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Dietas basadas en plantas como alternativa para la prevención de la diabetes tipo 2 Revisión de la literatura

Plant-Based Diets as an alternative for the prevention of type 2 diabetes Literature review

As dietas à base de plantas como alternativa para a prevenção da diabetes tipo 2 Revisão de literatura

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Resumen

La diabetes tipo 2 representa un desafío creciente para la salud pública a nivel mundial. Entre los factores modificables que pueden influir en su prevención, la dieta ha recibido especial atención. Esta revisión bibliográfica exploró la literatura científica disponible sobre el posible papel de las dietas basadas en plantas como alternativa preventiva para esta enfermedad. Diversos estudios observacionales y ensayos clínicos reportan asociaciones entre los patrones dietéticos basados en plantas y una menor incidencia de diabetes tipo 2, lo que podría explicarse por mejoras en la sensibilidad a la insulina, la reducción de la inflamación crónica y un mejor control del peso corporal. También se han reportado beneficios derivados del consumo de fibra, antioxidantes y fitonutrientes presentes en los alimentos de origen vegetal. Si bien los resultados son prometedores, la evidencia presenta limitaciones metodológicas y no permite extraer conclusiones definitivas. No obstante, promover el consumo de alimentos de origen vegetal podría representar una estrategia dietética saludable con potencial para prevenir enfermedades metabólicas crónicas como la diabetes tipo 2.

Palabras Clave: dieta basada en plantas; diabetes tipo 2; prevención de enfermedades; regulación metabólica; función de la insulina; inflamación sistémica.

Abstract

Type 2 diabetes represents a growing public health challenge worldwide. Among the modifiable factors that may influence its prevention, diet has received special attention. This literature review explored the available scientific literature on the potential role of plant-based diets as a preventive alternative for this disease. Several observational studies and clinical trials report associations between plant-based dietary patterns and a lower incidence of type 2 diabetes, which could be explained by improvements in insulin sensitivity, reduction of chronic inflammation, and better body weight control. Benefits have also been reported from consuming fiber, antioxidants, and phytonutrients found in plant-based foods. While the results are promising, the evidence has methodological limitations and does not allow for definitive conclusions. Nevertheless, promoting the consumption of plant-based foods could represent a healthy dietary strategy with potential for preventing chronic metabolic diseases such as type 2 diabetes.

Keywords: plant-based diet; type 2 diabetes; disease prevention; metabolic regulation; insulin function; systemic inflammation.

Resumo

A diabetes tipo 2 representa um crescente desafio de saúde pública em todo o mundo. Entre os fatores modificáveis que podem influenciar a sua prevenção, a dieta tem merecido especial atenção. Esta revisão bibliográfica explorou a literatura científica disponível sobre o potencial papel das dietas à base de plantas como alternativa preventiva para esta doença. Vários estudos observacionais e ensaios clínicos relatam associações entre padrões alimentares à base de plantas e uma menor incidência de diabetes tipo 2, o que pode ser explicado por melhorias na sensibilidade à insulina, redução da inflamação crónica e melhor controlo do peso corporal. Foram também relatados benefícios com o consumo de fibras, antioxidantes e fitonutrientes encontrados em alimentos de origem vegetal. Embora os resultados sejam promissores, as evidências apresentam limitações metodológicas e não permitem conclusões definitivas. No entanto, promover o consumo de alimentos de origem vegetal pode representar uma estratégia alimentar saudável com potencial para prevenir doenças metabólicas crónicas, como a diabetes tipo 2.

Palavras-chave: dieta baseada em vegetais; diabetes tipo 2; prevenção de doenças; regulação metabólica; função da insulina; inflamação sistémica.

Introduction

Type 2 diabetes is one of the most prevalent chronic metabolic diseases of the 21st century, with a significant impact on public health globally (Saeedi et al., 2019). Its increasing incidence represents a challenge for healthcare systems, especially in countries experiencing rapid nutritional and demographic changes (Vázquez Morales et al., 2024). It is estimated that millions of people worldwide live with this condition, and many more are at risk due to modifiable factors such as a sedentary lifestyle, obesity, and especially poor eating habits. In this context, there is growing interest in investigating nutritional alternatives that may contribute to the prevention of type 2 diabetes. One of the approaches that has captured the attention of the scientific community is the plant-based diet, which prioritizes the consumption of plant-based foods such as fruits, vegetables, legumes, whole grains, nuts, and seeds, and limits or eliminates the consumption of animal-based and ultra-processed products. This dietary model has been associated with various metabolic benefits, including improved glycemic profiles, body weight regulation, decreased systemic inflammation, and a strengthened gut microbiota (McMacken & Shah, 2017; Frattari et al., 2022), all of which are relevant factors in the prevention of metabolic diseases such as type 2 diabetes.

Numerous observational studies and clinical trials have reported associations between predominantly plant-based dietary patterns and a lower incidence of type 2 diabetes. For example, the Adventist Health Study 2 has been a benchmark in this field, showing a progressive decrease in the prevalence of the disease with reduced consumption of animal products (Jardine et al., 2021). Likewise, other research has suggested that a higher intake of dietary fiber, antioxidants, phytonutrients, and unsaturated fats, common in plant-based diets, may play an important role in modulating insulin sensitivity and preventing metabolic dysfunctions (Silva, Anghinoni & Gomes, 2024). However, despite the growing body of evidence, findings in the literature are not entirely consistent, due to methodological differences between studies, variability in the definition of what constitutes a "plant-based diet" (Pointke & Pawelzik, 2022), and the influence of contextual factors such as lifestyle, genetics, socioeconomic status, or long-term adherence to this type of diet. These limitations make it necessary to interpret the results with caution and avoid categorical conclusions, especially when a strict systematic review methodology has not been applied. In this context, a bibliographic review such as the one presented in this paper allows for a broad and thoughtful exploration of the main trends found in the current scientific literature. It does not aim to achieve the exhaustiveness required by systematic protocols, but rather aims to identify common patterns, relevant contributions, and knowledge gaps. This approach is particularly useful in topics where research is constantly evolving, and where the diversity of methodological designs can enrich the overall understanding of the phenomenon studied.

Interest in plant-based diets has also increased due to their potential positive impact on other areas of health and sustainability. On the one hand, their association with a reduction in cardiovascular disease, some types of cancer, and lipid metabolism disorders has been documented. On the other hand, their smaller ecological footprint compared to diets focused on meat and animal products has led many international organizations to promote this dietary model as a healthy and environmentally responsible option (Pointke & Pawelzik, 2022; Goldman et al., 2024). In this sense, studying its application as a preventive tool for type 2 diabetes allows us to integrate individual and collective health perspectives, as well as the ecosystem approach. It is also important to consider that adopting a plant-based diet involves more than simply modifying the contents of one's plate. It requires behavioral changes, access to fresh and varied foods, adequate nutritional education, and, in many cases, social and cultural support (Otero et al., 2024). In regions with high levels of food insecurity or with food systems dominated by ultra-processed products, these

changes can represent a considerable challenge. Therefore, it is essential to analyze the feasibility, acceptability, and sustainability of this model in different population contexts, especially those most vulnerable to the development of chronic non-communicable diseases.

This literature review is therefore intended as an exercise in synthesis and reflection on the relationship between a plant-based diet and the prevention of type 2 diabetes, considering both the pathophysiological aspects and the social, cultural, and environmental determinants that influence its application. It offers an integrative perspective that allows us to understand the opportunities and challenges posed by this nutritional approach, as well as to guide future research and health promotion strategies from a more comprehensive and sustainable nutritional perspective. The following sections will present the main findings reported in the literature, with emphasis on the proposed mechanisms by which a plant-based diet could positively influence the prevention of type 2 diabetes, as well as the methodological limitations of the reviewed studies and the practical implications for public health and food education.

Methodology

Materials and Methods

This paper is a narrative review of the scientific literature on the relationship between a plant-based diet and the prevention of type 2 diabetes. The objective was to compile and critically analyze representative scientific studies that address the topic from diverse perspectives.

A broad literature search was conducted in academic databases such as PubMed, Scopus, Web of Science, Google Scholar, and Scielo. Combinations of keywords such as "plant-based diet," "plant-based nutrition," "type 2 diabetes," "prevention," "insulin sensitivity," and "chronic inflammation" were used. No restrictions were applied based on language, study type, or specific dates, allowing for the inclusion of relevant studies from diverse contexts and approaches. Previous reviews, observational studies, clinical trials, and scientific opinion articles were also considered. Priority was given to those documents that directly addressed the relationship between plant-based dietary patterns and the risk of developing type 2 diabetes, including studies exploring physiological mechanisms, dietary interventions, or epidemiological correlations. Studies were not excluded based on their methodological design, but clarity in presenting results and relevance to the objective of this review were considered. The collected information was organized and analyzed narratively, identifying common patterns, relevant findings, and recurring limitations in the reviewed studies.

No formal quality assessment tools were applied, nor was a quantitative data synthesis performed. The intention was to offer a general and critical overview of the topic, which could serve as a basis for future, more structured research or systematic reviews. However, it allows for greater flexibility to integrate different types of evidence and perspectives. It is acknowledged that the results presented here should be interpreted with caution and as a starting point for further research.

Documentary Analysis

As part of this narrative review, various scientific sources addressing the relationship between a plant-based diet and the prevention of type 2 diabetes were analyzed. A detailed critical synthesis of the findings is presented below, grouped into key themes: physiological mechanisms, epidemiological evidence, clinical interventions, effects of specific foods, methodological quality of the studies, implementation challenges, social considerations, and sustainability.

Proposed Physiological Mechanisms

A considerable proportion of the reviewed literature highlights plausible biological mechanisms by which a plant-based diet may favorably influence the prevention of type 2 diabetes. These mechanisms primarily include: Improved insulin sensitivity: Plant-based diets are typically rich in soluble fiber, antioxidants, and unsaturated fats, which improve insulin response and reduce peripheral insulin resistance (Silva, Anghinoni, & Gomes, 2024).

Reduction of chronic low-grade inflammation: This type of inflammation has been linked to the development of insulin resistance. A diet rich in anti-inflammatory compounds found in fruits, vegetables, and legumes helps mitigate this process (Kim & Giovannucci, 2022). Gut microbiome optimization: Fermentable plant fiber has been shown to stimulate the proliferation of beneficial bacteria that regulate plasma glucose and modulate gut hormones related to energy metabolism (Frattari et al., 2022).

Body weight management: The low caloric density and high fiber content of plant-based diets contribute to greater satiety and lower weight gain, which indirectly reduces the risk of diabetes (Austin, Ferguson, & Garg, 2021). These mechanisms do not operate in isolation but interact to generate a more efficient and protective metabolic environment. For example, improved insulin sensitivity can be enhanced by a more diverse microbiome and reduced systemic inflammation.

Epidemiological Evidence

Cohort and cross-sectional studies have consistently shown a lower incidence of type 2 diabetes among those who follow predominantly plant-based dietary patterns. For example, the Adventist Health Study 2 demonstrated a progressive decrease in the prevalence of diabetes as animal product consumption decreased (Jardine et al., 2021). Similarly, the meta-analysis by Qian et al. (2019), which included more than 300,000 participants, concluded that individuals with greater adherence to a healthy plant-based diet had a 23% lower risk of developing type 2 diabetes compared to those with lower adherence.

The study by Satija et al. (2016), meanwhile, examined American men and women for more than two decades and found that participants with high adherence to healthy plant-based diets had a significantly reduced risk of type 2 diabetes, even after adjusting for confounding factors such as body mass index, smoking, and physical activity.

Clinical Interventions and Therapeutic Findings

In addition to observational studies, several controlled clinical trials have explored the therapeutic effect of plant-based diets in patients with type 2 diabetes. McMacken & Shah (2017) reported significant improvements in glycemic regulation, blood lipid reduction, and body weight after adopting a vegetarian dietary pattern. Silva et al. (2024) add that a plant-based diet can improve the function of pancreatic beta cells, which are essential for insulin secretion. This improvement is observed even in patients with an established diagnosis of type 2 diabetes, suggesting that this dietary pattern is not only preventative but also therapeutic.

Another relevant study by Adokwe et al. (2024), conducted in a Thai hospital, demonstrated that patients following a plant-based diet showed a significant reduction in fasting blood glucose and glycated hemoglobin (HbA1c), without the need to increase their medication dose. These results are in line with the findings of Austin et al. (2021), who observed clinical improvements in body mass index and glycemic regulation after vegan diet interventions in diabetic populations.

Effects of Specific Foods

A closer look at the foods typically included in a plant-based diet reveals specific benefits:

Legumes: Associated with a lower incidence of type 2 diabetes due to their high fiber content and low glycemic index (Becerra-Tomás et al., 2018). Fruits and vegetables: Promote blood glucose reduction and offer significant antioxidant effects (Adokwe et al., 2024).

Fermented foods: Such as miso, tempeh, and kimchi, contribute to improving gut microbial diversity (Lian, 2022). Whole grains: They have been shown to increase insulin sensitivity (Qian et al., 2019). Regularly including these foods in the diet appears to be a determining factor in the observed positive results, reinforcing the importance of nutritional quality within the plant-based model.

Methodological Quality and Limitations of the Evidence

Despite the general empirical support, the available studies have limitations that should be considered. Some clinical trials have small sample sizes or short follow-up times (Pollakova et al., 2021). Other studies do not clearly differentiate between healthy plant-based diets and those based on ultra-processed products, which may attenuate the observed effects (Pointke & Pawelzik, 2022). Likewise, Jardine et al. (2021) mention that not all participants manage to maintain strict adherence to the plant-based diet, which affects the validity of the results. The heterogeneity in study designs, combined with the variability of populations and sociocultural contexts, limits the generalizability of the findings. Furthermore, some authors warn that differences in operational definitions of "plant-based" make comparison across studies difficult (Goldman et al., 2024).

Social, Cultural, and Educational Determinants

The successful implementation of a plant-based diet also depends on social, economic, and educational factors. Otero et al. (2024) documented that nutrition education programs increase adherence to healthy eating patterns and improve understanding of diabetes management.

In regions with high levels of food insecurity or limited availability of fresh food, the transition to this type of diet represents a substantial challenge. In this regard, Vázquez Morales et al. (2024) highlight that factors such as formal education, income level, and cultural environment significantly influence the ability to adopt sustainable dietary changes.

Considerations on Sustainability and Public Health

From a population perspective, promoting plant-based diets may offer benefits not only in terms of preventing type 2 diabetes, but also in reducing the environmental impact of the food system. According to Goldman et al. (2024), combining a plant-based diet with strategies such as time-restricted fasting could further optimize the metabolic and sustainable benefits of the food model. These dual benefits—health and sustainability—are being recognized by international public health organizations, which promote dietary patterns that reduce processed meat consumption and increase the intake of whole, plant-based foods.

The literature review reveals a strong trend linking plant-based diets with the prevention and management of type 2 diabetes. The findings point to improvements in multiple metabolic parameters, supported by consistent biological mechanisms. Plant-based diets are not only associated with a lower risk of developing type 2 diabetes, but may also offer therapeutic benefits for those already suffering from the disease.

However, methodological and contextual limitations persist, requiring caution when generalizing the results. Key challenges include long-term dietary adherence, the availability of quality foods, the influence of socioeconomic variables, and the need for more rigorous longitudinal studies.

The plant-based approach, when comprehensive, sustainable, and accompanied by nutritional education, represents a promising alternative for addressing the progression of metabolic diseases such as type 2 diabetes. This review supports the importance of considering plant-based diets as part of public prevention policies, integrating them with educational, cultural, and food accessibility strategies.

Final Comments

The narrative review provides a clearer understanding of the growing relevance of the plant-based dietary model in the context of type 2 diabetes prevention. Through the analysis of a wide range of scientific sources, various physiological mechanisms, epidemiological patterns, clinical outcomes, and sociocultural considerations were identified that support interest in this nutritional approach. The findings reviewed not only highlight the potential efficacy of plant-based diets as a preventive strategy but also provide insight into their therapeutic applicability, their population impact, and their compatibility with long-term food sustainability goals.

One of the most relevant contributions of this review has been the recognition of the multiple mechanisms through which a plant-based diet can influence metabolic regulation. Improved insulin sensitivity, reduced systemic inflammation, body weight control, and gut microbiota modulation are fundamental pillars for glycemic control and the prevention of type 2 diabetes (Silva, Anghinoni, & Gomes, 2024; Frattari et al., 2022). These mechanisms complement and reinforce each other, creating a metabolically favorable environment that transcends simple caloric or macronutrient counting.

At the epidemiological level, large-scale observational studies and meta-analyses provide consistent evidence that plant-based dietary patterns are associated with a lower incidence of type 2 diabetes (Jardine et al., 2021; Qian et al., 2019). This finding is particularly important given the progressive and silent nature of the disease and the need for low-cost, high-impact interventions that can be implemented at the population level. Due to their theoretical accessibility and potential for integration into different culinary traditions, plant-based diets represent a promising tool for public policies aimed at health promotion.

From a clinical perspective, the review highlights that the benefits of a plant-based diet are not limited to prevention. Several clinical trials have shown that this type of diet can significantly contribute to improving metabolic parameters in people with diagnosed type 2 diabetes, including reducing blood glucose, glycosylated hemoglobin, and plasma lipids (Adokwe et al., 2024; McMacken & Shah, 2017). This dual utility—preventive and therapeutic—makes plant-based diets a comprehensive alternative, especially relevant in contexts where access to pharmacological treatments is limited or expensive.

However, the results should also be interpreted with caution. The methodological limitations of some studies, the lack of standardization in defining what constitutes a plant-based diet, and the underrepresentation of vulnerable or non-Western populations suggest that there are still important gaps that should be addressed by future research (Pollakova et al., 2021; Pointke & Pawelzik, 2022). Added to this is the difficulty of maintaining long-term adherence to these types of dietary patterns, especially in environments with food insecurity or limited nutritional education (Otero et al., 2024).

In this sense, the effectiveness of plant-based diets depends largely on their contextualized implementation. That is, on their integration with educational strategies, public policies for access to healthy foods, and respect for cultural food practices. Only in this way can their sustainability

over time and their true impact on a collective level be guaranteed. As Vázquez Morales et al. (2024) point out, any nutritional proposal that ignores the social, economic, and cultural dimensions of the act of eating runs the risk of failure, regardless of its scientific basis.

Furthermore, the review suggests the need for broader reflection on the role of nutrition in public health. The growing burden of chronic non-communicable diseases such as type 2 diabetes requires integrative approaches that combine the promotion of healthy lifestyles with the transformation of food systems. In this context, the plant-based model should not only be understood as an individual diet, but as part of a more holistic vision of health, equity, and sustainability. This is proposed by authors such as Goldman et al. (2024), who emphasize the relationship between metabolic health and environmental sustainability.

Finally, it is important to acknowledge that this narrative review has limitations inherent to its design. By not following a rigorous systematic methodology, some relevant studies may have been missed. However, the approach adopted allowed for the integration of different types of evidence, fostering a critical reading of the current state of knowledge, and opening up new questions for future research. Along these lines, we propose that future research delve deeper into the effectiveness of plant-based diets in different population groups, analyze interventions in community settings, and develop integrated care models that combine diet, physical activity, and psychosocial support. The reviewed findings confirm that plant-based eating represents a valid and promising nutritional alternative for the prevention and treatment of type 2 diabetes. Its effectiveness, however, depends on multiple individual and contextual factors that must be comprehensively addressed. Promoting this approach from a public health perspective requires not only scientific evidence but also political will, sound educational strategies, and an ethical commitment to food equity.

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