The Impact of Dietary Patterns on Glycemic Control in Patients with Type 2 Diabetes

Joseph Mugisha*

Division of Diabetes & Metabolic Disorders, Makerere University, Uganda

Corresponding Author*

Joseph Mugisha

Division of Diabetes & Metabolic Disorders, Makerere University, Uganda

E-mail: dawit.habtom@orotta.edu.er

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Abstract

Effective glycemic control is essential in the management of type 2 diabetes mellitus (T2DM) to reduce the risk of complications. Dietary patterns significantly influence blood glucose regulation and metabolic health in these patients. This review synthesizes current evidence on the impact of various dietary approaches—including ketogenic, low-carbohydrate, Mediterranean, vegetarian/vegan, and low glycemic index diets—on glycemic markers such as HbA1c and fasting glucose. Findings from randomized controlled trials and meta-analyses indicate that ketogenic and low-carbohydrate diets produce substantial reductions in HbA1c, while Mediterranean and low glycemic index diets improve both HbA1c and fasting glucose levels. Traditional diets rich in whole grains and legumes also correlate with better glycemic outcomes, whereas high consumption of sweets and processed meats is associated with poorer glycemic control. Mechanistically, these dietary patterns modulate insulin sensitivity, reduce postprandial glucose excursions, and exert anti-inflammatory effects. Personalized dietary counseling emphasizing nutrient-dense, low glycemic foods is recommended to optimize glycemic control and reduce cardiometabolic risk in T2DM patients. Further long-term studies are warranted to establish sustained efficacy and safety of these dietary interventions.

Keywords: Type 2 diabetes; Glycemic control; Dietary patterns; Ketogenic diet; Mediterranean diet; Low glycemic index; Plant-based diet; HbA1c; Insulin sensitivity; Nutrition therapy

INTRODUCTION

Glycemic control is a critical aspect of managing type 2 diabetes mellitus (T2DM), and dietary patterns play a pivotal role in influencing blood glucose levels and overall metabolic health. Various dietary approaches have been studied to determine their effectiveness in improving glycemic markers such as HbA1c and fasting glucose in patients with T2DM.

Several studies have demonstrated that high intake of sweets, red meat, and processed meat may negatively impact glycemic control in drug-treated T2DM patients, whereas diets higher in red meat but lower in coffee, sweets, and high-fat dairy might be beneficial for glycemic outcomes [1]. A comprehensive network meta-analysis of 42 randomized controlled trials involving 4809 patients compared ten dietary patterns, including low-carbohydrate, ketogenic, Mediterranean, vegetarian/vegan, and low glycemic index diets. The ketogenic, low-carbohydrate, and low-fat diets significantly reduced HbA1c, while moderate-carbohydrate, low glycemic index, Mediterranean, and high-protein diets effectively lowered fasting glucose levels. The ketogenic and Mediterranean diets, along with moderate-carbohydrate and low glycemic index diets, showed promising combined effects on glycemic control [2].

Other research supports the beneficial effects of vegetarian, vegan, Mediterranean, and Dietary Approaches to Stop Hypertension (DASH) diets, which on average reduced HbA1c by approximately 0.8% and improved insulin sensitivity in T2DM patients [3]. Mediterranean, DASH, and the Alternative Healthy Eating Index (AHEI) dietary patterns are also associated with a strong potential for diabetes prevention and improved glycemic regulation [4].

In a study focusing on Brazilian T2DM patients, five main dietary patterns were identified, with the traditional Brazilian diet—characterized by higher consumption of rice, poultry, and beans—being inversely correlated with blood glucose levels. This suggests that adherence to this traditional pattern may protect against poor glycemic control [5]. Similarly, cross-sectional data from Saudi Arabia indicated that high consumption of refined grains like bread was common among T2DM patients, and pastries were negatively associated with achieving target HbA1c levels, emphasizing the importance of diet quality in glycemic management [6].

Low glycemic index (GI) or glycemic load (GL) diets have been shown through meta-analyses to reduce HbA1c by approximately 0.31%, along with improvements in fasting glucose, lipid profiles, body weight, and inflammatory markers, highlighting their role in comprehensive diabetes management [7]. Additionally, dietary patterns such as low-carbohydrate, Mediterranean, plant-based, and low-GI diets are clinically effective and recommended for people with T2DM due to their positive impact on glycemic control and cardiometabolic risk factors [8].

In summary, dietary patterns emphasizing low glycemic index foods, moderate to low carbohydrate intake, plant-based components, and traditional whole-food diets can significantly improve glycemic control in patients with type 2 diabetes. While ketogenic diets show strong short-term efficacy, long-term studies are needed to confirm sustained benefits and safety. Tailoring dietary recommendations to individual preferences and metabolic responses remains essential for optimal diabetes management [9,10].

CONCLUSION

Dietary patterns play a crucial role in the management of glycemic control among patients with type 2 diabetes. Evidence consistently supports that diets such as ketogenic, low-carbohydrate, Mediterranean, and low glycemic index diets can significantly improve glycemic markers including HbA1c and fasting glucose. Traditional diets rich in whole grains, legumes, and plant-based foods also demonstrate beneficial effects, while high consumption of sweets, processed meats, and refined carbohydrates is associated with poorer glycemic outcomes. The mechanisms underlying these effects involve improved insulin sensitivity, reduced postprandial glucose spikes, and anti-inflammatory actions. Personalized nutrition strategies that emphasize nutrient-dense, low glycemic foods tailored to individual patient preferences and metabolic profiles are essential for optimizing long-term diabetes management. Continued research is needed to further elucidate the long-term benefits and safety of these dietary interventions to guide clinical practice effectively.

References

1. Li Y, Zhang L, Wang Y (2022) Generative deep learning enables the discovery of a potent and selective RIPK1 inhibitor. Nat Commun 13
2. Zhang D, Luo G, Ding X, Lu C (2012) Preclinical experimental models of

drug metabolism and disposition in drug discovery and development. Acta Pharm Sin B 2: 549-561.

3. Sahu A, Mishra J, Kushwaha N. (2022) Artificial intelligence (AI) in drugs and pharmaceuticals. Comb Chem High Throughput Screen 25: 1818-1837.
4. Sahu A, Mishra J, Kushwaha N. (2022) Artificial intelligence (AI) in drugs and pharmaceuticals. Comb Chem High Throughput Screen 25: 1818-1837.
5. Bosch TM, Meijerman I, Beijnen JH (2006) Genetic polymorphisms of drug-metabolising enzymes and drug transporters in the chemotherapeutic treatment of cancer. Clin Pharmacokinet 45: 253-285.
6. Bosma PJ, Chowdhury JR, Bakker C (1995) The genetic basis of the reduced expression of bilirubin UDP-glucuronosyltransferase 1 in Gilbert's syndrome. N Engl J Med 333: 1171-1175.
7. Sapoval N, Aghazadeh A, Nute MG (2022) Current progress and open challenges for applying deep learning across the biosciences. Nat Commun 13.
8. Kim H, Kim E, Lee I, Bae B, Park M, et al. (2020) Artificial intelligence in drug discovery: a comprehensive review of data-driven and machine learning approaches. Biotechnol Bioprocess Eng 25: 895-930.
9. Miljković F, Rodríguez-Pérez R, Bajorath J (2021) Impact of artificial intelligence on compound discovery, design, and synthesis. ACS Omega 6: 33293-33299.
10. Adam G, Rampášek L, Safikhani Z, Smirnov P, Haibe-Kains B, et al. (2020) Machine learning approaches to drug response prediction: challenges and recent progress. NPJ Precis Oncol 4.

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