

FAD DIET

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Abstract

This paper reviewed the common types of fad diets. Fad diets have an effective role in promoting weight loss. It is believed to have beneficial effects on body composition and protect against the development of obesity and related chronic diseases such as type-two diabetes and coronary heart disease. Fad diets work simply because they restrict calorie intake, showing that the most important dietary concept of weight loss and maintenance is a decrease in caloric intake. Based on the contemporary studies on fad diets, the future concept for successful weight loss could run on the concept of energy density, which refers to the amount of energy in a given weight of food.

Key Words: fad, diet, low, carbohydrates, fat

Introduction

Obesity is an important public health problem during the recent years. Obesity has reached epidemic proportions. The prevalence of obesity has increased gradually throughout this century. The prevalence of obesity has reached alarming levels, affecting virtually both developed and developing countries across all socio-economic groups irrespective of age, sex or ethnicity (1). Childhood obesity has been estimated that worldwide, over 22 million children under the age of 5 are severely overweight. One in every ten children are overweight (1-2). The prevalence of overweight in Africa and Asia is below 10% and in the Americas and Europe, above 20% (3, 4). The proportion of school-age children affected will almost double by 2025 compared with the most recently available surveys from the late 1990s up to 2003 (5-7). Obesity is an independent risk factor for overall mortality (2). Obesity is associated with heart diseases, sleep apnea, diabetes mellitus, arthritis, and cancer (8). In 2014, the World Health Organization acknowledged that obesity was a "global epidemic" (4). Diet is one of the factors contributing to obesity as excessive calorie intake leads to weight gain (9).

Table 1: Prevalence and projection of overweight \obesity in children and adolescents in various regions of the world

Region	Overweight *	Obesity**	Overweight*	Obesity**
Africa (1987-2003)	1.6	0.2	-	-
Americas(1988-2002)	27.7	9.6	46.4	15.2
Eastern Med (1992-2001)	23.5	5.9	41.7	11.5
Europe (1992-2003)	25.5	5.4	38.2	10
South East Asia (1997-2002)	10.6	1.5	22.9	5.3
West pacific (1993-2000)	12.0	2.3	27.2	7.0

*Body mass index more than 25kg/m² - **Body mass index more than 30kg/m²

Increased availability of fast foods and televised entertainment could contribute to obesity by making eating more attractive and physical activity less. Previous research on the relationship between television viewing and body weight has shown positive associations in studies involving children and adults (6).

Table 2 Cut –off points by a WHO expert committee for the classification of overweight

BMI(kg\m ²)	WHO classification	Popular description
<18.5	Underweight	Thin
18.5-24.9	-	Healthy "normal", "acceptable"
25.0-29.9	Grade 1 overweight	Overweight
30.0- 39.9	Grade 2 overweight	Obesity
≥40.0	Grade 3 overweight	Morbid obesity

BMI is the weight in kilograms divided by the square of the height in meters.

Methodology

Google search engine was used to gather information relating to obesity and associated diets. The studies were written in English. The study period has occurred from January to the end of June 2018. Keywords included “fad diet”, “low carbohydrates”, and “fat”. The search generated about 165 sources, of which 70 sources were used. These 70 articles were considered relevant because they answered the objectives of the review. The library databases such as PubMed and MEDLINE were also used during the study.

Factors influencing obesity

Obesity is not a single disorder but a heterogeneous group of conditions with multiple causes (8). Body weight is the result of the interaction between genetic, environmental and psychosocial factors, acting through the physiological mediators of energy intake and expenditure (9-10).

Fatness runs in families but the influence of the genotype on the etiology of obesity may be attenuated or exacerbated by non-genetic factors (11). The genetic influences seem to operate through susceptible genes for obesity which are inherited and impact adversely on body fat composition, anatomical distribution of fat, food intake, and energy expenditure

It has been shown that environmental factors drive the susceptible gene into action (11, 12). Research hypothesized that environmental factors play a key role in unmasking tendencies to develop obesity (12). The biggest component of energy expenditure is a physical activity which represents 20-50% of total energy expenditure (5-7).

It is surprising that no direct correlation has been reported between the prevalence of obesity and increased energy intake in developed nations, given the ready availability of highly palatable foods (13). The evidence for the critical role of environmental factors in the development of obesity comes from migrant studies and the ' westernization' of diet and lifestyles of other cultures previously from developing countries (13). For example, there are reports that those

migrants that move to live in the United States are on average 25 kg heavier than Pima Indians living in Mexico (7). Similarly, in Nigeria the mean BMI for men and women has been reported as 21.7 and 22.6 respectively, relative to 27.1 and 30.8 in the United States (7). For instance, the prevalence of hypertension in adult Nigerians living in Africa is 15%, relative to as high as 30% among those living in the United States. A higher prevalence of overweight and obesity is observed in those with lower educational attainments and low income (7, 14-16). There is evidence that over-nutrition of the fetus during intrauterine development may determine the later onset of obesity, hypertension and type 2 diabetes independent of genetic inheritance. (15)

Fad diet

A fad diet is a weight loss eating plan that promises dramatic results over short term period (8). In fact, to some extent, the word "fad" is not a scientific term (17). Conversely, the widely used term "healthy" is also not scientific (17). However, an attribute of a fad diet is that those who consume it do not like it (18). It is generally considered that a fad diet is the other person's diet (9, 17). In practical terms there are two kinds of fad diets; firstly, those that have some quirky feature which hardly anybody adheres to (unlike fads in fashion), and secondly, the *bête noire* of the nutritional establishment. The operational definition of fad therapies includes the following; "therapies used for a limited period of time", "therapies used without proven efficacy", "therapies used by a limited number of patients", and "therapies that are not mainstream" (10).

People have always been obsessed with dieting. They will try the latest fad diets that defy logic, basic biochemistry, and even appetite appeal. Fad diets are popular because they promise quick results, are relatively easy to implement, and claim remarkable improvements in how their followers will look or feel. Unfortunately, there are some types of attributes fad diets have in common, and that is, they seldom promote sound weight loss (9). The common features of fad diets can be summarized according to (19) as follows. "They promise rapid weight loss"; "there is a restriction of one food item or food group"; "They promote intake of a particular food item or food group" and that "they claim to cure numerous health problems". Other attributes include these; "they have simplistic theories that are presented in a scientifically sound manner" though "they are not supported by scientific evidence"

Types of fad diet

According to (20), there are many types of fad diets. The most popular fad diets are low carbohydrate diets, high fat diets, and very low carbohydrate diets. Some diets are a combination of high carbohydrates, low fat or moderate fat. There are diets that are also low in glycemic index, vegetarian diet, high protein diet, cabbage soup diet and grape fruit diet. In this review, only three types of fad diet were discussed; low carbohydrates diet, low glycemic index diet and low fat diet.

Low carbohydrate diet

Low carbohydrate diets have primarily been used in the treatment of diabetes prior to the discovery of insulin (10). Low carbohydrate/high fat diets have also been used in the early 1900s as a pediatric anti-epileptic therapy. (11) Low carbohydrate diet has effective role in weight loss and in reduction of cardiovascular diseases risk factors (13). The low carbohydrate, high – protein diet is named "Atkins diet" (14, 15). This diet is low in carbohydrate, high in protein. It is one of the most popular alternative weight loss approaches. These diets derive a large proportion of energy intake from protein and fat (16). Low carbohydrate diet less than 130 gram/day or less than 26% of a nominal 2000 Kcal/day diet is the American Diabetes Association definition which seems appropriate (17). Carbohydrate restriction is not well

defined. Anything less than 50% of the diet is considered by some to be a low carbohydrate diet from this perspective (17). The definition of low-carbohydrate diets is even more widespread. Some of the diets known to be low in carbohydrate are the Atkins diet, protein powder diet, the South Beach Diet, and the Zone diet. (18) However, Low carbohydrate diets appear to have some adverse effects. A low carbohydrate diet has common short-term side-effects such as constipation, fatigue, halitosis, headache, thirst, polyuria, and nausea (19) muscle cramps, diarrhea general weakness, rash, chest pain, and hyperosmolar coma (12).

Long term disadvantages of low carbohydrate diet include increased fat intake and consequently high cholesterol level; accelerate the progression of pre-existing kidney disease, increased urinary calcium excretion (16).

Mode of action of low carbohydrate diet

Low carbohydrate diet shows success at six months to one-year period. Low carbohydrate diet decreases insulin resistance and improves lipid profiles. (21, 22). Ketosis occurs during the first few days of fasting or a low carbohydrate diet when breakdown of fat (oxidation) outstrips breakdown of carbohydrate (glycolysis) (23). Low carbohydrate diets work primarily by decreasing food choice in diets where fat and carbohydrate are so tightly associated (24). Also, there is an increased satiety with low carbohydrate diets (25). The systolic pressure did not change significantly but diastolic pressure decrease after following the low carbohydrate diet for six months (25, 26) Low carbohydrates diet relatively increases HDL cholesterol concentration and relatively decreases triglyceride concentration (27). Carbohydrate restriction leads to a marked reduction in triglycerides (TAG). This is one of the most reliable features of any dietary intervention. Changes in total cholesterol and LDL tend to be variable on low carbohydrate diet (28). Low carbohydrate diets are nutritionally inadequate. They are low in vitamins E, A, thiamin, B6, folate, calcium, magnesium, iron, potassium, and dietary fiber. This diet is usually high in saturated fat and cholesterol (29).

Randomized trial of low carbohydrate diet in literature

The study was approved by the institutional review board at the Philadelphia Veterans Affairs Medical during an enrollment period that lasted from May to November 2001, involving one hundred and thirty-two (132) subjects from the Philadelphia Veterans Affairs Medical center. In this study they had randomly assigned 132 severely obese subjects (including 77 blacks 23 women) with a mean body-mass index of 43kg/m^2 and high prevalence of diabetes (39 percent). All subjects, who are exposed to the low-carbohydrate diet lost more weight than those on the low -fat. Subjects on low carbohydrates diet had greater decreases in triglyceride. The amount of weight lost and assignment to the low-carbohydrate diet were independent predictors of improvement in triglyceride levels and insulin sensitivity (30).

In 2001 in Philadelphia they conducted a one-year, multicenter, controlled trial involving 63 obese men and women who were randomly assigned to either a low carbohydrate, high-protein, high fat diet. All subjects on the low-carbohydrate diet had lost more weight than subjects on the conventional diet at 3 months (3.7 percent of body weight) and 6 months (5.6 percent of body weight), but the difference at 12 months was not significant. After three months, no significant difference was found between the groups in total or low-density lipoprotein cholesterol concentrations (32).

Low glycemic index

The glycemic index was proposed in 1981 as an alternative system for classifying carbohydrate-containing food. Several hundred scientific articles and books have been published on the topic (36). One of the main dietary factors that thought to influence body weight is the glycemic index (GI). The glycemic index was initially conceived by Jenkins as a tool for the dietary management of type 1 diabetes and, later dyslipidaemia (37). Several studies have described a link between satiety and body metabolism. A large number of these studies have focused on the role of glycemic index and glycemic load (GI/GL) in weight loss. Evidence suggests that low GI and low glycemic load GL diets may be protective against the development of obesity-related disease (type 2 diabetes and coronary heart disease (CHD) (38). The GI of food will vary depending on the rate of digestion. The faster the digestion of food, the higher is the GI value (>70). Food with a low GI (≤ 70) is considered to be favorable in terms of health, particularly for the prevention of obesity, T2DM, and CVD (39).

-Low glycemic definitions:

1- The glycemic index (GI) is a physiological assessment of foods carbohydrate content through its effect on postprandial blood glucose concentrations.

2- The GI has been defined as the testing of a person in the morning, after an overnight fast (37). It is a property of carbohydrate –containing food that describes the rise of blood glucose occurring after a meal. There are foods that are rapidly digested and absorbed or transformed metabolically into glucose, and thus have a high GI index (40).

3- Glycemic index is also defined as the incremental area under the glucose response curve after a standard amount of carbohydrate from a test food relative to that a control food (either white bread or glucose) is consumed.

The glycemic index of a specific food or meal is determined primarily by the nature of the carbohydrate consumed and by other dietary factors that affect nutrient digestibility or insulin secretion. Glycemic index values for common foods differ by more than 5 fold and glycemic response to mixed meals can be predicted with reasonable accuracy from the glycemic index of constituent foods when standard methods are used (36).

4- The term of glycemic load defined as the weighted average glycemic index of individuals' food multiplied by the percentage of dietary energy as carbohydrate has been proposed to characterize the impact of food or dietary patterns with different macronutrient composition on the glycemic response (36).

Mode of action

The GI of a food is impacted by the nature of the starch, particle size, pH, the amount of fiber, fat, and protein, in addition to cooking method and time in general, low GI diets are thought to be metabolically advantageous because of their potential in improving glycemic control. The GI is determined by comparing the postprandial glycemic response of food with response to the postprandial glycemic food (white bread or glucose) in the same individual to the same amount of available carbohydrate from a standard (38). On the other hand, glycemic load (GL) includes both the GI and total carbohydrate intake; thus, approximates the total glycemic effect of the diet, which gives an adequate assessment of the total diet (41). The GI value of a food is tested on the food when eaten on its own, and there are published lists of high, medium and low GI foods (40).

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Table 3 meal composition based on sample test meals

Foods	Low GI	Medium GI	High GI
	55 g whole egg	639 g steel cut oats	609 g instant oatmeal
	45 egg white	160 g 2% milk	160 g 2% milk
	40 g low fat cheese	15 g half & half cream	15% half & xxxxxx
	200 g spinach	160 g fructose	19 g dextrose
	30 g tomato	0.0 g saccharine	0.2 g saccharine
	185 g grapefruit	397 g water	397 g water
	115 g apple slices		
Energy from carbohydrate	40	64	64
Energy from protein	30	16	16
Energy from fat	30	20	20
Energy density (kJ/g)	2.26	2.52	2.52

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The table represents the precooked weight "weight of oats used were adjusted to reflect differences in hydration as described in 'methods'. Treated with lactase to increase the GI of milk sugar (40).

Metabolic effects of low glycemic –index diets.

Low GI diets and metabolic syndrome

GI has been shown to be positively associated with the prevalence of metabolic syndrome and insulin resistance. Weight loss is an additional potential mechanism by which low-GI diets may contribute to a reduced risk of metabolic syndrome (Please reference this). It is the result of a great limitation of food choices. Low GI diets give a more stable diurnal profile, reducing postprandial rebounds in circulating free fatty acids, all factors that exacerbate various components of the metabolic syndrome (39). Thus, a reduced rate of glucose absorption after the consumption of low glycemic index carbohydrate foods will reduce the postprandial rise in gut hormones such as insulin (42). By reducing insulinemia, low GI foods may provide greater access to fatty acids as a source of fuel, promoting greater fat oxidation (43). It is believed that the prolonged absorption of carbohydrate seen over time will maintain suppression of the free fatty acids (FFA) and the glucose will be withdrawn from the circulation at a faster rate. In addition, LDL-cholesterol concentrations are reduced with the low GI diet (42). This improved blood glucose control is of importance to individuals with insulin resistance such as in obese and sedentary subjects, pre-diabetes and diabetes individuals.

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There are a number of trials that have been run on low GI diets to support the mechanisms that have been outlined. For instance, a study was run in University of Minnesota using 20 subjects who were randomly assigned to 1 of 3 hypo-caloric test diets: high glycemic index, low glycemic index or high fat with varying macronutrient composition has been reported (44). The study was conducted in two continuous phases involving 12 weeks feeding phase, followed immediately by 24 weeks "free-living" phase. The results showed that each diet group lost body weight during the 12 weeks feeding phase of the study, but the amount lost was not significantly different among the groups. It was however observed that the improvement in the low GI group was significantly greater than the improvement in the HF group at week 12. This study demonstrated that energy restriction over a 36-week period rather promote weight loss and improve insulin sensitivity in obese individuals, irrespective of the dietary substrate. Thus, the hypothesis that a low GI diet would enhance weight loss, relative to other diets, was not supported in either study phase

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In another study has been reported (45) using 21 obese or overweight volunteers (5 men 16 women), aged between 25 and 65 years clinical histories of hypercholesterolemia. The study design employed a randomized crossover single-blinded approach to examine the effects of low GI breakfast on satiety, lipid and glucose metabolism. A total of 21 subjects were recruited to ensure adequate numbers in the event of subjects choosing to withdraw from the trial, The results showed that total daily energy intake (calculated from 3-day dietary records) were not significantly different between the low and high dietary interventions after 21 days. The low GI intervention resulted in lower absolute intake in grams of all measured macronutrients relative to high GI intervention. However, the differences between interventions were not statistically significant.

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A reported trial (46) has also been made to study the effect of greater insulin secretion among obese subjects. The trial involved a total of 23 (25 women and 7 men) of 34 enrolled participants completed the 6-month intervention period and necessary measurements. Participants were randomized for 24 weeks between a high GI diet and a low GI diet at 30% calorie restriction relative to baseline individual energy needs. The findings showed that healthy overweight women and men with relatively greater insulin secretion in a standard oral glucose tolerance test, lost more weight when assigned to a low GI diet relative to a high GI diet. However, there was no differential effect of the two diets on weight loss in individuals who had relatively lower insulin secretion.

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Six patients with NIDDM who were studied in a randomized crossover design using both high and low GI diets in a six-week duration with metabolic diets have also been reported (47). Both diets were of similar compositions (57% carbohydrate, 23%fat, and 34% g/day dietary fiber), but the low GI diet had a GI of 58 compared with 86 for the high GI diet. The study concluded that small and similar amounts of weight were lost on both diets: 2.5 kg on high GI diet and 1.8 kg on low GI diet. On the low GI diet, the mean level of serum fructosamine, as an index of overall blood glucose control, was lower than on the high GI diet by 8% by 7%. The total serum cholesterol was however lower. Thus, in overweight patients with NIDDM, reducing diet GI improves overall blood glucose and lipid control.

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Definitions:

A low fat diet is defined as limiting food sources of fat. Dietary guidelines recommend a reduction in total fat content to less than 30% of the energy intake to help reduce the prevalence of obesity, ischemic heart disease and certain cancer (50).

In 2001 the American Heart Association published its therapeutic lifestyle changes (TLC) diets. It is recommended that fat account for no more than 30% of persons daily intake of calories and saturated fats make up no more than 10% of total calories (51). It aimed at an energy intake of 1500 kcal per day for women and 1800 kcal per day for men, with 30% of calories from fat, 10% of calories from saturated fat, and an intake of 300 mg of cholesterol per day. (52) The American Heart Association recommended keeping total fat intake to less than 35% of total calories (20 g per day based on a 2,000 calorie diet) and limiting trans-fat consumption to less than 1 percent (or about 2 g based on a 2,000 calorie diet) and saturated fat consumption to less than 7% of total daily calories (53). For the purposes of this statement, a very low fat diet is defined as one in which 15% of total calories are derived from fat (33 g for a 2000-calorie diet, 50 g for a 3000-calorie diet) with fat calories distributed approximately equally among saturated, monounsaturated, and polyunsaturated fatty acids. Approximately 15% of total daily calories consumed should be derived from protein and more than or equal 70% from carbohydrates. On the same way, current dietary guidelines from both the American Heart Association and the National Cholesterol Education Program recommend restricting consumption of fat to an upper limit of 30% of daily caloric intake. This limit translates into 67 g of fat for small or sedentary individuals who need 2000 calories per day and 100 g of fat for larger or more active individuals who need 3000 calories per day. World Health Organization Study Group recommends that 15% of total calories be derived from fat; current guidelines do not specify a lower limit on fat intake (54).

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Mode of action of low fat diet

Genetic and environmental factors play a role in the development of obesity, and diet is one of the main environmental factors that contribute to this disease. Human studies have shown that increased fat intake is associated with body weight gain which can lead to obesity and other related metabolic diseases (55). In animals, increasing dietary fat increases body fat, and it is believed that human beings show similar important biological trend. In epidemiological studies, increasing dietary fat is associated with increased prevalence of obesity probably because of increased intake of energy dense foods. There is a strong relationship between dietary fat and physical activity which is most evident as the speed of adaption to dietary fat is increased by exercise. When dietary fat is reduced, weight is lost, but weight loss eventually plateaus. Studies have shown that the rate of weight loss during the initial phase is about 1.6 g/day for each 1% decrease in fat intake (Please cite). It has been observed that when dietary fat was replaced with Olestra, to reduce fat intake from 33% to 25% in obese men, weight loss continued for about 9 months, reaching a maximum of nearly 6% of body weight and a loss of 18% of initial body fat (Please cite). The study also showed that in the control group with a 25% reduced fat-diet, weight loss ceased for 3 months only to be regained over the next 6 months (56), indicating the difficulty of adhering to a conventional low-fat diet. Thus, dietary fat is an important contributor to obesity in some people. Several intervention trials have examined the effect of a low fat diet with or without energy restriction in overweight subjects and these have been reviewed (57, 58). In a meta-analysis performed by Astrup et al, the rate of weight loss was generally greater when the low fat diet was combined with reduction in total energy intake (59). These studies show that

apart from energy restriction; a low fat diet alone is effective in inducing weight loss in overweight subjects, with an observed mean weight loss about 1.8 kg/month (60). Accepting the favorable effect of lowering blood lipid concentration, the studies on the quantitative and qualitative effects of dietary fatty acids on serum lipids in man are of interest (61). However, considerable confusion still exists whether a reduction of saturated fatty acid or an increase of polyunsaturated fatty acid concentration in the diet is the more effective approach in lowering human blood lipid concentrations. It has been reported that shorter carbon chain length fatty acids; lauric and myristic acids, each have a stronger effect relative to palmitic acid, oleic acid, stearic acid and other fatty acids with longer chain lengths (Please cite). Furthermore, it has been recently observed that elaidic acid in the presence of cholesterol, has a definite serum cholesterol increasing effect relative to a mixture of lauric acid and myristic acid, consumed in equal amounts (62).

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Trials on low fat diets

A study has been reported on dietary intervention that used a randomized controlled trial group in a 2-year trial involving 322 moderately obese subjects (63). Other characteristics of the subject include a mean age 52 years and a mean body index of 31 kg/m². About 86% males in sex and under three types of low fat diets, restricted calorie Mediterranean restricted calorie or low carbohydrate, non-restricted calorie. At this study the Mediterranean diet group consumed their diet in form of dietary fiber and had the highest ration of monounsaturated to saturated fat. In contrast, the low carbohydrate group consumed fat, protein and cholesterol as largest amount of diet but carbohydrate was consumed as the smallest amount of diet. The effect of this study on weight loss could be seen as the mean weight loss of 2.9 kg for the low fat group, 4.4 kg for the low Mediterranean-diet group and 4.7 kg for the low carbohydrate group. Thus, it is believed that Mediterranean and low carbohydrate diets may be effective alternatives to lower fat diet.

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Another study was done to report data on body weight in a long-term, low fat diet trial for which the primary end points were breast and colorectal cancer and also to examine the relationships between weight changes and changes in dietary components (64). The results showed that women in the intervention group lost weight in the first year (mean of 2.2 kg) and maintained lower weight relative to the controlled women during an average 7.5 years of follow up. It was evident that there was a difference of 1.9 kg per year for the test group relative to 0.4 kg for 7.5 years in the control group respectively. In other words, there was no tendency towards weight gain in the intervention women group overall, either when stratified by age, ethnicity or body mass index. Weight loss was greatest among women in either group who decreased their percentage of energy from fat. A similar but lesser trend was observed with increased vegetable and fruit servings. However, non-significant trend towards weight loss occurred with increasing intake of fiber, thus, a low fat diet pattern does not result in weight gain in postmenopausal women.

Conclusion:

Fad diets promote quick weight loss which are easy to be implemented and do not take longer time to give the result. Low carbohydrate diet has shown success in weight reduction and treatment for pathologies such as diabetes and cardiovascular stresses, while it may provide weight loss in the short term. Regarding low fat diet, there is a direct correlation between fat and disease, thus, people can avoid related diseases by decreasing the amount of fat intake in the food. It was also evident that strategies such as a decrease in the total daily energy consumption; reduction of saturated fatty acid or an increase of polyunsaturated fatty acid in the diet is a more effective approach in lowering human blood lipid concentrations.