

ORIGINAL RESEARCH

Effectiveness of Plant-Based Diets for Overweight and Obese Adults: A Scoping Review

Eficacia de las dietas basadas en plantas para adultos con sobrepeso y obesidad: una revisión a gran escala

Qudsy Husna Iqfir Lani. Department of Nutrition, Poltekkes Kemenkes Yogyakarta, Indonesia.

Email: qudsyhusnail37@gmail.com, <https://orcid.org/0009-0001-9886-0580>

Rahma Ayu Husna Maulida. Department of Nutrition, Poltekkes Kemenkes Yogyakarta, Indonesia.

Email: rahmaayu125@gmail.com, <https://orcid.org/0009-0008-8357-9359>

Almira Sitasari. Department of Nutrition, Poltekkes Kemenkes Yogyakarta, Indonesia.

Email: almira.sitasari@poltekkesjogja.ac.id, <https://orcid.org/0000-0002-2239-3963>

Agus Wijanarka. Department of Nutrition, Poltekkes Kemenkes Yogyakarta, Indonesia. Email:

agus.wijanarka@poltekkesjogja.ac.id, <https://orcid.org/0000-0001-8229-1216>

Fery Lusviana Widiany. Department of Nutrition, Faculty of Health Science, Universitas Respati Yogyakarta, Yogyakarta

Special Region, Indonesia. Email: fery_lusviana@respati.ac.id, <https://orcid.org/0000-0002-0960-1705>

Bunga A Paramashanti Research Center for Public Health and Nutrition, National Research and Innovation Agency (BRIN),

Jakarta, Indonesia. Email: pshanti.bunga@gmail.com, <https://orcid.org/0000-0001-6066-2039>

Nurul Ain Azizan. School of Biosciences, Faculty of Science and Engineering, University of Nottingham Malaysia, Selangor,

Malaysia. Email: ain.azizan@nottingham.edu.my, <https://orcid.org/0000-0001-9219-2430>

Tri Siswati. Department of Nutrition, Poltekkes Kemenkes Yogyakarta, Indonesia.

Email: tri.siswati@poltekkesjogja.ac.id, <https://orcid.org/0000-0003-3264-3214>

Received: May 1, 2025.

Accepted: November 18, 2025.

Conflicts of interest: None.

DOI: <https://doi.org/10.71164/socialmedicine.v19i3.2026.2155>

Abstract

Background. Obesity is a global epidemic associated with significant health risks, including diabetes, cardiovascular disease, and premature mortality. Plant-based diets (PBDs), characterized by high fiber, low fat, and nutrient density, have gained attention as a potential strategy for managing overweight and obesity. **Aims.** This scoping review aims to synthesize evidence on the effectiveness of PBDs in managing overweight and obesity in adults, while highlighting challenges such as nutritional adequacy, adherence, and cultural feasibility. **Methods.** A literature search was conducted for studies published between 2013 and 2023 using PubMed and Google Scholar. Six studies involving participants aged ≥ 18 years were included, comprising randomized controlled trials, clinical trials, cross-sectional studies, and systematic reviews. Key outcomes included weight loss, body mass index (BMI), fat mass, and metabolic parameters. **Results.** PBDs were associated with reductions in body weight, BMI, and fat mass. Improvements in metabolic parameters, including insulin sensitivity and glycemic control, were also observed. These effects may be attributed to the high fiber and low-fat composition of PBDs, which can promote satiety and reduce energy intake. However, challenges related to adherence, potential micronutrient deficiencies, and cultural acceptability were identified. **Conclusions.** PBDs represent a promising dietary approach for managing obesity and improving metabolic health. Future efforts should focus on enhancing adherence, ensuring nutritional adequacy, and improving accessibility to maximize public health impact.

Keywords: dietary intervention, metabolic health, obesity, overweight, plant-based die

Resumen

Antecedentes. La obesidad es una epidemia global asociada a riesgos de salud significativos, que incluyen diabetes, enfermedades cardiovasculares y mortalidad prematura. Las dietas basadas en plantas (DBP), caracterizadas por alta fibra, baja grasa y densidad nutricional, han recibido atención como una estrategia potencial para gestionar el sobrepeso y la obesidad. **Objetivos.** Esta revisión exhaustiva tiene como objetivo sintetizar pruebas sobre la eficacia de las DBP en la gestión del sobrepeso y la obesidad en adultos, al tiempo que destaca desafíos como la adecuación nutricional, la adherencia y la viabilidad cultural. **Métodos.** Se llevó a cabo una búsqueda de literatura entre estudios publicados entre 2013 y 2023 utilizando *PubMed* y *Google Scholar*. Se incluyeron seis estudios que involucraron participantes >18 años, entre los cuales ensayos controlados aleatorizados, ensayos clínicos, estudios de sección transversal y revisiones sistemáticas. Los resultados clave abarcaron pérdida de peso, índice de masa corporal (IMC), masa grasa y parámetros metabólicos. **Resultados.** Las DBP se asociaron con reducciones en peso corporal, IMC y masa grasa. También se observaron mejoras en los parámetros metabólicos, incluida la sensibilidad a la insulina y al control de la glucosa. Estos efectos pueden atribuirse a la alta composición de fibra y baja grasa de las DBP, que pueden promover la saciedad y reducir la ingesta de energía. Sin embargo, se identificaron desafíos relacionados con la adherencia, potenciales deficiencias de micronutrientes y en su aceptación cultural. **Conclusiones:** Las DBP representan un enfoque dietético prometedor para gestionar la obesidad y mejorar la salud metabólica. Los esfuerzos futuros deberán centrarse en mejorar la adherencia, garantizar la adecuación nutricional y mejorar la accesibilidad para maximizar su impacto en la salud pública.

Palabras clave: intervención dietética, salud metabólica, obesidad, sobrepeso, dieta basada en plantas



Introduction

Obesity has become a global epidemic, with rates continuing to rise unabated worldwide. Defined as a body mass index (BMI) greater than 30, obesity is characterized by abnormal or excessive fat accumulation that presents significant health risks. Overweight, defined as a BMI between 25 and 29.9, also contributes to these risks.^{1,2} In 2019, approximately 5 million deaths from noncommunicable diseases (NCDs) were attributed to a BMI exceeding optimal levels. The prevalence of overweight and obesity continues to rise among both adults and children. Between 1990 and 2022, the global proportion of children and adolescents aged 5–19 years with obesity quadrupled, increasing from 2% to 8%. Similarly, the proportion of adults aged 18 and older with obesity more than doubled during this period, growing from 7% to 16%.¹

In Indonesia, the prevalence of obesity among adults has seen a significant increase over recent years, highlighting a growing public health concern. As of 2018,³ approximately 35.5% of adults were classified as overweight or obese, a sharp increase from 28.9% in 2013,⁴ with women disproportionately affected (44.4% compared to 26.6% of men). Meanwhile, the prevalence of obesity in other lower-middle-income Southeast Asian Countries is 18% in Cambodia,⁵ 29.6% in the Philippines,⁶ and 18.3% in Vietnam.⁷ Urban areas have seen even more drastic changes; the prevalence of obesity among urban adults more than doubled from 23.0% in 2007 to 50.1% in 2018.³ The latest data from the 2023 Indonesian Health Survey indicates that 23.4% of the adult population is now classified as obese, with central obesity reaching 36.8%. Notably, women aged 40–44 years exhibit the highest obesity rates at 41.7%, while men aged 45–49 show a rate of 19.3%.⁴

The rise in obesity is attributed to a complex interplay of factors, including unhealthy diets, physical inactivity, and socio-environmental influences^{8–10} and genetic predisposition.¹¹ The

global shift toward energy-dense, nutrient-poor foods, combined with sedentary lifestyles, has exacerbated the problem.¹² Obesity is not just a cosmetic concern; it is a major risk factor for several non-communicable diseases (NCDs), including type 2 diabetes, cancer, hypertension, cardiovascular diseases,¹³ musculoskeletal disorders,^{14,15} and economic impact.¹⁶ These conditions severely impair the quality of life¹⁷ and reduce life expectancy,¹⁸ posing significant public health and economic challenges.^{1,19,20} In addition, ectopic fat accumulation in organs leads to metabolic dysfunction, further increasing health risks.^{21,22} The widespread impact of obesity underscores the urgent need for effective prevention and management strategies to mitigate its growing burden.

Efforts to address obesity have focused on various interventions, including dietary modifications, physical activity, behavioral changes, and medical treatments. Among these approaches, dietary intervention plays a pivotal role in weight management and overall health improvement.²³ Plant-based diets (PBDs), which include vegan and vegetarian dietary patterns, have gained attention as a promising strategy for managing obesity.²⁴ These diets emphasize the consumption of whole, plant-derived foods and minimize or eliminate animal products, offering benefits such as reduced calorie intake, improved satiety, and lower risks of obesity-related diseases. Research suggests that PBDs may enhance weight loss and metabolic health while reducing the environmental footprint of dietary patterns.^{24,25} Despite these promising findings, challenges remain in implementing and maintaining such diets, highlighting the need for further investigation into their long-term efficacy and practical application.

Despite extensive research on obesity management, several gaps persist, particularly regarding the application of plant-based diets (PBDs) as a primary intervention. Existing studies often focus on short-term outcomes, with limited exploration of adherence rates, cultural

acceptability, and long-term sustainability. Additionally, there is insufficient data on how PBDs can be effectively integrated into public health programs, particularly in low- and middle-income countries like Indonesia. This study seeks to address these gaps by synthesizing current evidence on the efficacy of PBDs in treating overweight and obesity among adults. Specifically, this scoping review aims to synthesize evidence on the effectiveness of PBDs in managing overweight and obesity in adults, while also highlighting challenges such as nutritional adequacy, adherence, and cultural feasibility. By doing so, this research aspires to inform policy and practice, supporting the development of sustainable, evidence-based interventions that align with global health goals.

Methods

Design

A scoping review design was used in this study to synthesize the literature on PBD quality indices by examining their benefit for overweight and obesity among adults. This scoping review was conducted and reported according to the Preferred Reporting

Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) reporting guidelines.²⁶ The article selection process, from initial search to final inclusion, is illustrated in Figure 1.

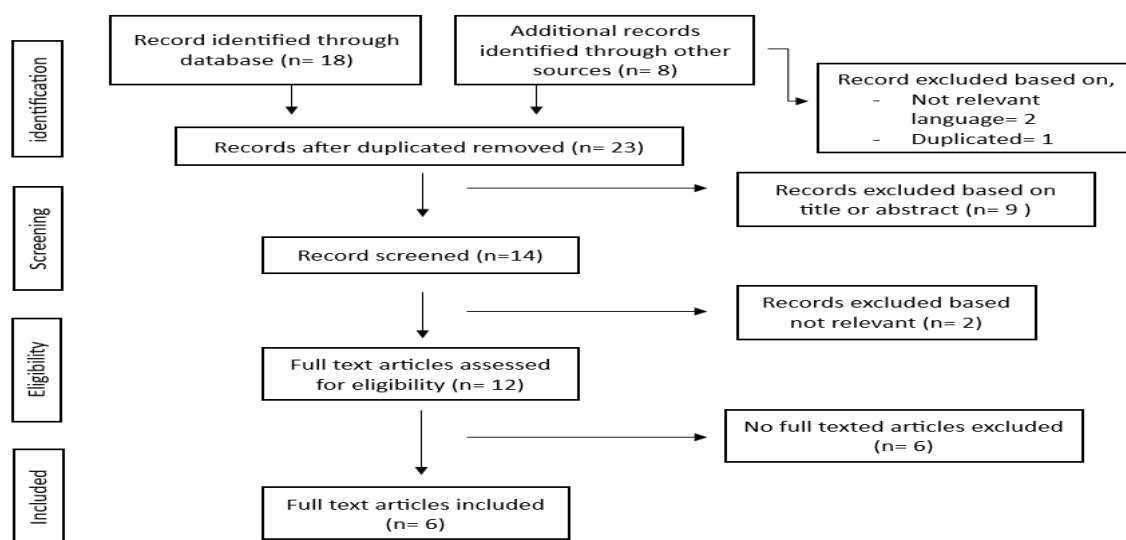
Identifying the research questions

The research questions were as follows: (1) What is the relationship between PBDs and weight loss in overweight and obese adults? (2) What are the benefits of PBDs for overweight and obese adults? (3) Are PBDs effective in managing overweight and obesity in adults?

Identifying relevant studies

An electronic search was performed using databases such as Google Scholar and PubMed. The search focused on full-text, English-language academic journals published between 2013 and 2023 that were relevant to the topic. All types of study designs were included, including observational studies and randomized control trial.

Figure 1. Article selection process.



Source: Authors' adaptation from PRISMA flow diagram.

During the study selection process, two researchers independently conducted data extraction, and consensus was reached for all eligible studies. The reference lists of all retrieved articles were hand-searched to identify additional relevant studies. Initially, the titles of the studies were screened, followed by the abstracts. The key terms used for searching articles are listed in Table 1. Studies deemed relevant during the initial screening were read in full. Any disagreements that arose during the selection process were discussed and reviewed by the researchers before final inclusion in the review.

Study selection

After careful consideration, the studies were selected based on the following criteria: (1) Examining the relationship between PBDs and weight loss in overweight and obese adults, (2) Investigating the benefits of PBDs for overweight and obesity among adults, (3) Assessing the effectiveness of PBDs in managing overweight and obesity among adults.

Key search terms

Plant based diet **AND** Overweight **OR** Obesity **AND** Adults

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Charting the data

The Mendeley program was used to record and export articles identified from electronic databases, such as PubMed and Google Scholar. Duplicates were filtered out, and the remaining full-text articles were evaluated for eligibility. The eligibility process involved determining specific inclusion and exclusion criteria. Studies were included if they met the following criteria: (1) Case-control, cohort, or cross-sectional study design, (2) Adult participants aged ≥ 18 years, (3) The term “plant-based diet” or a synonymous term (e.g., vegetarian) was mentioned in the abstract,

introduction, or methods section, (4) Published in English, (5) Published between 2013 and the date of the final search, (6) Available in full text. Studies were excluded if they: (1) were not peer-reviewed, or were review articles, commentaries, editorials, conference proceedings, or thesis studies, (2) Focused on animals, individuals under 25 or over 65 years of age, or pregnant and/or lactating individuals. After removing studies that did not meet the criteria, the remaining studies were included in this scoping review. The studies were qualitatively summarized, and key information, such as title, country, citation (author, year), study design, participant characteristics (age, sex), plant-based diet benefits, and results, are summarized in Table 1.

Collating, summarizing, and reporting the results

The significant findings and data from this review were organized using key search terms. The table was adjusted to align with the objectives of the study. The elements extracted from the table included the age of the population, study design, participant characteristics, and the benefits of PBDs. The table was designed to facilitate the qualitative synthesis of the included studies.

Results

A total of 26 titles were identified during the search, and 23 abstracts were considered for possible inclusion. However, six articles were selected for inclusion in the final screening stage of the review, as shown in Figure 1. The majority of the studies were randomized controlled trials (3 studies, 50%), followed by one clinical trial (17%), one randomized crossover study (17%), and one review including multiple study designs (17%). The sample sizes in the studies ranged from 75 to 771 participants aged between 25 and 65 years. This review summarizes the findings on the effectiveness of plant-based diets for managing overweight and obesity in adults, as outlined in Table 1

Table 1. Data extraction results of included studies on plant-based diets

Adherence to a Plant-Based Diet and Consumption of Specific Plant Foods—Associations with 3-Year Weight-Loss Maintenance and Cardiometabolic Risk Factors: A Secondary Analysis of the PREVIEW Intervention Study	Bulgaria	Ruixin Zhu, et al (June 2013 and April 2015) ²⁷	Randomized controlled trial	Participants (n = 710) aged 25–70 years with overweight (BMI 25–29.9 kg·m ⁻²) or obesity (BMI ≥ 30 kg·m ⁻²).	Diet may improve weight management only.	Assessment of Dietary Intake and Adherence to an Overall Plant-Based Diet	Body weight, fat mass, and waist circumference	Our findings support the hypothesis that specific components in a PBD are important. Although healthy and high-quality plant foods are currently recommended to individuals for reducing weight regain and the risk of developing CVDs, the observational nature of our analysis cannot establish a cause-and-effect relationship.
A Plant-Based High-Carbohydrate, Low-Fat Diet in Overweight Individuals in a 16-Week Randomized Clinical Trial: The Role of Carbohydrates	Minneapolis, Minnesota	Hana Kahleova, Sara Dort, Richard Holubkov, and Neal D. Barnard (between October 2016 and June 2017) ²⁸	Clinical Trial	As many as 75 participants overweight or obese adult men and women, with a body-mass index between 28 and 40 kg/m ² . The mean age of participant was 53.2 ± 12.6 years.	- Reduce body weight - Reduce fat mass - Reduce insulin resistance - Decrease BMI and volume of visceral fat	Stadiometer and a periodically calibrated scale	Body composition	Increased carbohydrate and fiber intake, as part of a plant-based high-carbohydrate, low-fat diet, are associated with beneficial effects on weight, body composition, and insulin resistance.
Effect of a Low-Fat Vegan Diet on Body Weight, Insulin Sensitivity, Postprandial Metabolism, and Intramyocellular and Hepatocellular Lipid Levels in Overweight Adults	Washington DC	Hana Kahleova, et al (January 2017 and February 2019) ²⁹	A Randomized Clinical Trial	244 participants. Adults aged 25 to 75 years with a BMI.	May lead to increased mitochondrial activity and postprandial metabolism is an effective tool for reducing body weight and increasing insulin sensitivity and postprandial metabolism.	Calibrated scale, dual x-ray absorptiometry.	Body weight, body composition, and visceral fat	A low-fat plant-based dietary intervention reduces body weight by reducing energy intake and increasing postprandial metabolism. The changes are associated with reductions in hepatocellular and intramyocellular fat and increased insulin sensitivity.
A Plant-Based Meal Increases Gastrointestinal Hormones and Satiety More Than an Energy- and Macronutrient-Matched Processed-Meat Meal in T2D, Obese, and Healthy Men: A Three-Group Randomized Crossover Study	Czech	Marta Klementova, Lenka Thieme, et al. (June 2015 - June 2017) ³⁰	Randomized Crossover Study	60 men: 20 men diagnosed with type 2 diabetes, 20 obese between 30 - 65 years old with a body mass index 25 - 45 kg/m ² . There also 20 healthy men control with normal BMI and glucose tolerance	- Increase postprandial secretion of gastrointestinal hormone - Promote satiety	Anthropometric measures, BMI- and age-matched, digital M6 Comfort monitor	Height, body weight, waist circumference, blood pressure	Plant-based meals may be an effective tool to increase postprandial secretion of gastrointestinal hormones, as well as promote satiety
Effectiveness of Plant-Based Diet on Reducing The Risk of Type 2 Diabetes Mellitus	Indonesia	Farahdina Amelia Rahmah, et al (Based data from 2011–2021) ³¹	Cross-sectional, cohort, case-control, crossover randomized and prospective study	Aged >45 years.	Effective in decreasing the risk of T2DM in patients. It can decrease the body weight and BMI because this diet is low in carbohydrate, fat and also high in fiber. High amount of fiber in the plant-based diet can decrease the blood glucose rate.			The consumption of a plant-based diet by patients can decrease weight and body mass index, blood glucose rate, in addition to influence hormones like insulin, intestinal hormone, etc.

Fat Quantity and Quality, as Part of a Low-Fat, Vegan Diet, Are Associated with Changes in Body Composition, Insulin Resistance, and Insulin Secretion. A 16-Week Randomized Controlled Trial	Washington DC	Hana Kahleova, Adela Hlozkova, et al (October 2016 - June 2017) ³²	Randomized Controlled Trial	75 participant overweight or obese adult men and women, with a body-mass index between 28 and 40 kg/m ² . The mean age of participant was 53.2 ± 12.6 years.	- Reduce fat intake, especially saturated and trans fat - Reduce fat mass - Decrease insulin resistance	Dual X-ray absorptiometry scan,	Dietary Intake, Body Weight, Body Composition, Insulin Resistance, and Insulin Secretion, Physical Activity and Dietary Intake	A 16-week low-fat vegan diet reduced body fat mass, improved insulin resistance, and increased insulin secretion, making it effective in improving body composition and metabolic health in overweight and obese adults.
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Source: Authors' data extraction from included studies.

This review analyzed six research articles that met the inclusion and exclusion criteria outlined in Figure 1, each examining the relationship between PBDs and weight-related outcomes in overweight and obese adults. The findings consistently demonstrate the benefits of adopting a PBD for reducing weight and body mass index (BMI). In addition to weight loss, PBDs were shown to improve metabolic parameters, including blood glucose levels and hormonal regulation, such as insulin and intestinal hormones. These hormonal changes enhance metabolic efficiency and support sustainable weight loss. The high fiber content of PBDs also promotes satiety, which leads to a reduction in overall energy intake. Taken together, these benefits highlight that PBDs provide a promising, non-invasive approach for managing obesity-related health risks in adults.

Discussion

Overweight and obesity are major contributors to the increasing prevalence of hypertension, dyslipidemia, and poor glycemic control, all of which are significant risk factors for chronic diseases such as diabetes and cardiovascular diseases.³³ The prevalence of obesity has reached alarming levels, with 2.5 billion adults (43%) overweight, including 890 million (16%) living with obesity, while 37 million children under 5 and 390 million aged 5–19 were overweight, of whom 160 million were obese.² This epidemic has fuelled a surge in obesity-related diseases, presenting a significant global health burden.^{15,18-20} Dietary interventions are increasingly recognized as effective strategies to combat obesity, with PBDs emerging as a promising approach.^{28,29,32} By emphasizing whole, nutrient-dense foods and minimizing animal products, PBDs address key

factors contributing to weight gain, including excessive caloric intake and poor nutrient quality.³⁴ This review highlights the potential of PBDs to promote sustainable weight loss and mitigate the risks of chronic diseases.

The studies included in this review also highlight the effectiveness of PBDs in achieving weight loss and improving overall health outcomes. For instance, a randomized clinical trial conducted in Washington, D.C., demonstrated that a low-fat, plant-based dietary intervention significantly reduced body weight by lowering energy intake and enhancing postprandial metabolism.²⁹ These effects were attributed to increased insulin sensitivity, resulting from a reduction in hepatocellular and intramyocellular fat. This dietary intervention not only facilitated weight loss but also contributed to improvements in metabolic health markers, making it a viable treatment option for overweight adults. Additionally, the low-fat, high-fiber nature of PBDs helps regulate appetite and energy balance, further reinforcing their effectiveness as a long-term strategy for obesity management.³² These findings underscore the potential of PBDs as a practical, evidence-based solution to the global obesity epidemic.

Plant-based diets are particularly effective in reducing body weight and improving body composition due to their high fiber and low fat content. Fiber-rich foods promote satiety through various mechanisms. First, they reduce energy density, as high-fiber foods are typically less energy-dense, providing fewer calories for the same volume of food. Second, they increase chewing time. Foods high in fiber require more chewing, which slows down the eating process and enhances feelings of fullness. Third, fiber causes gastric distension, expanding in the stomach to

slow digestion and prolong feelings of satiety.³⁴⁻³⁶ Additionally, the low glycemic index of many plant-based foods helps regulate blood glucose levels and prevent insulin spikes, further supporting metabolic health.^{37,38} Studies included in this review consistently showed significant reductions in BMI, fat mass, and visceral fat among individuals adhering to PBDs.³⁶ These benefits make PBDs a viable non-invasive intervention for managing overweight and obesity.

Moreover, PBDs influence hormonal responses, improving insulin sensitivity and beta-cell function. The reduction in visceral and ectopic fat observed in individuals consuming PBDs is linked to improved glucose metabolism and lower risks of type 2 diabetes. The dietary composition of PBDs, particularly their high levels of complex carbohydrates and plant proteins, plays a vital role in these outcomes. Plant proteins, although differing from animal proteins in amino acid composition, have been shown to reduce fat mass and improve lipid profiles.^{28,29,32,39} This combination of benefits underscores the effectiveness of PBDs as a comprehensive approach to obesity management.

Plant-based diets (PBDs) encompass vegetarian patterns that include dairy and eggs, as well as vegan patterns that exclude all animal products.⁴⁰ While beneficial, these diets present challenges regarding micronutrient adequacy, as plant foods are often devoid of vitamin B12 and contain less bioavailable forms of iron and zinc.^{41,46} Consequently, individuals following PBDs particularly vegan patterns require appropriate supplementation or fortification to avoid deficiencies.^{41,47} Additionally, the lower bioavailability of plant proteins compared to animal sources necessitates careful dietary planning to ensure a complete intake of essential amino acids.⁴¹ Beyond nutrition, cultural and socioeconomic factors shape the feasibility of PBDs.^{48,49} In regions like Indonesia, where traditional diets are relatively plant-heavy, access to affordable, nutrient-dense foods remains a hurdle.^{44,45}

Dietary preferences, accessibility to plant-based foods, and cultural dietary norms play significant roles in determining adherence to PBDs. In low-

and middle-income countries, limited availability of diverse plant-based food options and economic constraints pose additional barriers.⁵⁰ Tailoring PBD interventions to align with local food systems and cultural practices is essential to improving their acceptability and feasibility.⁵¹ Furthermore, public health initiatives should focus on increasing awareness of the health benefits of PBDs to encourage their adoption at a community level.

Finally, PBDs offer a promising, evidence-based solution to the global obesity epidemic. Their ability to promote weight loss, improve metabolic health, and reduce the risks of chronic diseases aligns with global health priorities. However, for their widespread implementation, addressing challenges such as nutrient deficiencies, cultural acceptability, and economic barriers is imperative. Future research should focus on the long-term sustainability of PBDs and explore innovative strategies to integrate them into public health programs. By overcoming these challenges, PBDs have the potential to transform obesity management and significantly improve global health outcomes.

This review has several limitations, including the heterogeneity of study designs, small sample sizes, and a focus on short-term outcomes, which limit the generalizability and long-term applicability of the findings. Lack of consideration for cultural and socioeconomic factors, and limited exploration of micronutrient deficiencies also pose challenges. Despite these limitations, PBDs show promise for managing obesity and improving metabolic health.

Conclusion

Plant-based diets (PBDs) effectively manage overweight and obesity by reducing body weight, BMI, and fat mass while improving metabolic health. To maximize clinical outcomes, potential nutrient deficiencies specifically vitamin B12, iron, and zinc must be addressed through fortified products and supplementation. Policymakers should integrate PBD guidance into national dietary programs and ensure the affordability and accessibility of nutrient-dense plant foods. Furthermore, promoting PBDs supports environmental sustainability, offering a dual benefit for public and planetary health. Finally,

ongoing long-term research is essential to ensure the safety, adherence, and effectiveness of PBDs across diverse populations.

Competing Interests The authors declare that they have no conflict of interest. **Funding** The authors did not receive any financial assistance.

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ISSN: 1557-7112