

Examining the Mediterranean Diet's Effect on Blood Glucose, Lipids, and Heart Function in Elderly Individuals with T2DM and High-Risk Patients: A Systematic Review

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ABSTRACT

The Mediterranean diet, rich in plant-based foods and unsaturated fatty acids, has been linked to better metabolic health in prior observational studies. The complete analysis in this review focuses on its effects on blood sugar, blood lipid and cardiovascular function in elderly (≥ 55 years old) patients with type 2 diabetes or high-risk patients. By following the PRISMA framework, we searched the research of PubMed Central, Scopus and MDPI. We searched the randomized controlled trials published from 2011 to 2025. After observation, five studies were selected, and the number of subjects in each study ranged from 215 to 4746. The results showed that the Mediterranean diet regularly improved the blood sugar control index, adjusted the blood lipid profile, and reduced the cardiovascular risk of this population. Primary prevention research shows that the incidence of type 2 diabetes is reduced by 31-52% within 4-6 years, while secondary prevention research shows the improvement of inflammatory markers and lipid metabolism. These findings support that the Mediterranean diet is a powerful dietary strategy, which can improve the metabolic regulation and heart health of the elderly and high-risk groups with type 2 diabetes.

Keywords: The Mediterranean Diet, Elderly People, T2DM, Blood Sugar, Blood Lipids, Cardiovascular Functions.

1. INTRODUCTION

According to Zheng et al. (2024)^[1], the incidence of diabetes has been on a steady rise. Experts predict that diabetes cases will hit the 592 million mark by 2035. The most of patients have complications, such as abnormal glucose and lipid profiles, and cardiovascular diseases, have adverse effects on the health of the elderly. Nowadays, scholars globally are slowly acknowledging the Mediterranean diet's role in human health. In contrast to other dietary approaches, for managing blood sugar levels, managing weight, and lowering cardiovascular risks in type 2 diabetes patients, the Mediterranean diet proves to be superior (Elhayany et al., 2010)^[2]. However, it should be noted that most of the studies on the relationship between type 2 diabetes and the adherence to the Mediterranean diet have mainly focused on younger individuals, while the existing evidence for older adults (aged 60 and above) is limited. In addition to being effective for patients with diagnosed T2DM, the Mediterranean diet also plays a crucial role in the primary prevention of high-risk elderly individuals. Metabolic syndrome encompasses a range of concurrent disorders such as central obesity, hypertension, type 2 diabetes mellitus, or disrupted glucose metabolism, which is popular among the elderly population (Thomaz et al., 2024)^[3]. Therefore, studying the preventive effect of the Mediterranean diet on this vulnerable group is of great significance for formulating early intervention strategies, delaying and even preventing the occurrence of T2DM and its cardiovascular complications. This systematic review aims to systematically integrate existing evidence to achieve the following three specific goals: (1) Evaluate the effectiveness of the Mediterranean diet in improving blood glucose, blood lipids, and cardiovascular function among the elderly population at different disease stages, including individuals with type 2 diabetes as well as senior citizens at high risk who do not have diabetes; (2) Explore its potential mechanism of action. Therefore, a systematic review of relevant studies examining how the Mediterranean diet impacts blood sugar, lipids, and heart health in elderly individuals with type 2 diabetes and those at high risk, clarifying its intervention effects, application scenarios and potential mechanisms, not only can fill the gaps in research in this field, but also can provide scientific basis for clinical formulation of personalized dietary intervention plans and reduction of the risk of chronic diseases in elderly patients.

2. METHODOLOGY

2.1 Study design

This systematic review was implemented in adherence to the PRISMA statement and design focuses on relevant literature from January 2011 to December 2025 without language restrictions, qualitatively integrating the improvement effects and core mechanisms of the Mediterranean diet on blood glucose, blood lipids, and cardiovascular function in elderly people with type 2 diabetes or at high risk. The PICOS tool was used to guide the search strategy: (P) population: elderly patients (aged ≥ 55 years): (1) diagnosed with T2DM without serious comorbidities; (2) people without T2DM but have high-risk factors, such as metabolic syndrome, obesity or cardiovascular diseases. (I) intervention: the Mediterranean diet as a primary dietary intervention; (C) comparator: The experimental group adhered to a Mediterranean diet, while the control group adhered to a non-Mediterranean diet such as low-fat diet, usual diet and low-carbohydrate diet. (O) outcomes: It contains indicators related to blood sugar, blood lipid, cardiovascular function or mechanism (Inflammation, endothelial function, insulin sensitivity); (5) study types: randomized controlled trials (RCTs). In this review, we defined patients with diagnosed T2DM as the secondary prevention group, and patients at high risk of metabolic syndrome but without diagnosed T2DM as the primary prevention group. Both groups were included in the analysis and were compared and discussed in the results section.

2.2 Literature search strategy

A comprehensive search was conducted in PubMed Central and Scopus. Search terms combined MeSH headings and keywords related to Mediterranean diet, type 2 diabetes mellitus, older adults, blood glucose, blood lipids and cardiovascular function. A PRISMA flowchart documented the screening process, which detailed how many records were identified, screened, excluded, and included. Study quality was assessed using the Cochrane Risk of Bias Tool.

2.3 Data extraction

Data extraction involves the following core elements: (1) study characteristics: first author, publication year, study design, sample size, follow-up duration; (2) participant characteristics: age, T2DM duration, metabolic and cardiovascular indicators; (3) intervention details: Mediterranean diet implementation protocols such as dietary intake, control group intervention measures such as low-carbon diet. (4) outcome measures: blood glucose (HbA1c, fasting blood glucose), blood lipids, and cardiovascular function (vascular elasticity indices, incidence of cardiovascular events).

3. RESULTS

3.1 Study selection

Five RCTs (2011-2025) were included, including three primary prevention studies (n=10,506) and two secondary prevention studies (n=772), with follow-up durations of 3-8.1 years.

3.2 Study characteristics

All the included studies were RCT, and their publication dates ranged from 2011 to 2025. Individual study sample sizes ranged between 215 and 4746 cases, and the length of follow-up was 3 to 8.1 years. The characteristics of the research population can be classified into two categories: (1) primary prevention study; (2) secondary prevention study. The subjects of the primary prevention study were elderly people without T2DM but have high-risk factors, such as metabolic syndrome, obesity or cardiovascular diseases (Pasanisi et al., 2024^[6]; Ruiz-Canela et al., 2025^[4] and Salas-Salvadó et al., 2010^[5]). The subjects of the secondary prevention study were elderly people with diagnosed T2DM (Maiorino et al., 2016^[7] and Gomez-Marin et al., 2018^[8]). These five studies all use the Mediterranean diet as the main intervention measure. The comparator included low fat diet, traditional Mediterranean diet without calorie restrictions and placebo. The outcome covered five indicators, including blood glucose control, lipid profile, and cardiovascular function indicators. The characteristics of the included studies are summarized in Figure 1.

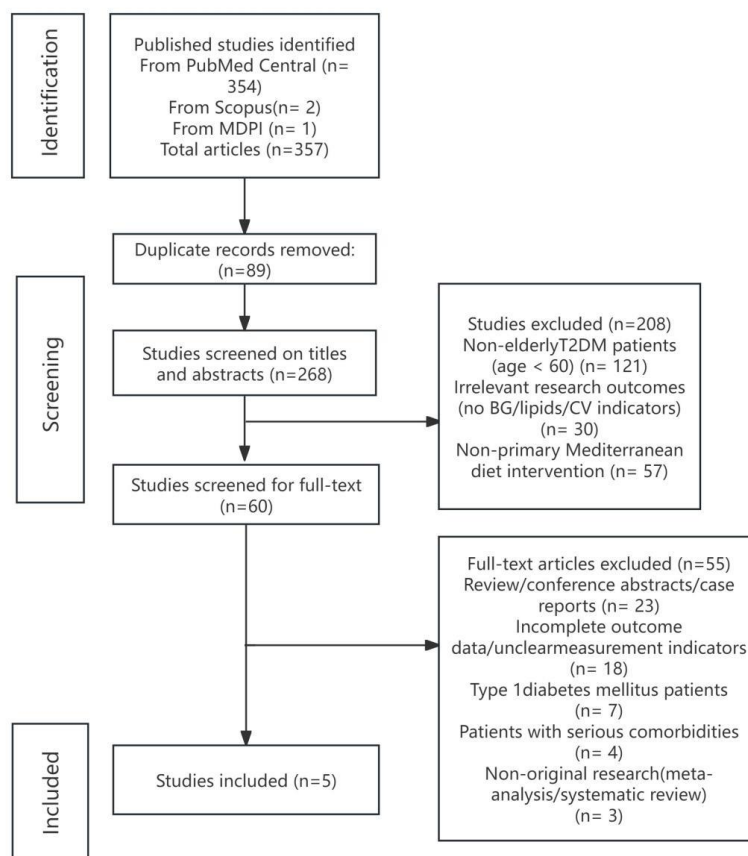


Figure 1. Summary of Characteristics of Included Studies.

3.3 Outcomes

Current Evidence on Glycemic Control

Primary prevention trials consistently demonstrate significant reductions in T2DM incidence. combining energy-limited Mediterranean diets with physical exercise resulted in a 31% reduction in risk (HR 0.69) over 6 years, whereas adding olive oil or nuts to a Mediterranean diet led to a 52% decrease (HR 0.49) in the same period. In secondary prevention, Mediterranean diet interventions improved HbA1c, fasting blood sugar and HOMA-IR indices in diagnosed T2DM patients.

Current Evidence on Lipid Profiles

Secondary prevention studies indicate beneficial effects on fasting blood lipid and postprandial lipid metabolism. Notably, post-meal triglyceride AUC decreased by 17.3% following Mediterranean diet with olive oil, with concurrent improvements in residual cholesterol.

Current Evidence on Cardiovascular Function

Primary prevention studies demonstrate the changes in weight and waist circumference which are closely related to cardiovascular risk. Energy-restricted Mediterranean diets combined with physical activity achieved 3.3 kg weight loss and 3.6 cm waist reduction, though weight-independent mechanisms appear to contribute to diabetes risk reduction. Improvements in inflammatory markers such as 37% reduction in CRP and 43% increase in adiponectin were observed in secondary prevention studies.

4. DISCUSSION

4.1 Summary of Main Findings

According to these five studies, they revealed that the Mediterranean diet had an effective impact on blood glucose, lipids and cardiovascular function among elderly patients with high-risk in T2DM and patients with diagnosed T2DM. In primary prevention, three studies consistently demonstrated that Mediterranean diet interventions significantly reduce T2DM risk. Ruiz-Canela et al. (2025)^[4] noted that there was a decrease of 31% in the likelihood of developing diabetes over 6 years, which demonstrated the synergistic effect of the Mediterranean diet and lifestyle intervention. Moreover, Body weight decreased by 3.3 kg, and waist circumference was reduced by 3.6 cm. Salas-Salvadó et al. (2010)^[5] reported that adhering to a Mediterranean diet abundant in olive oil or nuts correlated with an approximate 50% reduced likelihood of developing type 2 diabetes over 4 years. In contrast to the research conducted by Ruiz-Canela et al. (2025)^[4], this effect was not affected by changes in body weight, which indicated that the benefits of the Mediterranean diet are partly independent of changes in body weight. Pasanisi et al. (2024)^[6] confirmed these results. They showed that the mixture of Mediterranean diet and dimethyl diamine reduced the incidence of type 2 diabetes by 92% compared with the placebo group. In contrast, placebo intervention alone did not significantly reduce the risk of diabetes. These results indicate that there is a synergistic effect of Mediterranean diet and drug intervention.

In secondary prevention, there is evidence that it has a positive effect on inflammation and lipid metabolism. Maiorino et al. (2016)^[7] showed that Mediterranean diet decreased HS-CRP and increased adiponectin, and also increased insulin sensitivity, which helped to reduce inflammation. Gomez-Marin et al. (2018)^[8] pointed out that for people with type 2 diabetes and coronary heart disease, the Mediterranean diet helps to reduce the area of postprandial triglycerides and improve the level of postprandial lipid metabolism. These results show that the Mediterranean diet is beneficial to the onset of diabetes. It can not only delay the onset of type 2 diabetes in high-risk population, but also improve the inflammatory state and lipid metabolism of patients who already have the disease.

4.2 Comparison with previous reviews

The results are consistent with the meta-analysis conducted by Zheng et al. (2024)^[1], which reported a significant decrease in HbA1c level (MD=-0.39). 95%CI:0.58 to -0.20). However, Zheng et al. (2024)^[1] found that there was no statistically significant improvement in lipid profile compared with the secondary prevention study mentioned in the results. This difference may reflect the difference between the duration of the study and the age of the population, indicating that the elderly may be more sensitive to the Mediterranean diet, or may need longer intervention time to see the improvement of blood lipid levels. In addition, Du Hezhou (2025)^[9] showed that olive oil is a key component of the Mediterranean diet and may reduce the risk of diabetes by 22%. This study further strengthens the protective effect of diet on diabetes and high-risk patients.

In terms of action methods, Tuttolomondo et al. (2019)^[10] pointed out that Mediterranean diet has anti-inflammatory benefits by inhibiting NF- κ B activation and producing pro-inflammatory cytokines. This improves the insulin response and reduces the risk of cardiovascular problems in patients with type 2 diabetes. This finding is consistent with that proposed by Maiorino et al. (2016)^[7]. In addition, the influence on intestinal microflora is the subject of their discussion. By promoting the proliferation of beneficial bacteria, such as *Bacillus*, *Prevotella*, and *Faecalibacterium*, short-chain fatty acids are synthesized, which leads to good microbiota transformation. This improves insulin sensitivity, helps to improve metabolic syndrome and delay the onset of T2DM. Torres-Peña et al. (2020)^[11] pointed out that Mediterranean diet can improve vascular health by improving blood flow-mediated vasodilation (FMD), increasing the number of endothelial progenitor cells (EPCs) and improving the bioavailability of nitric oxide, thus promoting the recovery and function of cardiovascular function. These may be the reasons for the decrease of CRP and the improvement of blood lipid after meals.

4.3 Strengths and Limitations

This comprehensive analysis has several advantages. First of all, it has specific research objectives, focusing on primary and secondary prevention for the elderly (≥ 55 years old). Secondly, using the mature framework of systematic evaluation method (PRISMA) to standardize the process of literature selection, data extraction and quality evaluation can ensure the standardization of research; Thirdly, all the studies we included were high-quality randomized controlled trials, and the results, indicators and mechanisms were clearly defined.

The five included studies provide useful information, but there are still some limitations. First of all, this review only contains a few studies (n=5), and there are so few studies, we still need to improve the integrity of the analysis results.

Then, some intervention programs include other methods, such as physical activity or medical assistance. Therefore, it is necessary to study whether the Mediterranean diet alone can have different effects to improve type 2 diabetes. Finally, this article does not do quantitative meta-analysis. Therefore, it is impossible to accurately evaluate the actual impact of Mediterranean diet on type 2 diabetes, evaluate heterogeneity, or objectively evaluate the severity of publication bias, which may lead to overestimation of the effect of intervention.

4.4 Future directions

Firstly, further research is needed to gain a deeper insight into the underlying processes by which the Mediterranean diet affects blood glucose control, inflammation, and post-meal lipid metabolism, and to be able to provide personalized dietary recommendations. Secondly, more researches should be included to address frailty, sarcopenia, or cognitive decline problems, which are highly prevalent in older T2DM patients. Including these measurement indicators can determine whether the Mediterranean diet intervention measures can maintain cognitive and physical functions.

5. CONCLUSION

This systematic review provides convincing evidence that the Mediterranean diet can effectively improve blood sugar, blood lipid levels and cardiovascular function in older adults with type 2 diabetes. In primary prevention, implementation of a Mediterranean diet intervention could lower the risk of developing type 2 diabetes among elderly patients at high risk. As a secondary preventive measure, adopting a Mediterranean diet can enhance inflammation markers and lipid metabolism after meals in older people with type 2 diabetes. In the realm of elderly health management, integrating a Mediterranean diet into intervention strategies is feasible.

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