NATURAL STRATEGIES FOR A HEALTHY AND SUSTAINABLE LIFESTYLE: THE ROLE OF *NIGELLA SATIVA* IN DIABETES PREVENTION

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REVIEW ARTICLE

Abstract
Diabetes mellitus is a complex metabolic disease, with an increasing incidence globally, associated with hyperglycemic values and disruption of glucose metabolism and homeostasis, which can lead to severe complications such as kidney or cardiovascular disease. In this context, the identification of strategies for the prevention and management of diabetes mellitus, such as complementary phytotherapy, has increasingly captured the interest of the scientific community. The research objective of this review article is to explore the potential of the Nigella sativa species to improve the glycemic profile and reduce the risk of complications and morbidity of diabetic disease, and other types of lifestyle modification interventions, within a holistic approach. To achieve the goal, we searched scientific databases and used Zotero software. The investigations revealed the antioxidant, anti-inflammatory and insulin-modulating action of the Nigella sativa species, as well as the importance of lifestyle changes – integrating high-fiber foods into the diet and avoiding refined carbohydrates; adopting an exercise routine of at least 30 minutes a day; regular monitoring of glycemic and lipid parameters, especially in patients with prediabetes; continuous education of patients on the importance of a healthy lifestyle and its impact on the prevention of diabetic complications. This article provides a synthesis of the available research and data on the role of the Nigella sativa species and its active compound, thymoquinone, for the prevention of diabetes. Adopting an integrated approach that includes lifestyle changes is a promising strategy for reducing the incidence of diabetes.

Keywords: *black cumin, cardiometabolic parameters, dietary changes, holistic*.

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INTRODUCTION

In the context of the alarming increase in type 2 diabetes globally and its significant economic and social impact, identifying natural strategies that support a healthy lifestyle becomes essential (Yedjou et al., 2023). Diabetes, a complex metabolic disease, often develops from precursor stages, such as prediabetes, and is closely associated with cardiometabolic risk factors such as obesity, dyslipidemia, and hypertension (Saadati et al., 2022). In this context, medicinal plants are an option of interest for the preventive management of diabetes, and *Nigella sativa* (traditionally known as black cumin seeds) has attracted the attention of researchers due to its antioxidant, anti-inflammatory and hypoglycemic properties (Gawas et al., 2023). Recent studies have shown that supplementation with *Nigella sativa* can improve cardiometabolic parameters, including lowering postprandial blood glucose, glycosylated hemoglobin (HbA1c), total cholesterol, LDL-cholesterol, as well as reducing levels of inflammatory markers and oxidative

stress, such as CRP (C-reactive protein) and MDA (malondialdehyde), among patients with type 2 diabetes (Tabatabaei-Malazy et al., 2025). In addition, other natural interventions, such as lifestyle modifications, a balanced diet, regular physical activity, drinking water instead of sweetened beverages, and increasing fiber intake, have been shown to be effective in preventing progression to diabetes (Chen et al., 2025). This article explores both the specific effects of *Nigella sativa* on glycemic and lipid control parameters, as well as its integrative role in preventive strategies for diabetes, along with other health measures (Shabani et al., 2025; Zhang et al., 2024). A comprehensive analysis based on data from studies is presented, discussing how this herb can be used as an adjunct to conventional interventions and as part of a holistic approach to diabetes prevention (Khodaie et al., 2024b; Korkor et al., n.d.; Li et al., 2025).

MATERIAL AND METHOD

For this article, several recent scientific studies were analyzed that evaluated the effects of *Nigella sativa* supplementation on cardiometabolic parameters and diabetes risk (Hadi et al., 2021; Khodaie et al., 2024a; Saleem et al., 2024). The analysis is based on a synthesis of the available literature on the benefits of *Nigella sativa*, complemented by an assessment of its interaction with lifestyle interventions (dietary changes, physical activity). The approached methodology involves the collection of data from the PubMed, ISI Web of Science and Scopus databases; using Zotero software to manage and filter relevant articles; evaluation of the effects and design of studies. For a better illustration of the results and preventive strategies, the article includes a summary table with the effects of *Nigella sativa* supplementation on cardiometabolic parameters and a flowchart that summarizes natural diabetes prevention strategies, including the role of the *Nigella sativa*.

RESULTS AND DISCUSSIONS

Numerous clinical studies and meta-analyses have highlighted the benefits of supplementation with *Nigella sativa* in patients with prediabetes and type 2 diabetes (Akhtar et al., 2025; Al-Makhmari et al., 2025; Chatterjee et al., 2025). Specifically, a significant decrease in postprandial blood glucose, fasting blood glucose (FPG) and glycated hemoglobin (HbA1c) values have been reported, indicating an improvement in glycemic control. Studies have shown that supplementation with *Nigella sativa* leads to a considerable reduction in FPG (e.g., in some studies a significant decrease in glycemic values has been observed after administration of *Nigella sativa* oil for periods from 8 weeks and above, especially at doses ≥1g/day) (Karimi et al., 2025); improved glycemic control: HbA1c levels were significantly reduced following treatments, indicating a long-term improvement in blood glucose; lipid profile: some studies have reported decreases in total cholesterol and LDL-C, while HDL-C values may increase in subgroups with low baseline values (<40 mg/dL); inflammatory and oxidative stress indicators: reduced levels of C-reactive protein (CRP) and malondialdehyde (MDA) contribute to decreasing the risk of cardiovascular complications, being essential in the prevention of cardiovascular diseases associated with diabetes (Saadati et al., 2022; Shahzad et al., 2025).

Studies have reported that there is a direct link between the administration of *Nigella sativa* and the multiple beneficial effects on cardiometabolic health in patients with prediabetes and type 2 diabetes (Adam et al., 2022).

Below is a summary table summarizing the effects of *Nigella sativa* administration on the main parameters influencing cardiovascular risk (El-Afify and El Amrousy, 2025) (Tabel 1).

Table 1
Synthesis of the effects of supplementation with *Nigella sativa* on cardiometabolic parameters

Parameter	Effect observed after supplementation with *Nigella sativa*	Observation
Fasting blood glucose (FPG)	Significant decrease	Doses ≥1g/day, treatment >8 weeks
Glycosylated hemoglobin (HbA1c)	Notable decrease	Long-term improvement
Total cholesterol (TC)	Significant decrease	Suitable for the prevention of cardiovascular diseases

LDL-cholesterol (LDL-C)	Significant decrease	Beneficial for lipid balance
HDL-cholesterol (HDL-C)	Growth in selected subgroups	In the case of low base values
C-reactive protein (CRP)	Significant decrease	Decrease in systemic inflammation
Malondialdehyde (MDA)	Notable decrease	Reduced oxidative stress index

In addition to taking supplements such as those based on *Nigella sativa*, lifestyle modification interventions are fundamental in preventing the onset of type 2 diabetes.

The literature highlights some essential strategies, such as: dietary changes – adopting a diet rich in dietary fiber, decreasing the consumption of refined carbohydrates and simple sugars, is one of the most effective prevention measures (eating foods rich in fiber contributes to weight control, lowering blood sugar levels and improving insulin sensitivity); portion control and weight loss – reduce body weight by 5-7% (according to the recommendations of the American Diabetes Association) was correlated with up to a 60% reduction in the risk of developing diabetes over three years; regular physical activity – it is recommended to perform at least 30 minutes of moderate physical activity (brisk walking, swimming, cycling) on most days of the week to improve insulin sensitivity and maintain glycemic stability; smoking cessation – studies show that smoking contributes to insulin resistance, and quitting smoking significantly reduces the risk of diabetes in the long term; Adequate hydration – drinking predominantly water instead of sugary drinks helps maintain optimal blood sugar levels and prevents sudden blood sugar fluctuations (Zhang et al., 2024).

These strategies not only improve the general state of health, but also act synergistically with the administration of black seed oil, providing a complete and integrated preventive framework (Dąbrowski et al., 2024). Within a holistic plan, the implementation of these changes can significantly reduce the incidence of type 2 diabetes, through actions that address both nutritional and metabolic risk factors (Shaukat et al., 2023).

Below is a diagram illustrating the main natural strategies for diabetes prevention. The diagram provides a summary of the combined impact of lifestyle and nutritional interventions on diabetes prevention, highlighting the importance of each component within an integrated health program (Figure 1).

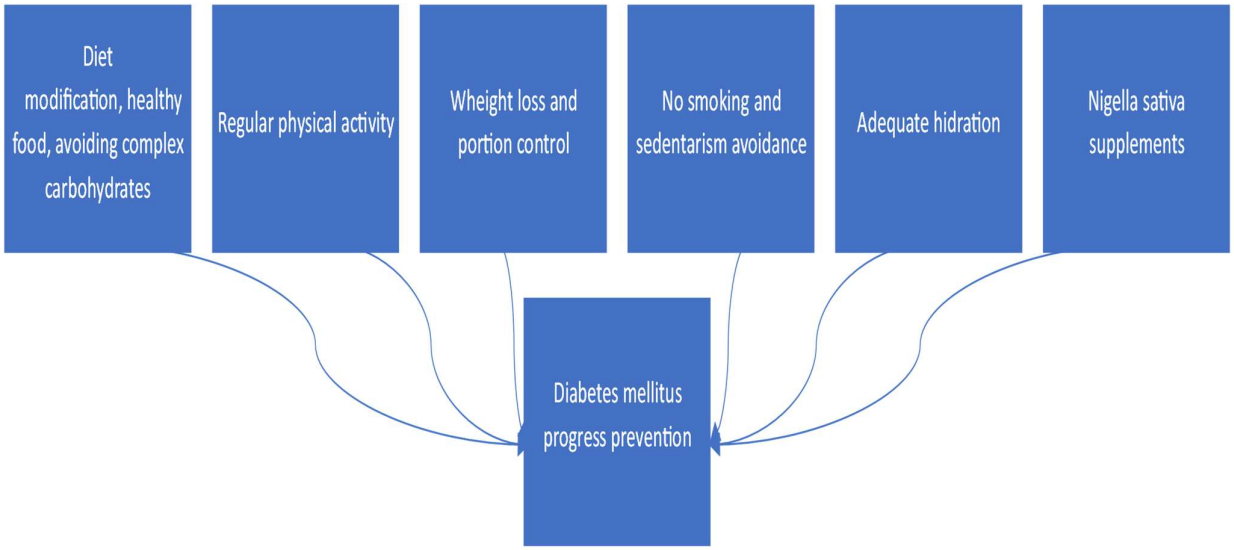

Figure 1 **Flowchart of diabetes prevention strategies**

Recent research indicates that the use of black cumin seeds can be very helpful when combined with other diabetes prevention and management strategies (Khan et al., 2024). Studies have shown that integrating supplementation with *Nigella sativa* into a nutritional plan rich in fiber and low in refined carbohydrates potentiates the hypoglycemic effect, leading to an optimization of glycemic control (Shaukat et al., 2023).

A moderate exercise routine can additionally improve insulin sensitivity, thus facilitating the reduction of blood glucose levels when combined with the use of blackfish seeds, highlighting the synergy with physical activity (Fullwood et al., 2024).

Studies have shown that *Nigella sativa* can act as a therapeutic adjunct to conventional drug treatments for diabetes (Dwivedi et al., n.d.), allowing the doses of hypoglycemic medicinal products to be lowered and the adverse effects associated with them to be reduced. Thus, an integrated approach that also includes healthy lifestyle measures and supplements with *Nigella sativa* can bring significant and sustainable benefits (Bedir et al., 2025). From the perspective of biological mechanisms, antioxidant, anti-inflammatory action and modulation of insulin secretion by active compounds such as thymoquinone (Kaushik and Barmanray, n.d.) are fundamental for relieving metabolic dysfunctions characteristic of diabetes.

CONCLUSIONS

This article highlighted the importance of natural strategies for maintaining a healthy lifestyle, with a special focus on the role of *Nigella sativa* in diabetes prevention.

Supplementation with *Nigella sativa* significantly improves cardiometabolic parameters, such as FPG, HbA1c, cholesterol and inflammatory markers, helping to reduce the risk of diabetes-related complications.

The integrated approach, simultaneous implementation of dietary changes, regular exercise and other healthy lifestyle interventions is essential for preventing progression to type 2 diabetes.

Combining supplementation with *Nigella sativa* other preventive strategies enhances the beneficial effects, thus reducing the incidence of diabetes and improving quality of life.

Although the results are promising, further research is needed to determine the optimal dose, duration of treatment and form of administration, ensuring effective integration into preventive clinical protocols.

These findings provide a solid basis for recommending the implementation of integrated prevention programs that consider both nutritional interventions and supplementation with natural extracts with multiple therapeutic properties. Such a holistic approach will help reduce the burden of diabetes on global health systems and provide patients with the necessary tools for preventive and effective management of their health.

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