Review Article

Indian J Med Res 148, November 2018, pp 642-647
DOI: 10.4103/ijmr.IJMR_1793_18

Pros & cons of some popular extreme weight-loss diets

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Received September 26, 2018

Obesity has now become a huge public health issue not only in the developed world but also in developing countries. In view of the health hazards associated with obesity and more importantly for cosmetic reasons, many people, particularly the youth, have started resorting to 'extreme' weight-loss diets to achieve a rapid reduction in weight. These extreme diets are either very low in carbohydrate or very low in fat. Such extreme diets not only make the diet unbalanced but also have safety issues. Moreover, these are not sustainable in the long run. The weight that is lost is regained within a short period of time when people go off these extreme diets. This explains why the popularity of most extreme diets peaks as well as wanes rapidly. Instead of resorting to such extreme diets, correction of obesity is best achieved with balanced, healthy, nutritious diets which are low in calories, combined with adequate physical activity (exercise). Motivational counselling can also help people to initiate weight loss and sustain this weight loss over longer periods of time.

Key words Diabetes - low-carbohydrate diets - low-fat diets - obesity - very-low-calorie diets - weight-loss diets

Introduction

The incidence and prevalence of obesity is rapidly rising. This is attributed to several factors including globalization, urbanization and rapid changes in lifestyle, leading to unhealthy diets and sedentary behaviours. The obesity epidemic is no longer confined to the developed world but is now rampant in developing countries as well. Obesity leads to type 2 diabetes, hypertension, cardiovascular disease, non-alcoholic fatty liver disease, cholelithiasis, osteoarthritis, sleep apnoea and even some forms of cancer[1].

The above health issues as well as cosmetic reasons have led to the need for weight loss in society today. Undoubtedly, dietary management plays a major role in the management of obesity, and in this context, numerous dietary fads have become popular[1,2]. Unfortunately, these are also controversial. Most diets recommend restriction of calories and portion sizes, leading to slow weight loss[1]. Many diets, however, promote rapid weight loss, and in this article, we will refer to them as 'extreme diets'. Some diet plans recommend extreme restriction of the carbohydrate intake without any fat restriction, while others are the reverse and place great emphasis on restriction of fat[3]. This review will focus on the pros and cons of some extreme diets that are widely used today and then discuss the more conventional diet plans for weight loss.

Classification of extreme diets

The extreme diets can be classified into low-carbohydrate (high-fat) diets, low-fat (high-carbohydrate) diets, very-low-calorie diets (VLCDs), and other diet modalities used for weight loss[1].

Low-carbohydrate/high-fat diets

Low-carbohydrate diets have received much attention in recent times. Examples of these diets are Atkins's diet and Protein Power Lifeplan[4]. These diets are low in carbohydrate (<100 g/day) and mostly fat based (>60%).

The proponents of the low-carbohydrate/high-fat diets give greater importance to restriction of carbohydrates than to fats. It is well known that high-carbohydrate meals lead to increased blood glucose, insulin and triglyceride levels and decreased high density lipoprotein cholesterol (HDL-C)[5]. High insulin levels inhibit the serotonin release in the brain, leading to decreased satiety. Marked restriction of carbohydrate promotes ketosis which indicates fat mobilization. The main benefit of these diets is that it results in lower blood glucose and insulin levels and appetite suppression. This promotes weight loss and decrease in body fat loss and thus to better control of type 2 diabetes, heart disease and hypertension[1].

In reality, weight loss is due to caloric restriction of approximately 500-1000 kcal. When unlimited intake of proteins and fats was permitted, the fat intake actually decreased and the protein intake increased only slightly[6]. Thus, the caloric reduction was mainly due to reduction in carbohydrate.

In the early phases of ketogenic diet, weight loss is mostly due to water loss, whereas there is no difference in protein and fat loss comparing ketogenic and non-ketogenic diets[7-10]. Low-carbohydrate ketogenic diets have little metabolic advantages for weight reduction, and it is mostly the negative energy balance which drives weight loss[1].

Metabolic benefits of low-carbohydrate diets

These include decreased blood glucose, insulin and lipid levels. The Prospective Urban and Rural Epidemiological Study (PURE) study[10], a large prospective cohort study of 135,335 individuals, found that high-carbohydrate intake (>60% calories) led to increased total and non-cardiovascular disease mortality. Conversely, high-fat intake was associated with reduced total mortality and non-cardiovascular disease mortality. The PURE study[10] thus does not support marked reduction of fat intake and clearly points to the dangers of consuming very-high-carbohydrate diets.

Side effects of low-carbohydrate/high-fat diets

It has been shown that a high-meat diet which is also low in fruits and vegetables leads to bone loss[11]. Very high protein intake leads to calciuria and affects bones, unless buffered by adequate fruits and vegetable intake. The ketogenic diet may also increase blood uric acid concentrations[12-16].

As low-carbohydrate diets have less fruits, vegetables and dietary fibre, this could increase the risk of cancer in the long run[17-20]. Seidelmann *et al*[21] recently showed that very-low-carbohydrate diets (<30%) markedly increases the mortality. Their data also suggest that the source of the protein and fat substituted for carbohydrates in the diet is also important and the animal protein is more harmful. Low-carbohydrate/high-fat diets may also promote inflammatory pathways and oxidative stress[21].

Compliance and sustainability issues

Historically and culturally, Indian diets are predominantly high carbohydrate based, as shown by Chennai Urban Rural Epidemiology Study (CURES)[5] in south India and the Study To Assess the dietaRy CarboHydrate content of Indian type-2 diabetes population (STARCH) study[22] across the country. Hence, adhering to low-carbohydrate/high-fat diet for prolonged periods of time is difficult. High-protein/high-fat diets usually comprise non-vegetarian items. It is difficult to plan vegetarian high-fat/high-protein-low-carbohydrate diets, because the vegetable proteins are also usually a rich source of carbohydrate.

Low-fat/high-carbohydrate diets

Low-fat diets are defined as diets with 11-19 per cent fat, whereas very-low-fat diets have <10 per cent fat. Low-fat diets are also usually by default high-carbohydrate diets (*e.g.*, the Dean Ornish and the Pritikin diets)[1,23]. The emphasis is more on consuming complex carbohydrates and high fibre. Low-fat diets are made up of vegetables, fruits, whole grains and beans, egg white, non-fat dairy, soya and white flour. The Dean Ornish diet is basically a vegetarian diet[1,23]. The Pritikin diet includes limited quantities of low-fat animal protein[1,23].

Metabolic benefits of low-fat diets

Low-fat diets lower total cholesterol, specifically low-density lipoprotein (LDL) cholesterol level, in the

short term. However, these effects are not seen over a long period of time[24]. Moreover, triglycerides levels increase in response to these diets, but the amount of carbohydrate consumption may play a role in this. Diets containing up to 70 per cent carbohydrates do not lead to hypertriglyceridaemia, provided sufficient fibre is included although the HDL cholesterol levels may decrease[25]. The blood pressure may decrease, leading to reduction in antihypertensive medications[26]. These diets also usually decrease blood glucose and insulin levels[27-30].

Compliance issues with low-fat diets

As some amount of fat is needed for palatability of diets, very-low-fat diets are usually less palatable. Long-term compliance can thus be a problem with these diets.

Very-low-calorie diets (VLCDs)

VLCDs provide <800 kcals/day. These diets lead to rapid weight loss. Lean body mass is preserved by providing adequate dietary protein in the form of milk, soy or egg-based powder which is mixed with water and consumed as a liquid[31,32]. Such diets provide 80 g carbohydrate and 15 g fat/day. Recommended daily allowance (RDA) of essential vitamins and minerals is also ensured. The source of protein may be from lean meat, fish and poultry[33,34]. These diets must be supplemented with a multivitamin and 2-3 g/day potassium and adequate fluid intake[31].

A study[35] has shown that VLCDs not only have beneficial effect on weight but also lead to remission of type 2 diabetes. The authors found that about 40 per cent of study participants achieved 'remission', *i.e.*, fasting plasma glucose of <7 mmol/l (126 mg/dl), and this lasted for several months. Along with weight loss, normalization of liver fat content was also seen. Interestingly, the dropout rate was low. Thus, a short-term VLCD intervention is successful in inducing the weight loss and achieving favourable metabolic profile including reversal of type 2 diabetes mellitus[35]. However, whether this will sustain in the long term needs more studies.

Side effects of very-low-calorie diets

VLCDs are associated with cholelithiasis, ketosis and increase in serum uric acid concentrations[36]. Long term safety data of these diets needs to be established. Also, whether these diets cause any micronutrient deficiency also needs to be established.

Other diet modalities used for weight loss

Meal replacers

Meal replacers are often used in weight-loss programme, but their use is usually over a short period of time[37]. Most individuals tend to severely underestimate their calorie intake when consuming a diet of conventional foods[38] because of difficulty in estimating portion sizes and calorie content and in dietary recalls. Meal replacements seem to obviate these difficulties[33]. Portion-controlled servings of conventional foods also facilitate weight loss[39-41].

Dietary fibre supplements

These are fibre-based drinks/foods which increase satiety, thereby leading to weight loss. These supplements have other benefits also, *e.g.*, reduction in serum lipids, blood pressure and uric acid levels[42-44].

Are there alternatives to extreme diets to control obesity?

It is believed that rather than short-term use of extreme diets which are not sustainable, a more balanced approach in dietary management of obesity is far better.

Balanced weight-loss diets

These diets tend to contain equal quantities of fats and carbohydrates (~30-40%) and the rest from protein but with the reduction in total calories. The Dietary Approaches to Stop Hypertension (DASH) diet, diets based on the use of food pyramid and the National Cholesterol Education Program (NCEP) Step I and Step II diet are based on this[45].

Principle of balanced weight-loss diets

The principle of these diets is that weight loss occurs if a negative energy balance is maintained, and these diets provide a deficit of 500-1000 kcals/day. The goal is to provide a range of food choices and to allow nutritional adequacy and compliance, while slowly but steadily promoting weight loss.

Metabolic effects of balanced weight-loss diets

These diets reduce LDL cholesterol, triglycerides (TG) and improve TG/HDL ratio[20]. Serum insulin levels are also reduced in participants on balanced weight-loss diets. Individuals taking such diets do not complain of hunger; rather, they feel there is too much food. Scientists have found that individuals consuming these diets have positive changes in their

dietary behaviours and a better physical wellness. This, however, was not correlated with the weight loss[46].

While the PURE study[10] pointed to the dangers of very high carbohydrates (>60%), Seidelmann *et al*[21] showed the dangers of very-low-carbohydrate diets (<30%). Thus, based on the Indian dietary patterns, a reduced calorie, moderate carbohydrate (~50%) and moderate fat (~30%) diet with healthy monounsaturated fats and adequate protein (~21%) along with plenty of green leafy vegetables is the best alternative.

Conclusion

Those trying to lose weight are willing to try any extreme diets. Unfortunately, none of these seem to work in the long run. This is shown by the rapid rise and fall of such extreme diets in the society. One of the reasons why people give up these diets is the sheer boredom of following an artificial type of diet or their craving to get back to their normal diet habits.

Weight management consists of two different phases: achieving the weight loss and maintaining the weight loss. The strategies that work for initiating weight loss may not be effective for keeping the weight off and vice versa. Hence, when choosing a weight-loss diet, no diet can be suitable for everyone. Thus, it is clear that weight-loss diets should be individualized. If one has to sustain the weight loss, a negative energy balance has to be maintained. There is enough evidence that increasing physical activity is equally important for achieving and maintaining weight loss and this is not discussed in this article. For weight-loss programmes to be effective, dietary therapy must be combined with adequate physical activity. Furthermore, counselling is equally important, as constraint motivation by a dietician or counsellor can play a significant role to ensure that people do not give up easily on their weight-loss programme. India is facing a serious epidemic of obesity. This must be tackled using a slow and steady but sustained diet and exercise programme, rather than following a 'crash diet' programme as the latter rarely succeeds in the long term.

***Financial support & sponsorship*:** None.

***Conflicts of Interest*:** None.

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