cup (150g)	30	13	3.0	4.2	180	Very low GI
Karela (Bitter Gourd)	1 cup (100g)	4	2.0	0.2	2.6	30	Natural hypoglycemic effect
Tinda	1 cup (100g)	5	1.5	0.1	2.0	35	Low starch vegetable
Guava	1 medium (150g)	14	1.5	0.4	4.0	70	High fiber, low sugar
Apple	1 medium (150g)	19	0.5	0.2	3.0	80	Low GI fruit
Sprouted Moong Salad	1 bowl (100g)	12	7.0	0.5	2.5	90	Rich in enzymes & fiber
Flax Seeds	1 tbsp (10g)	2	1.5	3.0	2.8	55	Omega-3 ALA, lowers glucose
Almonds (Raw)	10 pcs (15g)	6	3.0	7.0	2.0	110	Good fat for satiety

Medium GI Foods (GI 56–69) — Consume in Moderation

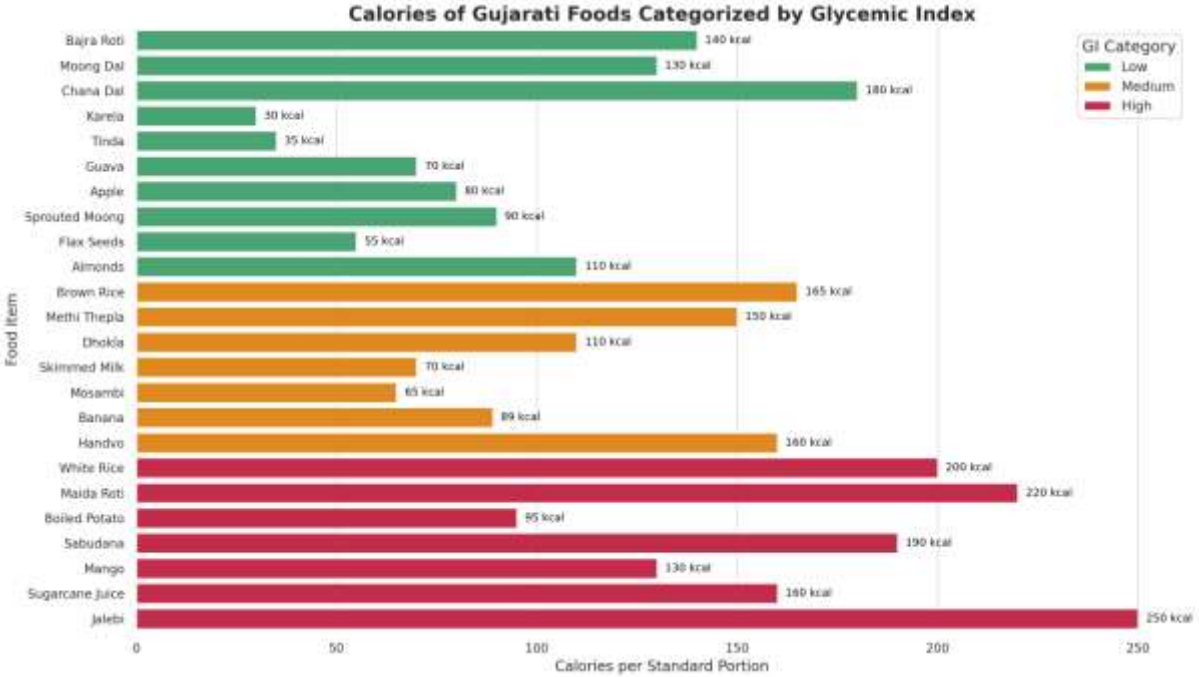
Food Item	Portion Size	Carbs (g)	Protein (g)	Fat (g)	Fiber (g)	Calories	Remarks
Brown Rice (Steamed)	1 cup (150g)	35	3.0	1.2	1.8	165	Better than white rice
Methi Thepla (Low Oil)	1 piece (60g)	20	4.0	3.5	2.5	150	Traditional, fiber-rich
Dhokla (Besan)	1 piece (60g)	15	4.0	2.5	1.5	110	Fermented, moderate GI
Milk (Skimmed)	1 glass (200ml)	12	6.0	0.5	0.0	70	Calcium source
Sweet Lime (Mosambi)	1 medium (180g)	16	1.0	0.2	2.4	65	Vitamin C, eat whole not juice
Banana (small)	1 piece (100g)	23	1.1	0.3	2.6	89	Prefer unripe in small quantity
Handvo (homemade)	1 piece (100g)	22	5.0	4.0	2.0	160	Protein-fiber dense if baked

High GI Foods (GI ≥ 70) — Limit or Avoid

Food Item	Portion Size	Carbs (g)	Protein (g)	Fat (g)	Fiber (g)	Calories	Remarks
White Rice	1 cup (150g)	44	4.0	1.0	0.6	200	High GI, low fiber
Maida Roti/Paratha	1 piece (80g)	35	3.5	4.0	0.5	220	Refined carbs, avoid

Potato (boiled)	1 med (100g)	21	2.0	0.1	2.0	95	Avoid in regular use
Sabudana (Tapioca)	1 cup (100g)	40	1.0	0.2	0.5	190	Very high GI
Mango (ripe)	1 medium (200g)	31	1.0	0.4	2.0	130	Occasional in small amounts
Sugarcane Juice	1 glass (250ml)	40	0.5	0	0	160	Causes a glucose spike
Jalebi (1 pc)	1 piece (50g)	40	0.5	10	0.3	250	Avoid completely

Graphical Representation of the Dataset Based on Calories



Here is an enhanced, visually appealing bar chart that displays the caloric values of various Gujarati food items categorized by Glycemic Index (GI) level. The colors clearly differentiate:

- 🟢 **Low GI** (diabetic-friendly)
- 🟠 **Medium GI** (consume with caution)
- 🔴 **High GI** (limit or avoid)

CONCLUSION

The escalating prevalence of Type 2 Diabetes Mellitus in Gujarat underscores a pressing public health challenge that calls for context-specific, culturally relevant solutions. This research addresses the urgent need for dietary interventions aligned with the traditional food patterns and nutritional realities of the Gujarati population. Through the development of a region-specific nutritional food recommendation dataset, categorized by glycemic index and supplemented with detailed macro- and micronutrient profiles, this study provides a scientifically grounded tool for more effective diabetes management.

The curated dataset not only bridges the gap between generalized dietary guidelines and local eating habits but also aims to improve patient adherence by including familiar and culturally accepted foods. By prioritizing low-GI, high-fiber, and nutritionally balanced options, this resource supports healthcare professionals, caregivers, and digital health innovators in designing personalized dietary plans and tools that are both effective and sustainable.

Furthermore, the insights gained from the literature highlight the multifaceted nature of diabetes care—where knowledge, behavior, healthcare access, and socioeconomic factors interplay. This reinforces the necessity of integrating nutrition informatics, behavioral change strategies, and public health policy to enhance outcomes.

Future directions include validating this dataset through clinical trials, expanding it to cover seasonal variations in food availability, and integrating it into AI-based dietary recommendation platforms tailored for Gujarati-speaking users. With its strong empirical and cultural grounding, the dataset stands as a valuable step toward precision nutrition and improved quality of life for diabetic individuals in Gujarat.

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