

# Effectiveness of different dietary strategies in the management of obesity and obesity-related comorbidities

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## ABSTRACT

The prevalence of obesity has been increasing worldwide; however, the optimal dietary strategy for improving anthropometric and cardiometabolic parameters remains unknown. This review discusses the effectiveness of popular diets in the management of obesity and obesity-related comorbidities. The differences among popular diets are small and associated with dietary adherence and caloric intake. The Mediterranean diet is most effective in facilitating weight loss and improving cardiometabolic parameters, although the Central European diet seems to be a good alternative.

## Introduction

Obesity is one of the most vital public health issues, with the global prevalence nearly tripling between 1975 and 2016 and more than 650 million adults currently obese [1]. Diet plays an essential role in the prevention and treatment of obesity, although the optimal dietary strategy for improving anthropometric and cardiometabolic parameters remains unknown [2]. This review discusses the effectiveness of popular diets in the management of obesity and obesity-related comorbidities.

## Mediterranean diet

The Mediterranean diet is based on the traditional cuisine of countries bordering the Mediterranean Sea and is characterised by a high intake of vegetables, fruits, grains, legumes and nuts. The main components of this diet also include a regular intake of fish, moderate intake of dairy products, limited intake of red meat and red wine, in addition to the use of olive oil as the main source of fat [3]. The efficacy of the Mediterranean diet has been investigated in a number randomised controlled trials [4–6]

and meta-analyses [2,7], revealing that this diet supports weight loss and improves cardiometabolic markers (e.g. glucose and insulin levels, inflammatory markers) [6,8]. In an umbrella review by Dinu et al. [2], the Mediterranean diet has been reported to provide the strongest and most consistent evidence of exerting a beneficial effect on anthropometric parameters (body weight and body mass index (BMI)), lipid profile, glucose and insulin homeostasis, as well as on blood pressure. Importantly, these effects seem to be independent of the caloric intake and are proportional to the dietary adherence rate [4,5].

## Central European diet

The Central European diet is based on foods including grains (e.g. rye, oat), fish (e.g. herring), vegetables (e.g. beetroot, cabbages) and fruits (e.g. berries, apples, plums) [5]. Consequently, the diet is low in fat and high in dietary fibre and has been shown to significantly improve body weight, waist circumference, visceral fat, metabolic and atherosclerosis parameters. Moreover, the effectiveness of the Central European diet seems to be similar to the Mediterranean diet [5,9].

## DASH diet

The dietary approaches to stop hypertension (DASH) diet is characterised by a high intake of vegetables, fruits, whole grains and low-fat dairy products, with a moderate intake of fish, poultry and nuts and a high intake of dietary fibre, calcium, magnesium and potassium. Furthermore, it includes a low intake of sodium and fat [10]. The DASH diet has been designed to control hypertension [11]. However, the diet also helps to reduce body weight [12] and decreases the risk of cardiovascular diseases [13]. In their umbrella review, Dinu et al. [2] found suggestive evidence that the DASH diet could improve weight and blood pressure. Additionally, according to a meta-analysis by Soltani et al. [12], the DASH diet is more effective in body weight reduction than other low-calorie diets, therefore, it is thought to be a good choice with regard to obesity management.

## Vegetarian diet

A plant-based diet focuses on foods of plant origin comprising a high intake of fruits, vegetables, grains, legumes, nuts and oils. Depending on the type of diet, dairy products, eggs and fish may be included or excluded [14]. Recently, it has been suggested that a vegetarian diet is more effective in body weight reduction than a non-vegetarian diet, although the effectiveness may vary depending on the type of diet. In their meta-analysis, Huang et al. [15] demonstrated a significant weight reduction in subjects consuming a vegan diet and a lacto-ovo-vegetarian diet. However, a recent umbrella review has reported this diet to have a low effectiveness in reducing cholesterol and glucose levels, blood pressure and anthropometric parameters [2], possibly due to the high variability among vegetarian diets.

## Low glycaemic index diet

Reducing the glycaemic index may play a crucial role in the prevention and treatment of obesity. A low-glycaemic-index diet can regulate anthropometric parameters (e.g. BMI), promote satiety and reduce food intake, as well as reduce postprandial insulin secretion, affect insulin sensitivity and maintain glucose levels within the normal range [16]. Compared to a high-glycaemic-index diet, not only does a low-glycaemic-index diet reduce body weight, but it also affects body composition [17]. Nevertheless, the umbrella review only provided suggestive evidence of a reduction in anthropometric parameters following this diet and contrasting evidence with regard to its effect on lipid and glucose levels, as well as on blood pressure [2].

## Ketogenic diet

The ketogenic diet is a type of low-carbohydrate diet, in which carbohydrate intake is limited to 5-10% of the total daily dietary requirements [18]. The diet is employed in epilepsy, Alzheimer's disease [18], or autism [19]. A recent meta-analysis has also reported a ketogenic diet to be more effective in improving metabolic and anthropometric parameters in obese subjects than a low-

fat diet [20]. However, in another meta-analysis, Lee et al. [21] found no effect of combined exercises and ketogenic diet on body composition, fasting glucose and cholesterol levels. Additionally, the long-term use of the diet may be associated with an increased risk of various chronic diseases. In fact, Mazidi et al. [22] observed that participants with the lowest carbohydrate intake have the highest risk of overall mortality, as well as cardiovascular disease and cancer mortality. Moreover, several adverse effects were reported, including constipation, headache, diarrhoea, malaise and rash [23].

## High-protein diet

A high-protein diet is defined as a diet in which at least 20% of energy is obtained from protein [24]. Mitra et al. [25] reported that in comparison with a standard diet, a high-protein diet significantly reduces anthropometric parameters (body weight, BMI, waist circumference, fat mass and percentage of body fat), insulin resistance, and C-reactive protein levels. Furthermore, de Luis et al. have reported a beneficial effect of a high-protein diet on anthropometric and metabolic parameters [26]. Such a positive effect of the diet on the abovementioned parameters is a consequence of the diet-induced diuresis, and is associated with glycogen mobilisation and loss of appetite. However, it should be noted that a long-term use of this diet may cause renal, bone and hepatic abnormalities [24].

## Conclusions

Studies on the effectiveness of different dietary strategies in the management of obesity and obesity-related complications have shown heterogeneous findings. The differences among popular diets are small and associated with dietary adherence and caloric intake. Nevertheless, most evidence has supported the effectiveness of the Mediterranean diet in facilitating weight loss and improving cardiometabolic parameters. In view of the recent data, the Central European diet could be a good alternative to the Mediterranean diet, at least in Central European countries.

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### Contributors

M.J. wrote the manuscript. M.W.G. discussed the manuscript. J.W. commented on the manuscript. All authors reviewed and approved the final manuscript.

### Conflict of interest statement

The authors declare no conflict of interest.

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