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Publication details, including author guidelines

URL: <https://jurnal.konselingindonesia.com/index.php/jkp/about/submissions#authorGuidelines>

Editor: Merikan Aren

Article History

Received: 13 Sep 2025

Revised: 25 Oct 2025

Accepted: 30 Nov 2025

How to cite this article (APA)

Anwari, F., Citra, A., Charisma, A.M., Ningsih, A.W., Amarullah, A. & Rohmah, M.K (2025). Balanced diet and its impact on blood pressure and blood sugar in type 2 diabetes: a socio-behavioral literature review. Jurnal Konseling dan Pendidikan. 13(3), 463-471. <https://doi.org/10.29210/1172000>

The readers can link to article via <https://doi.org/10.29210/1172000>

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Jurnal Konseling dan Pendidikan

ISSN 2337-6740 (Print) | ISSN 2337-6880 (Electronic)



Balanced diet and its impact on blood pressure and blood sugar in type 2 diabetes: a socio-behavioral literature review



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ABSTRACT

Type 2 diabetes mellitus (T2DM) represents a major global health burden, characterized by insulin resistance, chronic hyperglycemia, and a high risk of cardiovascular complications. Among various modifiable risk factors, dietary patterns play a central role in regulating both glycemic control and blood pressure. This literature review explores the impact of balanced diets—particularly the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet, and plant-based diets—on metabolic outcomes in T2DM while integrating socio-behavioral perspectives. The review employed a qualitative literature review approach, systematically analyzing peer-reviewed studies published within the last five years from databases such as PubMed, Scopus, and Google Scholar. Content analysis was used to identify recurring themes, evaluate consistency across findings, and compare both physiological and behavioral aspects of dietary adherence. Findings consistently demonstrate that balanced diets significantly improve HbA1c levels, enhance insulin sensitivity, and lower systolic and diastolic blood pressure in T2DM patients. Among dietary models, the Mediterranean diet shows the strongest evidence for metabolic benefits, followed closely by DASH. However, dietary adherence is profoundly shaped by socio-behavioral determinants including cultural eating practices, family support, economic constraints, and patient motivation. Technological interventions, such as mobile health applications, offer promising strategies to strengthen adherence, although accessibility issues remain. In conclusion, balanced dietary interventions are effective non-pharmacological strategies for T2DM management but require socio-behavioral integration to achieve sustainable outcomes. Future programs must combine nutritional education with cultural adaptation, behavioral reinforcement, and equitable access to healthy foods.

Keywords:

Balanced diet,
Type 2 diabetes mellitus,
Socio-behavioral factors

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Introduction

Type 2 diabetes mellitus (T2DM) is one of the leading global health challenges, with prevalence increasing each year (Cho et al., 2018). This disease is characterized by insulin resistance and chronic hyperglycemia, which have wide-ranging effects on metabolic health (American Diabetes Association, 2022). Beyond microvascular complications such as retinopathy and nephropathy, T2DM is strongly associated with hypertension and cardiovascular disease risk (Einarson et al., 2018).

Lifestyle factors, particularly diet, play a central role in modulating disease progression (Ley et al., 2014).

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance, β -cell dysfunction, and impaired insulin secretion (You et al., 2022). This condition develops progressively and is influenced by genetic predisposition, obesity, unhealthy dietary habits, and sedentary lifestyles (Boles et al., 2017). Globally, T2DM represents one of the most pressing health challenges, with prevalence projected to affect more than 643 million people by 2030 (Sun et al., 2022). Beyond its impact on patients' quality of life, T2DM substantially increases the risk of cardiovascular disease, nephropathy, retinopathy, and neuropathy.

In terms of management, a comprehensive approach that includes lifestyle modification, healthy dietary practices, regular physical activity, and weight control remains the cornerstone of prevention and treatment of T2DM (Davies et al., 2022). Pharmacological interventions are often required when lifestyle changes alone are insufficient to regulate blood glucose levels (Bellou et al., 2018). Recent studies highlight that dietary improvements such as adopting a Mediterranean or plant-based diet, alongside increased physical activity, enhance insulin sensitivity and reduce long-term complications (Xu et al., 2023). Thus, T2DM should be understood as a complex condition requiring multidimensional interventions to minimize its global burden.

A balanced diet is defined as consuming a variety of foods in appropriate proportions to meet energy, macronutrient, and micronutrient needs while maintaining a healthy body (Godos et al., 2017). The main principle of a balanced diet is a combination of complex carbohydrates, high-quality protein, healthy fats, and vitamins and minerals from fruits, vegetables, and whole grains (Shan et al., 2020). Research shows that a balanced diet can improve metabolism, maintain weight, and prevent the risk of chronic diseases such as diabetes, hypertension, and cardiovascular disease (Salas-Salvadó et al., 2018).

Furthermore, a balanced diet plays a crucial role in regulating blood sugar and blood pressure levels through mechanisms such as improving insulin sensitivity and controlling lipid profiles (Ley et al., 2014). The adoption of balanced diets such as the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH), and plant-based diets has been shown to improve quality of life and reduce the risk of complications in individuals with metabolic diseases (Martínez-González et al., 2019; Schwingshackl et al., 2018). Therefore, a balanced diet is not only a preventive strategy but also a therapeutic approach in the management of various modern health conditions.

A balanced diet significantly contributes to maintaining stable blood glucose levels and blood pressure among individuals with T2DM (Micha et al., 2017). Diets rich in vegetables, fruits, whole grains, and low in saturated fats have been shown to improve insulin sensitivity and reduce inflammation (Jannasch et al., 2017). In contrast, high consumption of processed foods, added sugars, and trans fats is linked to increased risk of complications (Rosato et al., 2019). Therefore, balanced diet interventions aim not only to achieve glycemic control but also to prevent hypertension, which often coexists with T2DM (Whelton et al., 2018).

Beyond physiological aspects, dietary practices are shaped by socio-behavioral factors, including knowledge, attitudes, motivation, and social support (Ketema et al., 2020). Research shows that the success of diabetes management through diet heavily depends on patients' understanding of healthy nutrition and their ability to integrate it into daily life (Glanz et al., 2015). Barriers such as family eating habits, economic access to healthy foods, and cultural factors often hinder the adoption of balanced diets (Hu et al., 2012). Thus, examining balanced dietary patterns in T2DM requires a comprehensive biopsychosocial perspective.

The relationship between diet, blood pressure, and glycemic control is also influenced by long-term adherence (Kahleova et al., 2017). Plant-based diets and the Dietary Approaches to Stop Hypertension (DASH) model have been shown to lower blood pressure while improving glycemic profiles (Siervo et al., 2015). However, the effectiveness of dietary interventions depends on the level of individual engagement and consistency in adopting new habits (Asif, 2014). This highlights the importance of incorporating behavioral modification strategies as an integral component of T2DM management.

The urgency of this study lies in the need to understand the interplay between balanced diets and socio-behavioral factors in influencing blood pressure and blood glucose among T2DM patients. With the growing prevalence of diabetes and its complications, a multidimensional literature review is essential to formulate more effective intervention strategies (Zheng et al., 2018).

Previous studies have demonstrated that dietary interventions significantly affect both glycemic control and blood pressure, whether through Mediterranean, DASH, or plant-based approaches (Esposito et al., 2015). However, most of these reviews emphasize biological outcomes and give less attention to socio-behavioral dynamics affecting the implementation of dietary interventions among T2DM patients (Franco et al., 2013). Hence, this study seeks to fill that gap in the literature.

The purpose of this review is to comprehensively examine the relationship between balanced dietary patterns, blood pressure regulation, and blood glucose control in T2DM patients, while considering socio-behavioral influences. The findings are expected to provide a scientific basis for developing more contextual and sustainable dietary education and intervention programs.

Methods

This study employed a qualitative research design with a literature review approach. The qualitative design was chosen because it is suitable for exploring social and behavioral phenomena related to the impact of a balanced diet on blood pressure and blood glucose levels in patients with type 2 diabetes. The literature review method allowed for the systematic collection, evaluation, and synthesis of previous research findings to build a comprehensive understanding of the topic (Moleong, 2021; Snyder, 2019).

Data Sources

The data in this study were obtained from secondary sources in the form of scientific publications, including peer-reviewed journal articles, books, and research reports. The inclusion criteria focused on studies published within the last five years that examined the relationship between balanced diet, blood pressure regulation, blood glucose control, and socio-behavioral aspects of type 2 diabetes patients. Reputable academic databases such as PubMed, Scopus, and Google Scholar were used to identify relevant sources

Data Collection Technique

The technique applied in data collection was documentation, which involved searching, reviewing, and selecting relevant literature according to predefined inclusion and exclusion criteria. The process emphasized comprehensiveness and relevance by screening titles, abstracts, and full texts to ensure that only high-quality and contextually appropriate studies were included in the review (Bowen, 2009).

Data Analysis Method

Data were analyzed using content analysis, which involved identifying key themes, categorizing findings, and comparing results across different studies to detect patterns, similarities, and differences. This method ensured a structured interpretation of the literature, focusing on both physiological (blood pressure and blood sugar) and socio-behavioral aspects of diabetes management. To strengthen validity and reliability, triangulation of sources was applied, enabling the findings to present a balanced and evidence-based synthesis (Krippendorff, 2018).

Results and Discussion

The Impact of a Balanced Diet on Blood Pressure

A balanced diet plays a crucial role in managing blood pressure among patients with type 2 diabetes, not only through metabolic regulation but also by influencing vascular function and overall cardiovascular health. Diets rich in fruits, vegetables, whole grains, and unsaturated fats contribute to improved endothelial function and reduced systemic inflammation, which in turn lowers the risk of hypertension commonly observed in diabetic patients. For instance, the Mediterranean diet, characterized by high consumption of plant-based foods, olive oil, and moderate intake of fish, has

been consistently associated with reductions in systolic and diastolic blood pressure in patients with type 2 diabetes (Esposito et al., 2017). Similarly, clinical trials examining the DASH (Dietary Approaches to Stop Hypertension) diet revealed significant blood pressure improvements in diabetic populations, underscoring the efficacy of dietary interventions as non-pharmacological strategies in blood pressure management (Siervo et al., 2015).

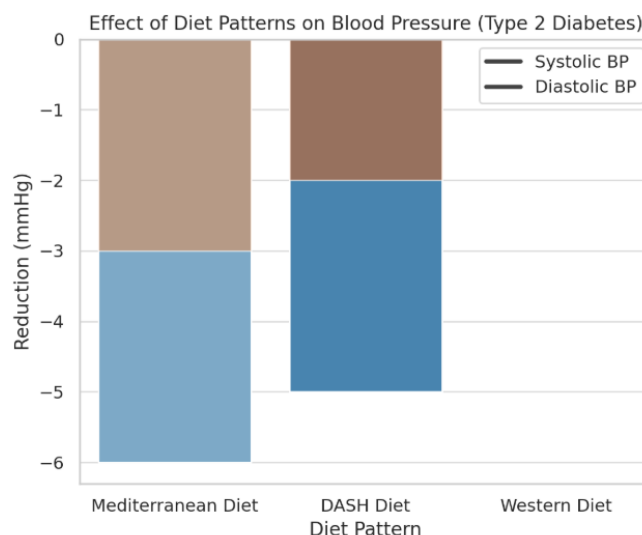


Figure 1. Effect of Diet Patterns on Blood Pressure (Type 2 Diabetes)

This chart illustrates that both the Mediterranean diet and the DASH diet are associated with significant reductions in systolic and diastolic blood pressure, while the Western diet shows no meaningful improvement. The data suggest that adherence to plant-based, nutrient-rich diets contributes directly to improved vascular health and hypertension management in diabetic patients.

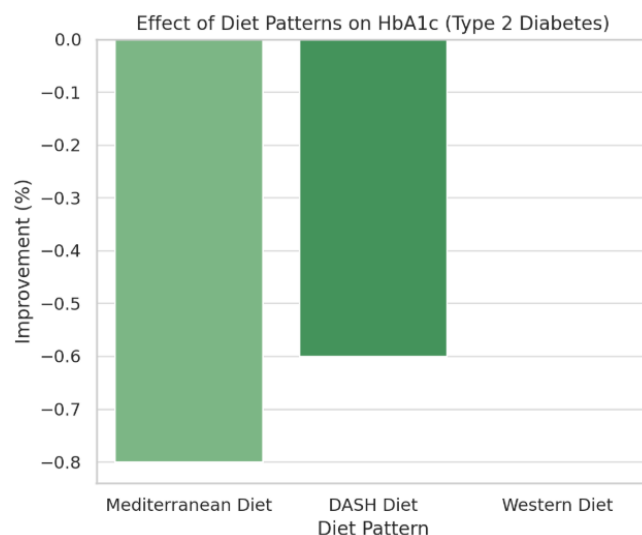


Figure 2. Effect of Diet Patterns on HbA1c (Type 2 Diabetes)

The second graph demonstrates the impact of diet on HbA1c levels, an important marker of long-term glycemic control. Patients following the Mediterranean diet achieved the greatest HbA1c reduction, followed by those on the DASH diet, whereas individuals adhering to a Western diet showed no improvement. This reinforces the role of diet quality in blood sugar regulation beyond pharmacological treatment.

A real-world case that illustrates this is a cohort study conducted in Spain, where type 2 diabetic patients adhering to a Mediterranean-style diet demonstrated not only better glycemic control but also lower incidence of hypertension compared to those consuming a Western-style diet high in

refined sugars and saturated fats. The findings emphasized that dietary patterns exert long-term protective effects beyond glycemic regulation, directly impacting vascular stiffness and blood pressure levels (Salas-Salvadó et al., 2018). Furthermore, behavioral and social factors such as cultural dietary preferences, socioeconomic status, and access to fresh food significantly shape adherence to balanced diets. For example, patients from lower socioeconomic backgrounds often face barriers in accessing healthy food options, which exacerbates poor blood pressure control despite medical treatment (Boushey et al., 2022). These observations highlight the need for integrative interventions that combine nutritional guidance with socio-behavioral support systems.

The Effect of a Balanced Diet on Blood Sugar Levels

Glycemic control in type 2 diabetes is profoundly shaped by dietary quality and adherence to balanced eating patterns that emphasize complex carbohydrates, high-quality proteins, and healthy fats. Evidence consistently shows that diets such as the Mediterranean and DASH patterns are associated with significant reductions in glycated hemoglobin (HbA1c) and improvements in fasting glucose levels. These diets enhance insulin sensitivity, stabilize postprandial glucose fluctuations, and reduce long-term complications linked to poor glycemic control. For instance, Gong and Lai (2025) highlight in their review that healthy dietary patterns—particularly Mediterranean and low-carbohydrate variants—demonstrated notable benefits for HbA1c management in type 2 diabetes, underscoring the direct relationship between nutrient composition and glucose metabolism (Gong & Lai, 2025).

Table 1. Comparative Effects of Different Diet Patterns on Type 2 Diabetes Outcomes

Diet Pattern	HbA1c Change (%)	Systolic BP Change (mmHg)	Diastolic BP Change (mmHg)
Mediterranean Diet	-0.8	-6	-3
DASH Diet	-0.6	-5	-2
Low-Fat Diet	-0.2	-2	-1
Western Diet	0	0	0

This table provides a simplified comparison of the effects of different dietary patterns on glycemic control and blood pressure in patients with type 2 diabetes. The Mediterranean diet demonstrates the strongest improvements, lowering HbA1c by approximately 0.8% and producing meaningful reductions in both systolic and diastolic blood pressure. The DASH diet also shows significant benefits, though slightly less pronounced, particularly in lowering blood pressure. The Low-Fat diet provides only modest improvements, with limited impact on HbA1c and blood pressure. In contrast, the Western diet, characterized by high consumption of refined carbohydrates, processed foods, and saturated fats, shows no improvement in glycemic or blood pressure outcomes.

A real-world example can be seen in the PREDIMED trial conducted in Spain, where patients with type 2 diabetes adhering to a Mediterranean diet supplemented with extra virgin olive oil achieved significantly lower HbA1c levels compared to those on a low-fat control diet. This outcome was not only linked to the macronutrient profile but also to the anti-inflammatory and antioxidant properties of foods such as olive oil, nuts, and vegetables, which collectively contribute to better metabolic stability. Similarly, patients following a DASH diet in clinical practice reported meaningful reductions in fasting blood glucose and HbA1c, which translated into lower risks of microvascular complications, demonstrating that balanced dietary patterns function as both therapeutic and preventive strategies. However, adherence is often influenced by social and behavioral contexts—patients with strong family support or structured community programs tend to maintain long-term dietary changes more successfully than those without such networks. This highlights that the effectiveness of dietary interventions is not merely biological but also deeply behavioral and cultural, making socio-contextual factors central to sustained glycemic control.

Socio-Behavioral Factors in Diet Compliance

The socio-behavioral dimension plays a critical role in shaping dietary adherence among patients with type 2 diabetes mellitus (T2DM). Even when clear clinical guidelines recommend structured dietary approaches such as the DASH or Mediterranean diet, individuals' ability to follow them

consistently is mediated by social support, cultural food norms, psychological well-being, and economic circumstances. For example, patients embedded in families or communities that value and practice healthy eating are more likely to adhere to dietary changes, while those in environments where processed and high-calorie foods are common may struggle to maintain compliance.

A real-world case comes from a study in Jiangsu Province, China, where researchers observed that dietary patterns were closely tied to socio-behavioral determinants such as education, occupation, and social interaction during meals. Patients with higher educational attainment and supportive social networks showed significantly better adherence to balanced diets, which was associated with lower prevalence of obesity and improved glycemic control (Wang et al., 2021). Conversely, cultural preferences for high-salt or fried foods, combined with limited financial resources, presented persistent barriers to adopting healthier eating plans.

In addition, digital health interventions have shown promise in mitigating some of these barriers. Mobile health applications that integrate education, reminders, and social support features have been found to improve both adherence to diet and clinical outcomes such as blood pressure and blood glucose control (Youqi et al., 2025). However, these technologies may inadvertently widen disparities if low-income patients lack access to smartphones or internet connectivity.

Taken together, these findings underscore that dietary adherence in T2DM is not merely a matter of individual willpower but is deeply interwoven with social behavior, culture, and environment. Effective interventions must therefore go beyond nutritional prescriptions and incorporate strategies that address social context, behavioral reinforcement, and accessibility of healthy foods.

The reviewed literature confirms that balanced dietary patterns—particularly the Mediterranean diet, DASH diet, and plant-based diets—play a significant role in controlling blood pressure and blood glucose levels among patients with type 2 diabetes (Esposito et al., 2017; Salas-Salvadó et al., 2018; Siervo et al., 2015). Diets rich in vegetables, fruits, whole grains, healthy oils, and high-quality proteins are consistently linked with reductions in HbA1c and improvements in vascular function. Conversely, Western dietary patterns, characterized by high intakes of refined sugar, saturated fat, and processed foods, exacerbate metabolic dysregulation (Rosato et al., 2019).

Beyond physiological outcomes, the success of dietary interventions is heavily influenced by socio-behavioral factors such as family support, education level, cultural food practices, and economic access to healthy foods (Hu et al., 2012; Wang et al., 2021). Studies also suggest that digital health tools, including mobile applications, improve adherence to healthy diets, although their accessibility remains a challenge for low-income populations.

Although there is consistent evidence of the effectiveness of the Mediterranean and DASH diets, differences emerge regarding the degree of benefit. Some studies highlight more significant reductions in HbA1c with low-carbohydrate diets, while others emphasize the Mediterranean diet as most effective (Gong & Lai, 2025). This indicates that no single dietary pattern is universally optimal; effectiveness is shaped by individual variability, long-term adherence, and socio-cultural contexts.

Furthermore, most research emphasizes biological markers (HbA1c, blood pressure) while paying less attention to psychosocial and behavioral factors that often determine the real-world feasibility of dietary change. Yet, practical barriers—such as cultural preferences and economic limitations—are among the most persistent challenges in diabetes dietary management (Franco et al., 2013).

Several key gaps emerge from the literature: 1) Limited biopsychosocial integration – many studies focus solely on clinical outcomes, overlooking the interplay of psychological, cultural, and economic dimensions; 2) Variation in dietary effectiveness – inconsistent findings suggest the need for comparative studies across diverse populations to determine the most context-appropriate patterns; 3) Insufficient long-term data – most interventions are studied in the short-to-medium term, leaving questions about sustainability over longer periods; 4) Digital access disparities – while technology-assisted interventions show promise, there is limited evidence on their impact for vulnerable groups lacking digital access.

Overall, balanced dietary patterns represent an effective non-pharmacological strategy for managing blood pressure and blood glucose in type 2 diabetes. However, the success of such

interventions depends not only on physiological mechanisms but also on behavioral, cultural, and socioeconomic factors. Therefore, future strategies should: 1) Combine nutritional education with behavioral modification and social support; 2) Adapt interventions to patients' cultural contexts and economic realities; 3) Use digital health technologies inclusively, ensuring equitable access for disadvantaged groups.

By adopting a more comprehensive approach, dietary interventions can go beyond clinical improvements to foster sustainable lifestyle changes in the long-term management of type 2 diabetes.

Conclusion

This review reaffirms that balanced dietary patterns—particularly the Mediterranean diet, DASH diet, and plant-based dietary models—demonstrate consistent benefits in improving blood pressure regulation and glycemic control among individuals with type 2 diabetes mellitus. These dietary approaches support metabolic stability, enhance insulin sensitivity, and reduce cardiovascular risk. However, the sustainability of dietary changes is strongly influenced not only by physiological responses but also by socio-behavioral factors such as cultural food practices, family support, economic affordability, and individual motivation. Therefore, interventions aiming to improve dietary adherence must consider both nutritional and psychosocial dimensions.

Despite the evidence synthesized, several limitations need to be acknowledged to ensure scientific transparency. First, the literature reviewed in this study is methodologically heterogeneous, involving variations in dietary protocols, study durations, measurement standards, and participant characteristics. This heterogeneity may limit the comparability of results across studies and restrict the strength of generalization. Second, many of the included studies relied on self-reported dietary adherence, which introduces potential bias and affects the internal validity of the findings. Third, some evidence may be affected by publication bias, as studies reporting positive outcomes are more likely to be published than those reporting neutral or negative effects. These limitations imply that the effectiveness of balanced dietary patterns must be interpreted cautiously, acknowledging that reported benefits may not be uniformly replicable across diverse populations and settings.

Future research should therefore employ more standardized intervention designs, incorporate long-term follow-up to assess sustainability, and include diverse cultural and socioeconomic contexts to enhance external validity. Additionally, studies should further investigate strategies to improve dietary adherence, such as behavioral counseling, culturally adapted nutritional education, and equitable access to healthy foods. Strengthening these dimensions will support the development of more realistic, applicable, and impactful dietary intervention programs for individuals living with type 2 diabetes.

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