



NARRATIVE REVIEW

Nutrition strategies for obesity management

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Abstract

Introduction: Obesity is a chronic disease that requires a nutritional strategy for effective weight management. Behavioral modifications related to nutrient intake, food selection, and dietary patterns are essential for maintaining long-term results. Many diet interventions have been developed to help facilitate weight loss among obese patients.

Objective: This review aims to provide an in-depth exploration of nutrition-based strategies that can effectively address the obesity epidemic and their applicability in the Indonesian context.

Methods: This narrative review was conducted by searching electronic databases, including Google Scholar, PubMed, and ScienceDirect, for relevant papers published between 2004 and 2025. The search strategy included the terms 'obesity,' 'diet,' 'strategies,' and 'weight loss.'

Results: Several diet approaches are utilized in weight-control programs, including calorie restriction, intermittent fasting, low-carbohydrate and low-fat diets, high-protein diets, the Mediterranean diet, and a vegetarian diet. These diets differ in the quantity and type of food consumed, timing of food intake, and other influencing factors.

Conclusion: The optimal dietary approach for weight loss depends on individual preferences, metabolic factors, and health considerations. Therefore, a locally food-appropriate and professionally guided dietary approach is essential to achieve sustainable and effective weight-management outcomes.

Keywords: diet, obesity, weight loss

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Obesity has emerged as a significant global public health challenge, with its prevalence continuing to rise across populations and regions. According to the World Health Organization (WHO), in 2022, 43% of adults were overweight, and 16% were obese.¹ This trend is similarly evident at the national level. In Indonesia, data from the 2023 Indonesian Health Survey indicate that the prevalence of obesity—defined as a body mass index (BMI) of 27 kg/m² or higher—reached 23.4%, up from 21.8% in 2018.^{2,3} The prevalence of obesity among females (31.2%) is higher than that among males (15.7%).² These findings highlight the escalating burden of obesity at both global and national levels, reinforcing the urgent need for context-specific, nutrition-based interventions.

Obesity is a significant risk factor for various chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension, and malignancies. Based on several studies, obesity can increase the mortality risk by up to 1.8-fold in individuals with heart failure, and by as much as 108% for all-cause mortality.^{4,5} Moreover, central obesity is closely linked to chronic low-grade inflammation, which plays a critical role in the pathogenesis of many obesity-related diseases.⁶

Nutrition and obesity are closely related.^{7,8} Unbalanced nutrient intake can lead to obesity, while obesity can affect nutrient intake and increase the risk of developing chronic diseases.⁹ Although numerous nutritional strategies have been created to reduce obesity rates, each strategy presents distinct strengths and limitations.¹⁰ Therefore, this literature review aims to provide an in-depth exploration of nutrition-based strategies that can effectively address the obesity epidemic and their applicability in the Indonesian context.

Methods

This narrative review emphasizes the interaction between satiety and hormonal responses, dietary risk factors in obesity, and nutrition-based strategies to address obesity. This review was conducted by searching for relevant papers published in electronic databases, including Google Scholar, PubMed, and ScienceDirect, between 2004 and 2025. The search strategy included the terms ‘obesity,’ ‘diet,’ ‘strategies,’ and ‘weight loss.’ Additional studies published in English or Indonesian were identified through manual screening of reference lists from relevant review articles.

Discussion

Individual variability and physiological interactions between satiety and hormones in obesity

Sex-based biological differences and gender-related factors significantly shape obesity prevalence, adipose tissue distribution, metabolic profiles, and treatment responses. In women, estrogen facilitates greater subcutaneous fat storage.¹¹ It enhances brown adipose tissue (BAT) thermogenic activity, whereas men are more susceptible to visceral fat accumulation and exhibit diminished BAT thermogenic capacity.^{11,12} Although women generally demonstrate higher overall obesity prevalence and increased susceptibility to obesity-related cancers and mental health conditions, men tend to accumulate more visceral fat, which is associated with heightened risk of cardiovascular disease, type 2 diabetes, and other cardiometabolic disorders.¹¹



Individuals with obesity may have greater gastric capacity, potentially allowing higher energy intake before gastric distension-mediated satiation.¹³ Ghrelin stimulates appetite and is suppressed after eating. It is generally lower in individuals with obesity than in lean individuals, possibly reflecting maximum suppression due to excess adiposity.^{13,14} Additionally, gut-derived satiety hormones seem to be dysregulated in obesity. Postprandial secretion of peptide YY (PYY), which promotes satiety, is reduced in obese individuals and is linked to a diminished satiety response.¹⁴ Similarly, secretion of glucagon-like peptide-1 (GLP-1) is decreased in obesity.¹⁵ Weight loss partially restores GLP-1 secretion, and that impaired GLP-1 response may be a result of excess adiposity rather than an inherent defect.¹⁴

Dietary risk factor in obesity

The leading cause of obesity is an imbalance between energy intake and expenditure, whereby increased consumption combined with reduced activity can result in significant weight gain.¹⁶ Modifiable diet-related risk factors—including nutrient intake, food choices, dietary patterns, and eating behaviors—play an essential role in the development of obesity.¹⁷ Limited access to healthy food options contributes to poor diet quality and greater consumption of junk food.¹⁸ The Western dietary pattern, typical in modern lifestyles, is characterized by high consumption of ultra-processed foods, fast foods, and high-fat snacks, along with low intake of fruits, vegetables, whole grains, fiber, and unsaturated fats, and high intake of calories, added sugars, sodium, and trans fats—factors that are strongly associated with non-communicable diseases.^{18,19}

Dietary patterns commonly practiced in Indonesia

Traditional dietary patterns in Indonesia include a high consumption of fish, vegetables, and fruits such as bananas, leafy greens, papaya, carrots, and sweet potatoes.²⁰ Rice often functions as the primary carbohydrate source.²¹ Plant-based proteins like tofu and tempeh are commonly used to replace dairy products.²² In the broader Asian dietary context, especially in Indonesia, red meat consumption is often limited, with a preference for lean cuts and alternative protein sources such as tofu. A variety of locally sourced fruits and vegetables are typically included, as these foods generally have a low glycemic index and provide significant amounts of dietary fiber, vitamins, minerals, and antioxidants.²¹

Obesity-related dietary guidelines commonly used in other countries may not fully apply to the Indonesian context due to unique cultural and dietary patterns. A study in Indonesia reveals that consumption data indicate ongoing deficiencies in intake of cereals and tubers (285 g/day versus 300 g/day), vegetables (111 g/day versus 250 g/day), and fruits (46 g/day versus 100–150 g/day), emphasizing a persistent gap in meeting recommended dietary targets.²³ While average protein intake from both animal and plant sources (87.46 g/day) falls within the recommended range (70–140 g/day), the excessive consumption of added sugar (40.58 g/day versus ≤ 40 g/day) and salt (10 g/day versus 6 g/day) remains a significant concern.²³ These dietary imbalances reflect poor diet quality and could elevate the risk of non-communicable diseases. Overall, these findings support the need for culturally appropriate, context-specific dietary strategies to improve nutritional quality and health outcomes in Indonesia.

Result



Nutrition strategy

Weight loss, far beyond aesthetics, is a cornerstone of disease prevention and management.²⁴ According to the American Heart Association's 2013 guidelines on obesity management, lifestyle intervention constitutes the initial step and involves both nutrition and physical activity. This intervention includes recommendations for aerobic exercise and resistance training performed at moderate to high intensity, typically involving more than 14 sessions over six months. Pharmacological therapy, including fat blockers, GLP-1 receptor agonists, and combinations of sympathomimetic agents, may be indicated when lifestyle modification is insufficient to prevent weight gain or in patients with a BMI ≥ 27 kg/m².^{25,26}

Several dietary methods are utilized in weight-control programs, each aiming for long-term effectiveness while minimizing side effects.^{27,28} Dietary approaches include traditional calorie restriction, low-carbohydrate and low-fat diets, intermittent fasting, plant-based diets, the Mediterranean diet, and personalized or mindful eating.²⁸ These diets differ in the quantity and type of foods consumed, the timing of food intake, and various other factors.

Low-calorie and very low-calorie diets represent structured dietary interventions aimed at reducing total daily calorie intake.²⁹ Low-calorie diets (1,000–1,500 kcal/day) are recommended by many obesity societies and clinical guidelines, compared with very low-calorie diets (800 kcal/day).^{28,30} Food replacements offer a practical way to reduce daily caloric intake, including fixed-energy, portion-controlled, or prepackaged foods.³¹ Food replacement is effective for weight loss and improving various clinical parameters, but it is not suitable for long-term use due to the severe energy restriction.³²

Nutrition strategies categorized by food composition include low-fat, low-carbohydrate, ketogenic, high-protein, and Mediterranean dietary patterns.²⁸ A low-fat diet involves reducing fat intake 10%-30% of total calories and limiting saturated fatty acids consumption to below 7-10%.³³ Reducing total fat intake impacts overall calorie consumption, given that fat provides 9 kcal/g, more than double the energy density of carbohydrates or protein (4 kcal/g each).³⁴ Low-carbohydrate and ketogenic dietary approaches restrict carbohydrate intake to varying degrees; low-carbohydrate diets typically provide 150 g/day, while ketogenic diets restrict non-fibre carbohydrates to approximately 20–50 g/day.³⁵ A high-protein diet—increasing protein consumption to about 30% of total calories per day—improves satiety, decreases fat mass, and serves as a valuable tool for weight loss.²⁸ The Mediterranean diet is a predominantly plant-based dietary pattern characterized by high consumption of vegetables, dairy products, fish, and poultry, while limiting red meat intake.³⁶

Meal timing diet prioritizes the temporal distribution of food intake rather than specific food selection, macronutrient composition, or caloric targets.^{28,37} Intermittent fasting is a dietary pattern characterized by alternating periods of fasting and eating.³⁸ The benefits include reduced calorie intake, subsequent metabolic switching to reverse insulin resistance, enhanced immune system, and improved physical and cognitive performance.³⁹

A low-glycemic index diet affects postprandial glycemia, resulting in a more stable blood glucose level.⁴⁰ The effect of a low-glycemic index is to promote rapid weight loss and lower fasting glucose and insulin concentrations.⁴¹ The Nordic diet, adapted from the Nordic countries, emphasizes whole grains, fish, root vegetables, and berries.⁴²



Vegetarian diets tend to contain more carbohydrates and fiber, while excluding meat and other animal-derived products.⁴³ Table 1 summarizes all the diets listed above. We also provide the perks and pitfalls of each diet.



Table 1. Overview of dietary approaches and their benefits and limitations

Diet	Definition	Composition or characteristics	Feasibility and effectiveness	Perks	Pitfalls
Low-calorie diet	Consumption of 1000 – 1500 kcal per day or deficits of 500-750 kcal per day ²⁸	Fundamental principle of energy restriction, usually restricts carbohydrate or fat, and enhances the consumption of fiber ²⁸	Around 2 kg per month weight loss ⁴⁴	Modest weight loss without severe adverse effects ⁴⁴	Weight loss rate is slowing down due to the hormonal mechanism ⁴⁵
Very low-calorie diet	Consumption of less than 800 kcal a day ²⁸	Extreme caloric restriction ⁴⁶	Limited to patients with a BMI greater than 25 with complications of overweight ⁴⁷	Rapid weight loss ⁴⁸	Complications such as loss of lean body mass, increased serum uric acid, ketosis, and cholelithiasis. ⁴⁹ Need intensive monitoring.
Food replacement	Substitution of one or more daily meals with specially formulated and portion-controlled products ⁵⁰	Shakes, bars, soups to create a caloric deficit ³²	Replacing regular meals with controlled calorie alternatives, an individual can create a consistent and predictable diet ³²	Simple and convenient, structured meal plan, eliminates the need for calorie counting ³¹	Can cause boredom if done in the long term ³¹
Low-fat diet	Reducing total fat intake for weight loss	Divided into a wide range of fats: very low (contains less than 10% calories from fat) to moderate (less than or equal to 30% calories from fat) ³³	Influenced by the recognition that not all dietary fats are detrimental. Certain fats, such as those from sources like nuts and fish, can be consumed in moderation ⁵¹	Significant weight loss in normal and overweight patients compared to diet ³⁴	Can not be used in the long term ³⁴
Low-carbohydrate diet	Carbohydrate consumption lower than 45-65% of total daily energy in adults ²⁸	Limiting or eliminating high-carbohydrate meals like bread, pasta, and sugary snacks while increasing intake of foods rich in protein and healthy fats ^{35,52}	Rapid weight loss. Lifelong maintenance can continue according to patients' preferences. Therefore, it is more flexible ⁵³	Help to control appetite, which contributes to weight loss, can be used to manage type 2 diabetes, other than losing weight ^{54,55}	Elevating the risk of mortality due to increased Low-Density Lipoprotein (LDL) cholesterol level if the low-carbohydrate diet is combined with high-fat intake ⁵⁶



Diet	Definition	Composition or characteristics	Feasibility and effectiveness	Perks	Pitfalls
Ketogenic diet	Restricting carbohydrates to induce nutritional ketosis. Carbohydrate consumption was limited to around 20-50 grams ⁵³	Significant reduction of carbohydrate consumption. Consumption of a wide range of low-carbohydrate, high-fat foods, including meats, fish, eggs, dairy products, non-starchy vegetables, and nuts ⁵⁷	Some individuals find success and sustainability with this dietary pattern because it reduces feelings of hunger and enhances satiety associated with high-fat intake. Effectivity varies among individuals and depends on various factors, including metabolic status, activity level, and health goals ⁵⁸	Weight loss and improvement of metabolic markers such as blood glucose and insulin sensitivity ^{58,59}	Others may have problems with strict carbohydrate restrictions and miss the variety offered by a balanced diet ⁵⁸
High-protein diet	Protein consumption over 0.8 g/kg/day, or increased protein consumption to 30% of total calories per day ²⁸	High-protein foods include lean meat, fish, poultry, dairy products, legumes, and plant-based protein sources such as tempeh and tofu ⁶⁰	The satiating nature of protein can reduce feelings of hunger and promote a sense of fullness. It contributes to its feasibility ⁶¹	Effective for weight loss and muscle development ⁶²	Strain on kidneys due to higher nitrogen load, dehydration if water intake is inadequate, excessive calorie intake, which can hinder weight loss effort ⁶¹
Mediterranean Diet	Limiting red meat intake while increasing consumption of vegetables, dairy products, and fish, as well as poultry ²⁸	Fruits and vegetables such as tomatoes, cucumbers, olives, regular consumption of nuts, whole grains such as couscous and quinoa, olive oil, fish like salmon and mackerel (fatty fish), moderate consumption of dairy products and wine, limited consumption of meat ^{36,63}	To ensure long-term sustainability, it is crucial to encourage the cultivation and consumption of Mediterranean-inspired foods that can be locally grown ^{64,65}	Superior to low-fat diet in case of long-term weight management, can reduce mortality in cause-specific mortality cases, reducing cardiovascular disease risk ^{66,67}	No evidence on long-term weight management effect ⁶⁸



Diet	Definition	Composition or characteristics	Feasibility and effectiveness	Perks	Pitfalls
Intermittent fasting	a dietary regimen that alternates between periods of fasting and eating ²⁸	During fasting periods, consumption of water, herbal tea, and black coffee is usually allowed, which can help curb hunger and enhance feasibility ⁶⁹	The flexibility in choosing fasting and eating windows allows individuals to tailor Intermittent fasting to their schedules and preferences. The dietary choices during intermittent fasting windows play a crucial role in the effectiveness of intermittent fasting. While there are no strict rules about which foods to eat, it is advisable to prioritize nutrient-dense, balanced meals. Whole foods, including lean proteins, vegetables, fruits, whole grains, and healthy fats, are encouraged ⁶⁹	Flexible and can be tailored according to personal preferences, promoting weight loss ^{69,70}	Increased feelings of hunger, irritability, fatigue, and difficulty concentrating. Dehydration can also occur if individuals ignore their fluid intake during fasting periods ⁶⁹
Meal timing diet	Focusing on when to eat the food instead of what to eat ²⁸	Lean proteins, fruits, vegetables, whole grains, and healthy fats. Meals should provide essential nutrients and be well-rounded to ensure nutritional adequacy ⁷¹	For many individuals, meal timing diets are feasible and adaptable to their daily routines. The flexibility in choosing eating windows allows individuals to adjust their meal timing according to their schedules ⁷²	Improved weight management, better blood sugar control, and potential benefits for metabolic health. By aligning eating patterns with the body's circadian rhythm, meal timing diets may optimize the utilization of nutrients and energy, potentially leading to better health outcomes ^{73,74}	Skipping meals or fasting for extended periods can lead to nutrient deficiencies if not carefully planned. Moreover, the emphasis on when to eat can sometimes overshadow the importance of what to eat ⁷³



Diet	Definition	Composition or characteristics	Feasibility and effectiveness	Perks	Pitfalls
Low glycemic index diet	Consuming food which can cause a low to moderate increase in postprandial blood glucose ^{40,75}	Foods like oats, barley, quinoa, and whole wheat, and Legumes such as beans, lentils, and chickpeas, which are rich in fiber and protein and have a low glycemic index. Most non-starchy vegetables and many fruits, particularly those with high fiber content, are suitable for a low glycemic index diet. Furthermore, incorporating lean proteins, such as poultry, fish, and tofu, alongside low glycemic index carbohydrates can create balanced meals ⁷⁶	Does not require strict portion control or calorie counting, making it accessible to many individuals. Additionally, the satiating nature of low glycemic index foods can contribute to overall dietary satisfaction, potentially enhancing adherence ⁴¹	Blood sugar management, especially for those with type 2 diabetes, reduces the risk of insulin resistance, promoting a feeling of fullness due to its slower digestion and absorption ⁴¹	The glycemic index of a food can vary depending on various factors. An overly restrictive diet may overlook the essential aspects of nutrition ⁴¹
Nordic diet	Diet inspired by traditional eating habits in Nordic countries ⁴²	Emphasize whole grains, fish, root vegetables, and berries ⁴²	Feasibility may be limited in other countries outside the Nordic area because several foods may be less accessible ⁷⁷	The diet may lead to neuroprotective effects due to the nature of antioxidant activity in the meal ⁷⁸	The benefit of this diet has been observed, but it is generally inconsistent ⁴²
Vegetarian diet	Exclusion of meat and, in some cases, animal-derived products ⁷⁹	Vegetables, fruits, legumes, nuts, and whole grains, which are rich in essential fiber, nutrients, and antioxidants ⁴³	Access to plant-based food makes it feasible. Vegetarians may also be influenced by certain beliefs, culture, or religion ⁸⁰	Potential health benefits and reduced environmental impact, lower risk of chronic disease ⁵⁶	Nutrient deficiency such as vitamin B12, iron, calcium, and omega-3 ⁴³



Conclusions

It is important to recognize that no single diet is universally the "best." The optimal dietary approach for weight loss depends on individual preferences, metabolic factors, and health considerations. While numerous diets have been studied and found effective in specific contexts, it is crucial to emphasize that long-term success often depends on an individual's ability to sustain and adhere to a chosen dietary pattern. Although several dietary patterns have been shown to promote weight loss, their long-term sustainability remains challenging for many individuals. For instance, diets like low-calorie, very low-calorie, and ketogenic diets may yield rapid weight loss but often require close medical supervision and might not be sustainable in the long run. In contrast, diets such as the Mediterranean, Nordic diet, and vegetarian diets prioritize overall health and offer a balanced, sustainable approach to weight management. The Mediterranean diet, supported by substantial evidence of its benefits for cardiovascular health and physical outcomes, stands out as a highly advantageous approach, particularly given its potential compatibility with traditional Indonesian foods.

Dietary interventions should be personalized, with weight-management strategies based on locally available Indonesian foods to encourage long-term adherence. However, because individual preferences and physiological needs vary, professional guidance from healthcare providers or nutritionists is crucial for creating dietary plans that align with personal health goals and requirements.

Conflict of interest

The authors declared no conflict of interest regarding this article.

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Author Contributions

DEA: Conceptualization, made the first draft of the manuscript, and final approval of the version to be published; VAN: Critical revision of the manuscript and final approval of the version to be published; F and DS: Supervision and final approval of the version to be published.

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