

# 前 言

为帮助营养师、营养从业者跟进肥胖相关营养共识/指南、相关标准，提高从业能力，促进营养健康行业高质量发展，在中国营养学会教育培训中心指导下，华堂教育营养师赋能工作组收集了 2016 年 1 月至 2024 年 3 月减重肥胖营养共识/指南和相关标准资料，涵盖国际和国内减重肥胖医学营养治疗指南、限能量膳食和代餐相关标准等，汇编成文。工作组会持续收集健康相关营养共识/指南、营养标准等，供各位同仁查阅。

营养师赋能工作组

2024年•月



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REVIEW

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# The treatment of obesity in children and adolescents: consensus position statement of the Italian society of pediatric endocrinology and diabetology, Italian Society of Pediatrics and Italian Society of Pediatric Surgery

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## Abstract

This Position Statement updates the different components of the therapy of obesity (lifestyle intervention, drugs, and surgery) in children and adolescents, previously reported in the consensus position statement on pediatric obesity of the Italian Society of Pediatric Endocrinology and Diabetology and the Italian Society of Pediatrics. Lifestyle intervention is the first step of treatment. In children older than 12 years, pharmacotherapy is the second step, and bariatric surgery is the third one, in selected cases. Novelty is available in the field of the medical treatment of obesity. In particular, new drugs demonstrated their efficacy and safety and have been approved in adolescents. Moreover, several randomized control trials with other drugs are in process and it is likely that some of them will become available in the future. The increase of the portfolio of treatment options for obesity in children and adolescents is promising for a more effective treatment of this disorder.

**Keywords** Children, Adolescents, Obesity, Treatment, Nutrition, Physical activity, Cognitive and family-based behavior therapy, Drug, Bariatric surgery

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## Introduction

The treatment of childhood and adolescent obesity is urgent due to at least three main factors: *i.* the dramatic epidemiological impact of obesity, which is continuously increasing in all the world; *ii.* the association of obesity with metabolic [impaired glucose tolerance and diabetes, hypertension, dyslipidemia, non-alcoholic fatty liver disease (NAFLD), etc.] and non-metabolic (weight stigma, teasing, bullying, victimization, low self-esteem, depression, body image disturbances, eating, respiratory and orthopedic disorders, etc.) disorders; *iii.* the reduction of life expectancy in youth with obesity [1–3].

Overweight and obesity from the earliest stages of life are risk factors for the persistence of obesity and more than 60% of overweight, prepubertal children maintain the extra weight into adulthood. Exposure to excess adiposity, especially if prolonged, is associated with cardiometabolic risk factors and the consequent development of cardiometabolic comorbidities such as hypertension, dyslipidemia, type 2 diabetes and NAFLD, which have an important impact on the overall mortality of the population [4]. Moreover, functional deficits, with a severe restriction of motor skills and psycho-social unease are common in youth with severe obesity and affect the quality of life, leading to true disability [5].

The National Institute for Health and Care Excellence suggests lifestyle intervention as the primary approach to managing obesity [3]. However, available data suggest that therapeutic interventions for childhood and adolescent obesity have shown modest efficacy, especially in the long term [6, 7], and relapse is fairly common. In recent years, bariatric surgery and drug therapy showed some encouraging results on substantial and lasting weight loss and contribute to the increase of the treatment portfolio available for the clinician [8].

Therefore, on the basis of this evidence, the Italian Society of Pediatric Endocrinology and Diabetology, the Italian Society of Pediatrics and the Italian Society of Pediatric Surgery made this consensus on the treatment of obesity in children and adolescents, with the purpose to provide an update on available treatments for obesity in pediatrics. This consensus does not cover prevention and the treatment of obesity-comorbidities.

## Methods

An expert group on obesity in children and adolescents was involved in document processing. The definition of obesity is based on body mass index (BMI) > 99<sup>th</sup> centile for 2–5-year-old children and > 97<sup>th</sup> centile for children older than 5 years till 18 years, using World Health Organization (WHO) BMI reference [9, 10]. A principal coordinator was identified for each of the five areas of

treatment of childhood and adolescents: 1. Nutrition, 2. Exercise and Physical activity, 3. Cognitive and family-based behavior therapy, 4. Medical treatments, 5. Bariatric Surgery.

For each topic, a systematic review of the literature was conducted using database PubMed with MeSH terms or descriptors, limited to patients 0–18 years old and from May 2016 to November 2022.

Scientific articles, systematic reviews, meta-analysis, consensus, recommendations, international and national guidelines published on pediatric obesity even prior to 2016 were considered and deemed useful to the Consensus. The level of evidence (LOE) and the grade of recommendations were established in accordance with the National Manual of Guidelines [11].

Each working group prepared a preliminary draft reporting the LOE for each specific recommendation, followed by a brief description of the scientific evidence in support, epidemiological data, and any notes deemed as useful. The final document was sent on December 2022 to all the extensors and members of the Pediatric Obesity Study Group of the Italian Society for Pediatric Endocrinology and Diabetology and approved on January 2023 in its definitive form. The literature search was updated before preparing the final draft; no additional relevant publications were identified that might have required a change in the statements.

## Targets of treatment

The treatment of obesity, i.e., the excessive accumulation of fat in the body, should be based on an action on the specific causes of this condition. In less than 10% of cases, obesity is secondary to other diseases, such as syndromes, monogenic obesity, endocrine disorders, drugs, cancer, psychological and psychiatric disorders. The treatment of the primary disease is therefore the main target of therapy.

In more than 90% of cases, the specific cause of obesity is not known and an etiologic based treatment is not possible. Therefore, a reasonable target of treatment is to maintain a chronic negative energy balance to reduce the fat mass level. To achieve and maintain this objective, it is necessary to act on the factors contributing to regulating food intake and energy expenditure. A crucial issue is to avoid any kind of stigmatization of weight excess, that requests a careful sensitization and training of all professionals involved in the care procedure.

At present, three treatment options for children and adolescents with obesity are available: lifestyle intervention, pharmacotherapy, and bariatric surgery.

The purpose of this Consensus is to provide an overview of the current treatment options for pediatric severe obesity in different age groups.

## Lifestyle intervention

Multidisciplinary lifestyle intervention programs that focus on nutrition, physical activity, and behavioral change are the first and most frequently applied treatment options for obesity.

In particular, lifestyle intervention was effective on weight loss in children with obesity, but almost no effect was found in adolescents with severe obesity [12]. Danielsson et al. reported that the BMI z-score was reduced at least 0.5 units during a three-year intervention in 58% of the 6–9 years old children with severe obesity, but in only the 2% of the adolescents (14–16 years old) [13], underlining the importance to start treatment for severe obesity at an early age. Possible reasons for the low response of adolescents to lifestyle interventions are the decline in parental influence during adolescence, which was demonstrated to play a key role in the treatment process [14], and the reduced adherence to these interventions as age increases [15].

However, the evidence that lifestyle intervention is effective in treating comorbidities that often accompany pediatric severe obesity further justifies its use as the first step in the treatment program even if clinically meaningful weight loss is difficult to achieve in youth with severe obesity, especially adolescents [16, 17].

## Nutrition

Nutrition is an important target of treatment: dietary components have a modest but sustained impact on reducing total energy intake and improving intakes of specific food groups in youths with overweight or obesity that can be deficient [18].

Different diet interventions have been tested in the treatment of obesity, including modification of macronutrient composition, implementing different dietary patterns, and changing meal timing.

Ideally, in the clinical practice, a child nutrition plan should be individualized based on age, food preferences, cultural preferences, family and personal lifestyle, and concurrent medical diseases.

A recent review of 28 clinical practice guidelines, consensus and position statements concluded that dietary approaches based on caloric restriction are recommended to achieve weight loss although no evidence of the long term durability of the results obtained is available [19, 20]. However, guidance on the management of severe obesity (BMI > 99<sup>th</sup> centile for children older than 5 years) using dietary approaches is currently unavailable.

Few guidelines recommend intensive dietary approaches for the management of obesity with related comorbidities or severe obesity, such as very low-energy diet (VLED) and very low-carbohydrate diets (VLCD).

## Non-restrictive approach

This dietary model does not consider a given calorie intake or a composition of nutrients, rather it focuses on the consumption of low-fat and high-nutrient-dense foods (e.g. reducing fruit juice consumption and increasing fresh fruit consumption). It has been suggested that, to provide advice targeted towards specific food components (for example the reduction of the consumption of carbonated drinks and sugary foods or foods with a high caloric density), is more effective in weight control than providing advice on healthy eating. Supporting these long-term dietary changes has the potential to improve energy balance and decrease the BMI z-score in children and adolescents aged 2–18 years [21–23].

The Italian Guidelines for healthy and proper nutrition, issued by Council for Agricultural Research and Analysis of Agricultural Economics of Italy (CREA) in 2019, report both the portions by age and the weekly recommended daily consumption frequencies.

This approach begins with the assessment of the child's and family's eating habits, through the detection of the composition of meals, portions, frequency of food intake, food preferences or aversions, the eating habits of the family. The 3-day food diary or the diet history are good tools for assessing dietary intake, providing adequate instruction for filling in the diary. (LOE VI-A)

Several lifestyle changes must go hand in hand with non-restrictive approach, such as paying attention to food consumption while screen watching. In fact, a systematic analysis has shown the positive association between watching television in the 1–18 age group and the consumption of snacks, sugary carbonated drinks and foods with a high calorie density [24].

Furthermore, it is important to educate the patient to consume meals and snacks on appropriate occasions of consumption. In particular, a frequency of 5 meals per day, has been associated with a lower risk of developing obesity in children and adolescents [25]. On the contrary, nighttime consumption of snacks has been associated with an increased risk of obesity in children with low levels of physical activity [26]. However, randomized clinical trials (RCTs) are necessary for confirming these results. (LOE III-A)

## Traffic light diets (modified Traffic light diets)

The Traffic Light diet is a calorie-controlled approach in which foods in each category are color-coded according to their calorie density per serving: green for low-calorie foods that can be eaten freely; yellow for moderate-calorie foods that can be eaten occasionally; and red for high-calorie foods that should be eaten rarely. Children and adolescents with obesity following this diet showed an improvement in the anthropometric parameters of

obesity (BMI z-score, waist circumference, fat mass), with maintenance of the result even at 1 year follow-up [27]. (LOE I-B)

#### Diets with low glycemic index and low glycemic load

The low carbohydrate (LC) diet limits carbohydrate (CHO) intake to no more than 60 g/day, and the reduced glycemic load (RGL) diet restricts intake of rapidly absorbed carbohydrates [28].

The glycemic index (GI) is defined as the ratio of the area under the blood glucose curve measured two hours after consuming 50 g of test carbohydrates and the area under the blood glucose curve obtained by 50 g of glucose or white bread. The term glycemic load (GL) was introduced to quantify the overall glycemic effect of the food compared to amount of CHO contained in the serving (usually 100 g). Diets that consider the GI and the GL imply an evaluation not only quantitative of the selected foods, but also qualitative (for example, semolina pasta 82.8 g CHO, whole meal semolina pasta CHO 66.2 g). The patients are instructed to distinguish: “high glycemic index” foods such as sugary drinks, refined baked goods, candies and sweets, white bread and potatoes ( $GI \geq 70$ ), “intermediate glycemic index” foods such as pasta, corn and dried fruit ( $GI = 56-69$ ) and “low glycemic index” foods such as fruit, non-starchy vegetables, 100% whole grains, meat, fish and poultry ( $GI \leq 55$ ). While the last category can be consumed without restriction, the intermediate and high GI categories must be introduced respectively less frequently and occasionally during the week [28]. There are no specific restrictions on energy or fat intake.

Diets using modified CHO intake have resulted in improved weight status even in the medium-long term period (12 months) in children and adolescents [28].

Normal calorie diets with a low GI and/or low GL can be useful in children and adolescents with obesity and glucose metabolism alterations, with positive impact in fasting blood sugar, fasting insulin and homeostasis model assessment (HOMA)-index [28, 29]. (LOE I-A)

#### Mindful eating

Recently, new strategies have been proposed for the treatment of obesity focused on the factors that influence patients’ abilities to acquire behavioral changes necessary to follow diet therapy. Mindful Eating Approaches aim to make the subjects aware of their food choices, develop attention to one’s physical and not psychological fullness, respect the stimuli of satiety and finally consume healthy foods precisely in response to such stimuli [30]. The primary objective is therefore not weight loss but the ability to perceive and respond appropriately to

one’s own stimuli appetite/satiety. Despite the growing interest in this treatment, studies in children with obesity are currently limited and aimed primarily at adolescents. A RCT demonstrated the greatest efficacy of this type of treatment, compared to a control group with traditional nutritional advice, in reducing BMI in adolescent girls (14–18 years) in the short-term (10 weeks) [31]. In addition, a recent study on adolescents (12–17 years) at risk of obesity has shown how the Mindful Eating approach is more effective than standard health education in reducing food reward sensitivity or stress-eating after six months [32]. Similarly, a study targeting adolescents living with obesity (14–18 years) and their families showed a reduction in distraction during the meal and an increased food awareness following a Mindful Eating approach compared to standard nutritional counseling [33].

This approach has also been reported to be effective to prevent childhood obesity [30]. (LOE II-C)

#### Balanced low calorie diets

Balanced low-calorie diets are effective in promoting weight loss in children [27, 34, 35]. The diets most frequently reported include a 30% reduction in the average daily caloric intake, measured through a 3-day food diary or Food Frequency Questionnaire (FFQ), or a 15% reduction compared to the energy requirement estimated through predictive equations for gender and age [27]. This dietary approach combined with changes in physical activity level has been reported to be effective in treating children and adolescents with obesity [36]. After 3 months of intervention, significant reduction of BMI has been observed compared to the control group ( $-1.7 \pm 1.1 \text{ kg/m}^2$  vs  $-0.2 \pm 1.0 \text{ kg/m}^2$ ), and the difference in BMI between the two groups was maintained even at 1 year of follow up ( $-1.7 \pm 2.3 \text{ kg/m}^2$  vs  $0.6 \pm 0.9 \text{ kg/m}^2$ ). Long-term efficacy was demonstrated even without changes in the level of physical activity in a RCT targeting children with overweight or obesity aged 7–12 years [28].

This intervention involves the formulation of a food plan, periodically re-evaluated during the follow-up in relation to the nutritional needs of the growing child or adolescent, which respects a balanced distribution of macronutrients suggested by Reference Intake of nutrients and energy for Italian Population (LARN) (proteins: 10–15% of daily energy, between 0.9–1 g/kg/day depending on age; CHO: 45–60% of daily energy, simple sugars <15% of total calories; and lipids: 35–40% of total calories in the 1–3 year-old children and from 4 years 20–35% of daily energy, of which saturated fatty acids <10% of daily energy) [37]. (LOE I-B)

### Low-calorie high-protein diets

The high-protein diets are characterized by a protein intake increased up to 19–30% of the daily energy intake, with a reduction of CHO intake to 35–50% of total energy, while lipid intake remains in the range of 25–35% of total energy.

A meta-analysis of six trials evaluated the impact of a high-protein diet versus a balanced low-calorie diet on the outcome of obesity indices (primarily assessed as BMI, BMI z-score, and/or body composition) in a group of 6–18 years old subjects [35]. No differences of the level of overweight and metabolic parameters (glycemia, insulin sensitivity and blood pressure) between the two treatments have been found, so that there is no evidence to recommend high-protein low-calorie diets for the treatment of obesity in school age and adolescence. (LOE I-D)

### Hyperlipidic low-calorie diets

High-fat nutritional approaches have been poorly investigated in the pediatric population with obesity. A study in a group of a 9–14-year-old girls compared a high-fat diet (42% CHO, 40% fat and <10% saturated fat, ~18% protein) with a normal fat diet (55% CHO, 27% fat with <10% saturated fat, ~18% protein). At 11-weeks, the change of BMI was not different between the two groups [38]. (LOE II-D)

### Very low-energy diet or very low-carbohydrate diet

Diets with a low or very low energy content (from 600–800 up to 1,200 kcal/day) or low carbohydrate content (<20 g CHO/day or 10–20% of total daily energy) have been investigated in last years in children and adolescents with obesity. These approaches have a limited duration, generally between 8 and 20 weeks.

A 2014 systematic review demonstrated improvement in BMI, BMI z-score or body composition following the adoption of this regimen for a short period of time (1–6 months duration) in children and adolescent aged 6–18 years. However, there is no significant difference in weight loss between the highly hypocaloric dietary regimen and a balanced low-calorie dietary approach (50–60% CHO and <33% fat or less than 40 g/day) after two years [35].

A second systematic review and meta-analysis in 2019 evaluated the effects of low-calorie diets (600–800 kcal/day or <50% of energy requirement) in 5–18-year obese subjects, demonstrating the effectiveness of this treatment in reducing weight and BMI values (but BMI z-scores were not reported) in the short term (6 months), although a comparison with a standard dietary approach was not provided. Six studies included adolescent and no studies were conducted in children [39]. The authors concluded that this dietary treatment may be particularly

useful for achieving weight loss, in particular in adolescents with comorbidities related to obesity or eligible for bariatric surgery. Furthermore, the authors stressed the importance of adopting this treatment in a hospital setting or in centers specialized in the treatment of pediatric obesity and under medical supervision [39]. (LOE I-C)

However, the compliance of these diets is low and the long-term outcomes is comparable to that of the balanced low-calorie diets. Moreover, it is not recommended to undertake low-calorie diets especially in school-age children, since. The safety of these dietary approaches on the growing subject has not yet been demonstrated. (LOE I-D)

### Dietary patterns

#### Mediterranean diet

The Mediterranean diet (MD) is characterized by a high intake of vegetables, fruit, oily nuts, whole meal cereals, legumes and olive oil, as well as a moderate consumption of fish and poultry and a low intake of sweets, red meat and dairy products [40]. It promotes increased consumption of dietary fiber, antioxidants and long-chain fatty acids.

Dietary models based on the principles of the MD can be used as a normocaloric approach for the treatment of obesity in children and adolescents. Despite the high number of studies that have investigated the effect of adherence to the MD on obesity, methodological limitations in most of the intervention studies, such as non-inclusion of a control group or lack of analysis considering confounding factors, lead to the conclusion that there is limited evidence of a beneficial effect in following a MD to obtain weight loss in children with obesity [41–47]. This recommendation is mainly based on expert opinion [41, 48]. (LOE VI-A)

#### DASH diet

The DASH (Dietary Approach to Stop Hypertension) diet is a dietary pattern that advocates the daily introduction of at least 8 portions of fruit and vegetables, two or three daily portions of dairy products or low-fat dairy products and a sodium consumption  $\leq 2.4$  g/day.

The nutritional indications also include a reduced consumption of foods with a high fat and cholesterol content, such as red meat, whose portions must be reduced to two or less (per day). The indications aim to ensure a balanced macronutrients distribution, without a necessary energy-restriction (53–58% CHO, 15–18% protein and 26–30% fat) [49].

This nutritional approach has proven effective in improving several comorbidities associated with obesity and metabolic syndrome in children and adolescents. In particular cohort studies and cross-sectional studies

highlight an association between the DASH diet and beneficial effects on blood pressure, overweight and obesity in 11–18 year-old adolescents [50], although these results were not obtained in intervention studies [49]. (LOE III-C)

## Exclusionary diets

### Vegetarian and vegan diet

These two dietary patterns are characterized by the exclusion of meat and seafood from the diet. In addition, the vegan diet excludes “products of animal origin”, such as milk, dairy products, eggs and honey, which are allowed in the vegetarian model.

These eating patterns are effective in the treatment of obesity in adulthood [51, 52]. On the contrary, studies evaluating the effectiveness of this dietary model for the treatment of the obese pediatric patient are currently lacking. There is therefore no evidence to recommend vegetarian and vegan diets for the treatment of childhood obesity [48]. (LOE VI-D)

### Physical activity

Physical activity, defined as “any movement of the body produced by skeletal muscles that requires energy expenditure”, plays an important role in the treatment of obesity since it contributes to increasing energy expenditure and obtaining weight loss without significant variations of fat free mass (FFM) [53].

Fat free mass is the strongest predictor of the resting metabolic rate and its reduction have significant implications in the long-term weight management. Interventions based on supervised and structured programs of physical activity, such as aerobic and/or resistance exercise combined to diet may counteract the negative effects on FFM compared to interventions based on diet only [54, 55].

Programs encourage to achieve the recommended levels of physical activity through an increase of both organized and non-organized physical activities. In order to achieve optimal outcomes, recommendations about type and amount of physical activity should be age specific and should consider the extent to which the severity of obesity impairs the components of physical fitness, the musculo-skeletal system and the quality of life. Children and adolescents with obesity have lower coordination, balance, speed, agility and fine and gross motor skills compared to their healthy weight peers [56]; this hinders the adherence to the physical activity goals and sustains a vicious circle of inactivity and weight excess. In addition, poor motor skills expose children to bullying victimization and contribute to low self-esteem and poor quality of life [57]. For these reasons, increasing physical activity and exercise can be difficult in children with obesity and an adapted physical activity intervention is needed for a successful outcome.

Ideally, exercise promotion and treatment should be included in the setting of multidisciplinary teams, composed of exercise physiologists or activity specialists trained to manage the physical barriers of children with obesity, working in concert with other professionals. Realistically, these experts are lacking in the multidisciplinary teams in most countries of the WHO European Region [58].

### Young children (3–5 years of age)

The rise in childhood obesity in this period is mostly driven by unbalanced energy intake rather than decline in physical activity [59]. Progression in many of the fundamental motor skills, such as running, jumping, throwing, and catching, typical of this developmental stage, may be negatively influenced by weight excess. Combination of increased physical activity and reduced sedentary behaviors should be promoted in preschool children with obesity as an essential component of a healthy lifestyle, improvement of fundamental movement skills, motor coordination activities and fitness [60, 61].

Pre-schoolers, independently from BMI, should spend at least 180 min in a variety of types of physical activity at any intensity, of which at least 60 min is moderate/vigorous physical activity, distributed throughout the day. In addition, they should not be restrained for more than one hour at a time and should limit the screen time to less than one hour/day [62, 63].

The physical activity goals may be achieved through promoting free play, with emphasis on safe, enjoyable and supervised motor tasks [64]. (LOE VI-A)

### Children and adolescents (6–17 years of age)

At this age, physical inactivity and sedentary behaviors are significant contributors to the development of pediatric obesity and increase the cardiometabolic risk. Both inactivity and body fat excess significantly impair several components of the health related physical fitness, such as aerobic and muscular fitness [65, 66].

Both components have been associated to a healthier cardiometabolic profile [67–69] and may attenuate the adverse effects of obesity on insulin-resistance and cardiometabolic risk [70]. Exercise in children and adolescents with obesity can improve anthropometric (body mass, BMI, central obesity, fat mass) cardiovascular (triglycerides, fasting glucose, fasting insulin) parameters, and cardiorespiratory fitness [71].

Regarding the type of exercise, either aerobic or combined aerobic and strength training have been associated with significant and clinically improvements in BMI, fat mass and fat mass percent in children and adolescents with overweight and obesity [72].

Therefore, physical activity and exercise at this age should be designed to improve both components of physical fitness, without overlooking fundamental movements and motor coordination skills.

Children and adolescents should accumulate at least 60 min per day of moderate-vigorous physical activity, involving a variety of aerobic activities based on gross motor skills (walking, cycling, swimming); activities that promote flexibility and muscle strength should be performed at least three days per week [73]. As in young children the proposed activities should consider the ease and enjoyment of moving and playing.

Structured exercise programs based on aerobic and/or resistance training or sports participation in gym or sport facilities can be performed at moderate intensity, gradually increasing the frequency, intensity and duration over time.

A research gap is still represented by establishing the optimal exercise dose for promoting weight loss in children and adolescents living with overweight or obesity. According to a recent meta-regression analysis that included aerobic exercise and strength training interventions, a positive linear association between exercise dose and weight loss was found without identifying the best dose. In most studies the exercise prescription dose was below the recommended amount of physical activity (roughly 150 min of moderate activity per week).

In addition, the daily physical activity outside the intervention was not considered. This issue is not of secondary importance, since it is still questioned whether high amount of exercise can negatively influence the total weekly physical activity [74].

Conversely, there is much evidence about the amount of physical activity able to produce health outcomes. Physical exercise programs lasting 4–12 weeks, or sessions of 60 min each, or involving a total exercise time of at least 1,500 min were effective in improving cardiometabolic and vascular parameters (lipids, fasting glucose, fasting insulin, homeostasis model assessment of insulin resistance [HOMA-IR], intrahepatic fat, systolic blood pressure, and carotid intima-media thickness) in children with obesity [75].

As part of behavioral approaches, sedentary activity should be reduced, particularly the amount of recreational screen time to a minimum of two hours daily [73]. (LOE I-A for exercise, LOE I-B for sedentary reduction)

### **Cognitive and family-behavioral therapy**

In the treatment of obesity, a substantial, feasible, lifestyle change is recommended through an integrated approach to diet, exercise and strategies aimed at changed behavior. (LOE I-A)

To get better adherence to diet and exercise programs, the main strategies of intervention proposed in the literature are behavioral therapy (BT), cognitive behavioral therapy (CBT) and therapeutic education of the patient (ETP) [76]. (LOE VI-A)

Furthermore, recent studies show that strategies aimed at behavioral change are associated with a greater probability of long-term maintenance of the results obtained through calorie restriction and increased physical activity [77]. (LOE I-A)

Behavioral therapy aims at modifying dysfunctional eating and motor behaviors without affect the personality of the subject [76]. (LOE VI-A)

Behavioral therapy uses behavioral techniques, which can also be used in combination such as: self-monitoring, goal setting, problem solving, social support, stress management, stimulus control, alternative behaviors, environmental control parental monitoring, parental modeling, positive reinforcement and fragmented techniques [76]. (LOE VI-B)

Cognitive behavioral therapy aims to change the thoughts that induce dysfunctional behavior and hinder change. Cognitive strategies in addition to the behavioral ones are more effective than BT alone, however, they are less applicable to pre-adolescents and entire families [76]. (LOE VI-A)

The ETP's purpose is to know the disease, manage the disease and the therapy, as well as, prevent avoidable complications. The tools of the ETP adapted to obesity in childhood are: therapeutic relationship, reflective and proactive listening, family approach, modeling, counseling motivational, therapeutic storytelling, positive reinforcement, small steps, bargaining on goals [76]. (LOE VI-B)

Recent systematic reviews, published on Cochrane, have assessed the importance of using such cognitive behavioral approaches on weight loss in pediatric-adolescent-aged subjects (0–6 years, 6–11 years and 12–17 years) with different levels of validity.

### **0–5 years**

Colquitt et al. [78] reported that a multidisciplinary approach related to diet and physical activity integrated to a strategy aimed at lifestyle change in young children is an effective treatment option compared to diet and physical activity alone. The multicomponent intervention promoted an improvement of BMI z-score, waist circumference, health-related quality of life [79–82]. Moreover, other positive outcomes have been reported, such as an increase of daily vigorous physical activity, a reduction of sugary drinks intake and time of video exposure, and an increase of parents' beliefs, attitudes and practices regarding feeding children [80–83]. (LOE I-B)

### 6–11 years

Mead et al. [20], analyzed the same primary and secondary outcomes in patients treated with diet, physical activity and behavioral therapy compared to those who followed diet and physical activity alone, selecting RCT studies (range of ages 6 to 11).

Cognitive and/or behavioral therapy in addition to treatment was found to improve adherence to short- and long-term therapy. In particular Epstein et al. [84] evaluated that the addition of problem-solving exercises with or without parental involvement in 6–11 years old is associated with improvement of primary outcomes (BMI and BMI z-score). Taveras et al. [85] found that a family and individual coaching as clinical support intervention is associated with more easily maintained weight loss, even in the long term. The primary results showed that interventions that change behavior recorded lower values of BMI, BMI z-score and body weight compared to the absence of treatment, at the short-term follow-up. (LOE I-B)

### 12–17 years

Al-Khudairy L et al. [86] regarding the age range from 12 to 17 years, found that multidisciplinary interventions with the combination of diet, exercise and behavior modification further reduced BMI and weight of adolescents with overweight and obesity, compared to those who did not receive any treatment (no specific food program and maintained in follow up) or only with only a dietary approach and not supported by psychological therapy. (LOE I-B)

The National Institute for Health and Care Excellence (NICE) guidelines state that “multicomponent interventions are the treatment of choice for obesity and these should include the behavioral component” [87]. Furthermore, a systematic review of 37 randomized trials comparing patients treated with BT versus non-behavioral approaches [88], highlighted greater efficacy in cases than in controls (with a difference weighted mean of  $-2.8$  kg in the treated group after 12-months). (LOE I-A)

A review of 266 articles related to healthy eating interventions using behavior change theory was recently published [89]. In one of the articles reported, Kelly et al. [90], highlighted that many people may lack knowledge and skills to follow a proper diet. Therefore, dietary education alone may not be sufficient to guide a change in nutritional behavior and dietitians/nutritionists should perform an important role in changing nutritional behavior and the role of nutrition education. [91]

The most common theories of behavior change identified in the published studies are: the social cognitive theory [92], the most used according to Rigby et al. [93]; the theory of planned behavior [94], the trans-theoretical

model [95], the model of health knowledge [96] and the theory of self-determination [97]. (LOE I-A)

A recent RCT study which aimed to develop a multidisciplinary lifestyle intervention program for children and adolescents with moderate to severe obesity, evaluated the additional effects on outcomes compared to traditional treatments [98]. Overall, 103 participants in the 85<sup>th</sup> percentile of age and sex-specific BMI were selected and divided into groups that received 16 weeks of routine care or multidisciplinary interventions.

This study showed that the intervention had positive effects on body composition (BMI and BMI z-score), cardiometabolic risk markers and in maintenance of weight loss at the 16-week follow-up [99]. (LOE I-A)

### Medical treatment

Pharmacotherapy is the next step in obesity management for patients who fail to achieve their weight loss goals with lifestyle modification therapy alone [100]. Indications for pharmacotherapy in pediatric obesity are patients aged 12 years or older and having BMI  $\geq 95^{\text{th}}$  percentile with weight-related comorbidities or BMI  $\geq 120\%$  of the 95<sup>th</sup> percentile regardless of comorbidities, who have not properly responded to lifestyle modification [101]. Management of drugs should be done in third level centers [102].

Weight loss medications, although effective, have low popularity, high costs (usually not covered by the national health care systems), and concerns regarding their safety still persist due to historical problems associated with their use [103]. Studies report that between 3 and 44% of patients taking weight loss medications may experience side effects [104]. However, recent data on weight loss medications show promising results in adolescents [105, 106].

In the last few years, more drugs have become available for the treatment of youth with obesity, but options approved are limited. The Food and Drug Administration (FDA) has approved once-daily liraglutide (3.0 mg), orlistat (120 mg), and phentermine-topiramate (7.5 mg of phentermine with 46 mg of topiramate or 15 mg of phentermine with 92 mg of topiramate) for adolescents at least 12 years of age [107–109]; only liraglutide is approved by the European Medicines Agency (EMA) [110, 111].

*Orlistat* (tetra-hydro-lipstatin) is FDA-approved for long-term treatment of obesity in adolescents aged  $\geq 12$  years. The medication has not been approved for use by the EMA. By inhibiting pancreatic and gastric lipase, it decreases lipid absorption [111].

In the largest pediatric trial, children were randomized to either orlistat 120 mg or placebo three times daily over 52 weeks. At the end of the trial, BMI had decreased by

0.55 kg/m<sup>2</sup> with orlistat and increased by 0.31 kg/m<sup>2</sup> with placebo. Furthermore, 26.5% of children in the orlistat group had a 5% or greater decrease in BMI compared with 15.7% of those in the placebo group [112]. Of note, only 64% of participants in the control group and 65% in the orlistat group completed the trial. The most common adverse events in the orlistat group were gastrointestinal-related, generally of mild to moderate intensity [113]. (LOE II-B)

*Phentermine* is approved in the United States for adolescents > 16 years of age for up to 12 weeks, but not in Europe. Through reduction of norepinephrine reuptake, it stimulates pro-opiomelanocortin (POMC) neurons in hypothalamus [114]; additionally, it improves appetite inhibitory control on prefrontal cortex by acting on serotonin and dopamine reuptake [115, 116]. Weight loss is small to moderate. This drug may cause anxiety, tremors, slightly increased blood pressure. The main studies evaluating phentermine for the treatment of obesity in adolescents showed scarce safety and efficacy data reported [117]. Increased blood pressure and heart rate are common side effects [118]. The paucity of long-term data for phentermine, along with its short-term use indication represents an important limitation, considering the need for chronic treatment of obesity [119]. (LOE IV-B)

*Topiramate* is FDA-approved for neurological disorders and also, in combination with phentermine, is indicated for obesity in patients ≥ 12 years of age [120]. Topiramate blocks neuronal sodium channels, antagonizes glutamate receptors, inhibits carbonic anhydrase, and is thought to suppress appetite through an increase in gamma-aminobutyric acid (GABA) activity. Topiramate use for 6 months has been observed to correlate with a reduction in BMI between 2 and 4.9%. Its use for obesity in subjects under 18 years of age is off-label [120, 121]. Randomized controlled clinical trials are needed to examine efficacy and safety of topiramate for severe obesity in adolescents [121]. (LOE III-C)

In addition to the anti-obesity drugs, metformin is approved by the US FDA to treat type 2 diabetes in children aged over 10 years.

It is delivered orally and acts on reducing glucose levels by inhibiting hepatic gluconeogenesis and promoting intestinal absorption of glucose [122, 123]. Even though metformin does not often result in significant body weight loss, it appears to prevent or delay alteration of glucose homeostasis in children at high risk of developing type 2 diabetes mellitus [124]. Furthermore, metformin has also an off-label use to achieve weight loss in children. Masarwa et al. reported metformin efficacy in a systematic review of RCT studies in children and adolescents. They demonstrated that metformin use offers modest benefits in reducing BMI in subjects with

obesity [125]. Specifically, when BMI z-score variable was studied by evaluating seven RCTs, it was observed that metformin consistently produced a decrease in this parameter compared with placebo, with more evident results in children and adolescents with nonalcoholic fatty liver disease [100, 125]. In addition, metformin has been shown to improve cardiovascular risk profile and inflammatory biomarkers in obese children and adolescents [126, 127]. Side effects are usually gastrointestinal, including bloating, diarrhea, and flatulence, and are not reported as serious, with a discontinuation rate due to adverse events < 5% [118]. (LOE I-B)

Glucagon-like peptide 1 (GLP-1) receptor agonists are incretins that enhance insulin secretion and improve satiety by slowing gastric emptying and acting on arcuate nucleus of hypothalamus, limbic/reward system in amygdala, and the cortex [128–130]. A recent meta-analysis indicates that GLP-1 receptor agonists are safe and effective in modestly reducing weight, BMI, glycated hemoglobin A1c, and systolic blood pressure in children and adolescents with obesity in a clinical setting. Apart from increased rates of minor gastrointestinal-related symptoms such as nausea, no serious adverse events were noted [131].

*Liraglutide* was approved for obesity treatment in children aged 12–17 years (weight > 60 kg and BMI of > 30 kg/m<sup>2</sup> in accordance with international standards / ≥ 95<sup>th</sup> percentile) from both the FDA and the EMA. The efficacy and safety of liraglutide in adolescents were demonstrated in a randomized, double-blind trial, enrolling 251 adolescents (ages 12–18 years) with obesity and a poor response to lifestyle therapy alone. The trial consisted of a 56-week treatment period and a 26-week follow-up period. Participants were randomly assigned (1:1) to receive either liraglutide (3.0 mg) or placebo subcutaneously once daily, in addition to lifestyle therapy. Liraglutide was superior to placebo in reducing BMI standard-deviation score from baseline to the 56<sup>th</sup> week of treatment (estimated difference, −0.22; 95% CI [Confidence interval], −0.37 to −0.08). A reduction in BMI of at least 5% was observed in 43.3% of participants in the liraglutide group and 18.7% participants in the placebo group, and a reduction in BMI of at least 10% was observed in 26.1 and 8.1%, respectively. A greater reduction was observed with liraglutide than with placebo for BMI (estimated difference, −4.64 percentage points) and for body weight (estimated difference, −4.50 kg). At week 56, there was no substantial difference between treatment groups in glycemic and cardiometabolic variables or in overall weight-related quality of life [132]. The adverse events most frequently reported in the liraglutide group were gastrointestinal events including nausea, vomiting, and diarrhea, which represented the main cause of

discontinuation of the trial treatment. In summary, in adolescents with obesity, liraglutide 3.0 g as an adjunct to lifestyle therapy led to a greater reduction in the BMI than placebo [132]. (LOE I-A)

*Exenatide* is used off label under 18 years of age in obesity, in presence of diabetes, and/or in hypothalamic or syndromic obesity, for example Prader Willi syndrome [100, 111]. In a previous randomized, double-blinded, parallel, placebo-controlled clinical trial provides that exenatide XR is feasible, generally well tolerated, and leads to reduction, albeit modest, in BMI z-score and a significant improvement in glucose tolerance in adolescents with obesity [133]. In a recent randomized, double-blind trial exenatide partly mitigated the BMI rebound in adolescents who achieved weight loss with dietary intervention (meal replacement therapy run in phase up to 8 weeks) [134]. (LOE II-B)

*Semaglutide* is another GLP-1 receptor agonist, recently approved by FDA in pediatric patients 12 years of age and older. In the recent Semaglutide Treatment Effect in People with Obesity (STEP) TEENS trial, a double-blind, parallel-group, randomized, placebo-controlled trial, 201 adolescents (ages 12–18 years) with obesity (a BMI in the 95<sup>th</sup> percentile or higher) or with overweight (a BMI in the 85<sup>th</sup> percentile or higher) and at least one weight-related coexisting condition were enrolled. Participants were randomly assigned in a 2:1 ratio to receive once-weekly subcutaneous semaglutide (at a dose of 2.4 mg) or placebo for 68 weeks, plus lifestyle intervention. The mean change in BMI from baseline to week 68 was −16.1% with semaglutide and 0.6% with placebo (estimated difference, −16.7 percentage points; 95% CI, −20.3 to −13.2;  $P < 0.001$ ). At week 68, a total of 95 of 131 participants (73%) in the semaglutide group had weight loss of 5% or more, as compared with 11 of 62 participants (18%) in the placebo group (estimated odds ratio, 14.0; 95% CI, 6.3 to 31.0;  $P < 0.001$ ). Reductions in body weight and improvement with respect to cardiometabolic risk factors (waist circumference and levels of glycated hemoglobin, lipids [except high-density lipoprotein cholesterol], and alanine aminotransferase) were greater with semaglutide than with placebo. The incidence of gastrointestinal adverse events was greater with semaglutide than with placebo (62% vs. 42%). This study assessed the efficacy and safety of once-weekly subcutaneous semaglutide plus lifestyle intervention among adolescents with obesity [135]. (LOE II-A)

*Bupropion* is a selective dopamine and norepinephrine reuptake inhibitor, while *naltrexone* is an opioid receptor antagonist. This combination is approved for obesity treatment in adults, off-label under 18 years [115]. (LOE VI-C)

*Setmelanotide* is a melanocortin-4 receptor (MC4R) agonist approved by the FDA for patients 6 years and older with obesity due to three rare genetic conditions: POMC deficiency, Proprotein Convertase Subtilisin/Kexin Type 1 (PCSK1) deficiency, or Leptin Receptor (LEPR) deficiency, confirmed by genetic testing demonstrating pathogenic, likely pathogenic, or of uncertain significance variants of these genes [136]. It is also used in clinical trials for other rare genetic disorders associated with obesity. These disorders include Bardet-Biedl Syndrome, Alstrom Syndrome, POMC and other MC4R pathway heterozygous deficiency obesity, and POMC epigenetic disorders [137]. (LOE I-A)

Several RCT studies to test new medications are ongoing and recently new molecules, i.e. dual agonists of GLP-1 and glucagon receptor, have been approved for adults with obesity. It is possible that in the future new medications will be available also for the use in children with obesity [138].

### Bariatric surgery

Bariatric surgery is the ultimate solution in adolescents with severe obesity, resistant to all other treatments, especially when serious complications are detected. (LOE VI-B)

In a large meta-analysis including 49 studies with 3,007 adolescents, the Roux-en-Y gastric bypass (RYGB) ( $n=1,216$ ), laparoscopic adjustable gastric banding ( $n=1,028$ ), and laparoscopic sleeve gastrectomy ( $n=665$ ) were the most common surgeries performed. At the longest follow-up (range 12–120 months), bariatric surgery led to an overall 16.43 kg/m<sup>2</sup> and 31% reduction in BMI. After 12 months from surgery, there were significant improvements in glucose and lipid metabolism. The remission rate of dyslipidemia was 55%, 70%, and 95% at 1, 3, and >5 years after surgery [139]. Preliminary data suggest sustained benefits after up to 9 years in terms of weight loss and very high remission rates for lipid parameters, uric acid, liver enzymes, prediabetes and diabetes [140].

The American Society for Metabolic and Bariatric Surgery Pediatric Committee and the American Academy of Pediatrics recently updated the recommendations for metabolic and bariatric surgery in youth, which removes the previous restriction on surgery based on pubertal or skeletal maturation [141, 142]. Current adolescent bariatric recommendations include BMI >35 kg/m<sup>2</sup> or 120% of the 95<sup>th</sup> percentile for age and sex, with moderate to severe comorbidities (including obstructive sleep apnea (Apnoea Hypopnoea Index [AHI] >5), type 2 diabetes mellitus, idiopathic intracranial hypertension, non-alcoholic steatohepatitis, slipped capital femoral epiphysis, Blount disease, gastroesophageal reflux disease

and hypertension) or BMI > 40 kg/m<sup>2</sup> or 140% of the 95<sup>th</sup> percentile for age and sex [141, 142].

The authors state that previous barriers to surgery are not supported by evidence. According to guidance from the publications, no preoperative attempt at diet or exercise is necessary, a diagnosis of autism, developmental delay or syndromic obesity is not an automatic contraindication and unstable family environments, eating disorders, mental illness or prior trauma are not reasons to exclude surgery.

Contraindications to surgery are a medically treatable cause of obesity, untreated or poorly controlled substance abuse, current or planned pregnancy within 12–18 months of the procedure, current eating disorder or medical, psychiatric, psychosocial or cognitive condition that prevents adherence to postoperative medication and lifestyle changes [141, 142]. (LOE VI-A)

There is no evidence to support the application of specific age limits for the timing of surgery [143, 144].

Surgery should be performed in a highly specialized center that guarantees an experienced multidisciplinary team. (LOE III-A)

Indication for surgery must be given on a case-by-case basis by the multidisciplinary team. (LOE VI-A)

However, there are inherent risks associated with bariatric surgery. In particular, post-operative complications, i.e. symptomatic gallstone disease and small bowel obstruction, may require further operative procedures. Furthermore, a previous study shows a slightly higher reoperation rate in the 5 years following RYGB in adolescents compared to adults (20–25%) [145]. However, recent improvements in operative technique and post-operative management have led to a reductions in the causes of reoperation after bariatric surgery [146].

Additionally, the risks of bariatric surgery include specific micronutrient deficiencies. Low iron and ferritin levels with result anemia were reported [143]; low vitamin D was documented insufficiency even at 5 years [147]; among patients with poor adherence to prescribed supplements, deficiencies in vitamins. A, B1, B6, and B12 and folate have also been described [143]. Adolescents have been shown to experience also substantial decreases in bone mineral density [148].

### Surgical options and results

Roux-en-Y gastric bypass is often referred to as the gold standard for surgical management of severe obesity in adults [149, 150] and adolescents [151] and is performed by using minimally invasive, laparoscopic surgical techniques. RYGB results in significant weight loss as a result of its effects on appetite, satiety, and regulation of energy balance [150].

Among all bariatric surgery options, vertical sleeve gastrectomy (VSG), is recommended in adolescents with severe obesity [143, 152]. Minimally invasive surgery, namely laparoscopic sleeve gastrectomy (LSG) is the most common performed bariatric surgery due to its safety, high efficacy and survival rates, in pediatric age. It represents a “vertical gastrectomy” performed on the greater curvature with preservation of the pylorus. Gastric tubulization by resection reduces approximately 80% of the stomach (remaining gastric capacity is > 100 mL). Operative time is also described to be shorter than the other surgeries. This technique achieves significant weight loss through similar effects on appetite, satiety, and regulation of energy balance and may reduce appetite through delayed gastric emptying and altered neuro-hormonal feedback mechanisms [153].

Compared to other approaches, the comorbidity resolution is maintained, weight loss efficacy is durable in children and adolescents > 5 years after surgery and specific nutrients’ malabsorption is reduced.

Nausea, dehydration, gastroesophageal reflux and wound infection (especially in patients with severe obesity), anastomotic leak and, rarely, gastric tube twist as well as gastric volvulus are reported in 4.3% of the cases and are considered as minor complications [154–156]. A retrospective analysis from the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBASQIP) database (USA) showed that LSG was associated with a significantly lower rate of major complications in the first month after surgery [157–159]. (LOE III-B)

Laparoscopic adjustable gastric band (LAGB), a reversible procedure that accounted for approximately one third of all bariatric operations in the United States a decade ago [152], has experienced a significant decline in use among adults because of limited long-term effectiveness and higher-than-expected complication rates [160, 161]. Disappointing outcomes in the context of few prospective studies in the pediatric population have resulted in a similar decline in use of LAGB among adolescents [143]. At present, LAGB is limited by the United States FDA to people 18 years or older. (LOE IV-C)

Endoscopic sleeve gastroplasty (ESG) represents an attractive alternative to open surgery and is gaining popularity as first choice obesity operation. ESG is a bariatric endoluminal reversible procedure consisting in reducing and shortening the stomach by means of non-resorbable full-thickness sutures. It is performed endoscopically with an endoscopic suturing device and requires a learning plateau of 7–9 cases for experienced endoscopists. The plication starts on the anterior wall, 1 cm from the gastric incisura and proceeds all the way through the greater curvature to the gastric fundus which

will be preserved. The gastric wall is pulled against the instrument, suctioned, in order to have a perpendicular full-thickness bite, and then, the stitch is released. Four to seven purse string stitches are enough to significantly reduce the gastric volume (< 100 ml) [162].

This technique has a positive impact on quality of life and it is considered to be a valid suggestion in adolescents or younger patients. Indication is reported in cases with lower BMI (30–35 kg/m<sup>2</sup>) or high risk patients or those patients who wish to undergo bariatric surgery. Storm et al. documented short- and long-term results on 1,607 ESG cases with a percentage of total body weight loss at 6, 12 and 18 months was 15.8, 17.1 and 17.3 respectively [163]. Success or failure of ESG seems to be predictable early after surgery and long-term gastroplasty integrity/weight loss are correlated with preoperative BMI. Comorbidities also seem to be treated. Patients get a global improvement of their physical (significant decreases in systolic blood pressure, glycated hemoglobin, serum triglycerides and alanine transaminase [ALT]) and mental (improvements in self-esteem and lower rates of depression) health after ESG. Endoscopic and histopathologic evaluations showed no abnormalities within 1 year follow-up. Minor adverse events have been described (92%, nausea, vomiting, mild to moderate abdominal pain) and major problems (1.1–2%, fluid collections, late bleeding, refractory symptoms, intraoperative perforation, splenic injury and pulmonary embolism) [154]. ESG appears to be safe with the advantages of preserving the anatomy and being reversible and repeatable. However, the procedure still needs further assessment through a RCT to demonstrate efficacy in postoperative long term follow up in children and adolescents [146, 154, 164–166]. (LOE IV-B)

## Conclusion

Lifestyle modification therapy is the first necessary step of obesity treatment useful for improving many chronic disease risk factors and comorbidities but often fails to achieve clinically meaningful and sustainable weight loss. The addition of drugs to lifestyle therapy is the second step of treatment. Recently, new drugs approved for the use in adolescents were reported to be safe and effective in promoting remarkable weight loss.

The third level of treatment is bariatric surgery, that provided robust weight loss and risk factor/comorbidity improvements although potential risks have to be taken into account. Further research with long-term follow-up is necessary to assess durability of body weight improvement obtained with different treatments.

Obesity is not a homogeneous disease but is rather a complex, multifactorial condition that has multiple determinants that respond variably to a given intervention.

Therefore, each mode of treatment employed in youths demonstrates considerable heterogeneity in response. Availability of predictors of the response to treatment, especially for weight-loss maintenance, could improve the success rate. New longitudinal studies will contribute to identify potential predictors as well as test the efficacy of pharmacotherapy in children younger than 12 years, for whom there are not yet drugs approved for treatment.

## Abbreviations

|         |                                                                               |
|---------|-------------------------------------------------------------------------------|
| ALT     | Alanine transaminase                                                          |
| AHI     | Apnoea Hypopnoea Index                                                        |
| BMI     | Body mass index                                                               |
| BT      | Behavioral therapy                                                            |
| CBT     | Cognitive behavioral therapy                                                  |
| CHO     | Carbohydrate                                                                  |
| CI      | Confidence interval                                                           |
| DASH    | Dietary Approach to Stop Hypertension                                         |
| EMA     | European Medicines Agency                                                     |
| ESG     | Endoscopic sleeve gastroplasty                                                |
| ETP     | Therapeutic education of the patient                                          |
| FDA     | Food and Drug Administration                                                  |
| FFM     | Fat free mass                                                                 |
| FFQ     | Food Frequency Questionnaire                                                  |
| GABA    | Gamma-aminobutyric acid                                                       |
| GI      | Glycemic index                                                                |
| GL      | Glycemic load                                                                 |
| GLP-1   | Glucagon-like peptide 1                                                       |
| HOMA    | Homeostasis model assessment                                                  |
| HOMA-IR | Homeostasis model assessment of insulin resistance                            |
| LAGB    | Laparoscopic adjustable gastric band                                          |
| LC      | Low carbohydrate                                                              |
| LEPR    | Leptin Receptor                                                               |
| LOE     | Level of evidence                                                             |
| LSG     | Laparoscopic sleeve gastrectomy                                               |
| MBASQIP | Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program |
| MC4R    | Melanocortin-4 receptor                                                       |
| MD      | Mediterranean diet                                                            |
| NAFLD   | Non-alcoholic fatty liver disease                                             |
| NICE    | National Institute for Health and Care Excellence                             |
| PCSK1   | Proprotein Convertase Subtilisin/Kexin Type 1                                 |
| POMC    | Pro-opiomelanocortin                                                          |
| RCT     | Randomized control trial                                                      |
| RGL     | Reduced glycemic load                                                         |
| RYGB    | Roux-en-Y gastric bypass                                                      |
| VLCD    | Very low-carbohydrate diet                                                    |
| VLED    | Very low-energy diet                                                          |
| VSG     | Vertical sleeve gastrectomy                                                   |
| WHO     | World Health Organization                                                     |

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# Position of the Academy of Nutrition and Dietetics: Interventions for the Treatment of Overweight and Obesity in Adults



## ABSTRACT

It is the position of the Academy of Nutrition and Dietetics that successful treatment of overweight and obesity in adults requires adoption and maintenance of lifestyle behaviors contributing to both dietary intake and physical activity. These behaviors are influenced by many factors; therefore, interventions incorporating more than one level of the socioecological model and addressing several key factors in each level may be more successful than interventions targeting any one level and factor alone. Registered dietitian nutritionists, as part of a multidisciplinary team, need to be current and skilled in weight management to effectively assist and lead efforts that can reduce the obesity epidemic. Using the Academy of Nutrition and Dietetics' Evidence Analysis Process and Evidence Analysis Library, this position paper presents the current data and recommendations for the treatment of overweight and obesity in adults. Evidence on intrapersonal influences, such as dietary approaches, lifestyle intervention, pharmacotherapy, and surgery, is provided. Factors related to treatment, such as intensity of treatment and technology, are reviewed. Community-level interventions that strengthen existing community assets and capacity and public policy to create environments that support healthy energy balance behaviors are also discussed.

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## POSITION STATEMENT

It is the position of the Academy of Nutrition and Dietetics that successful treatment of overweight and obesity in adults requires adoption and maintenance of lifestyle behaviors contributing to both dietary intake and physical activity. These behaviors are influenced by many factors; therefore, interventions incorporating more than one level of the socioecological model and addressing several key factors in each level may be more successful than interventions targeting any one level and factor alone.

**THE PURPOSE OF THIS ARTICLE** is to provide an update to the 2009 position paper on adult weight management and incorporate the revised Academy's evidence-based adult weight-management guidelines from the Evidence Analysis Library (EAL) and the 2013 American Heart Association, American College of Cardiology, and The Obesity Society (AHA/ACC/TOS) Guideline for the Management of Overweight and Obesity in Adults.<sup>1</sup> The scope of the paper has been expanded to include a socioecological approach and provide evidence regarding community-based and policy-level interventions designed to reduce the prevalence of overweight and obesity in communities in the United States. Within those areas in which various interventions are described, included

evidence focuses as much as possible on systematic reviews and/or meta-analyses, randomized controlled trials (RCTs), and other evidence-based guidelines.

In 2012, 34.9% of adults in the United States were obese and another 33.6% were overweight.<sup>2</sup> The high prevalence of overweight and obesity in the United States negatively affects the health of the population, as obese individuals are at increased risk for developing several chronic diseases, such as type 2 diabetes, cardiovascular disease (CVD), and certain forms of cancer.<sup>1,3</sup> Because of its impact on health, medical costs, and longevity, reducing obesity is considered to be a public health priority.<sup>4</sup>

Weight loss of only 3% to 5% that is maintained has the ability to produce clinically relevant health improvements (eg, reductions in triglycerides, blood glucose, and risk of developing type 2 diabetes).<sup>1</sup> Larger weight loss reduces additional risk factors of CVD (eg, low-density and high-density

This Academy position paper includes the authors' independent review of the literature in addition to systematic review conducted using the Academy's Evidence Analysis Process and information from the Academy's Evidence Analysis Library (EAL). Topics from the EAL are clearly delineated. For a detailed description of the methods used in the Evidence Analysis Process, go to [www.andevidencelibrary.com/eaprocess](http://www.andevidencelibrary.com/eaprocess).

Recommendations are assigned a rating by an expert work group based on the grade of the supporting evidence and the balance of benefit vs harm. Recommendation ratings are Strong, Fair, Weak, Consensus, or Insufficient Evidence.

Recommendations can be worded as conditional or imperative statements. Conditional statements clearly define a specific situation and most often are stated as an "if, then" statement, while imperative statements are broadly applicable to the target population without restraints on their pertinence.

Evidence-based information for this and other topics can be found at [www.andevidencelibrary.com](http://www.andevidencelibrary.com) and subscriptions for nonmembers can be purchased at [www.andevidencelibrary.com/store.cfm](http://www.andevidencelibrary.com/store.cfm).

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lipoprotein cholesterol and blood pressure) and decreases the need for medication to control CVD and type 2 diabetes. Thus, a goal of weight loss of 5% to 10% within 6 months is recommended.<sup>1</sup>

**EAL Recommendation:** “The registered dietitian nutritionist (RDN) should collaborate with the individual regarding a realistic weight-loss goal such as one of the following: up to 2 lb per week, up to 10% of baseline body weight, or a total of 3% to 5% of baseline weight if cardiovascular risk factors (hypertension, hyperlipidemia, and hyperglycemia) are present.” **(Rating: Strong, Imperative)**

## GOALS OF ADULT OBESITY TREATMENT

While intentional weight loss of at least 3% to 5% improves some clinical parameters,<sup>1</sup> to sustain these improvements, this degree of weight loss needs to be maintained. While there is no standard definition for length of time for maintenance of weight loss for it to be considered successful, duration of 1 year is often used.<sup>5</sup> While long-term weight-loss maintenance is one of the challenges in obesity treatment, it is possible. For example, the Look AHEAD (Action for Health in Diabetes) trial, an RCT with >5,000 adults with type 2 diabetes, reported that 39.3% of the 825 participants who received a lifestyle intervention (consisting of a reduced-energy dietary and physical activity prescription, and a cognitive behavioral intervention) who lost at least 10% of their body weight at year 1 maintained at least a 10% weight loss at year 8, and another 25.8% maintained a 5% to <10% weight loss at year 8.<sup>6</sup>

To achieve a reduction in weight that can be sustained over time and improve cardiometabolic health, obesity treatment ideally produces changes in lifestyle behaviors that contribute to both sides of energy balance in adults. Thus, the diet should be altered so that reductions in excessive energy intake and enhancements in dietary quality occur, so that the likelihood of achieving recommendations provided in the 2010 Dietary Guidelines for Americans (DGA)<sup>7</sup> is increased. Along with changes in dietary intake, obesity treatment should encourage increases in physical activity in order to increase energy

expenditure, in the minimum to meet the 2008 Physical Activity Guidelines for Americans (150 minutes per week of moderate-intensity, or 75 minutes per week of vigorous-intensity physical activity)<sup>8</sup> and ideally to meet the American College of Sports Medicine's Position Stand for weight-loss maintenance (>250 minutes/wk of moderate-intensity physical activity),<sup>9</sup> and enhance cardiovascular fitness. Preservation of changes in lifestyle behaviors is required to achieve successful weight-loss maintenance.<sup>10</sup>

## FACTORS INFLUENCING FOOD INTAKE

Eating behavior is generally believed to be influenced by both internal and external cues.<sup>11,12</sup> Internally, two systems have been identified that assist with regulating intake.<sup>11</sup> The first system is the homeostatic system, in which neural, nutrient, and hormonal signals allow communication between the gut, pancreas, liver, adipose tissue, brainstem, and hypothalamus. The arcuate nucleus of the hypothalamus integrates these signals and regulates hunger, satiation, and satiety in response to the signals via higher cortical centers that influence the sympathetic and parasympathetic nervous system, gastric motility and hormone secretion, and other processes relevant to energy homeostasis. The second internal system is the hedonic system, which is influenced by the hedonic (“liking”) and rewarding (“wanting”) qualities of food and is regulated by the corticolimbic system.<sup>11,12</sup> It is through the hedonic system that environmental cues influence consumption.<sup>11,12</sup> The hedonic system does have a strong impact on intake, as is demonstrated in situations when eating occurs after reports of satiation and when there is no nutrition need (eg, the dessert effect).<sup>12</sup> It is believed that cross talk does occur between these two internal systems; however, little is known about this process.<sup>11</sup>

Many external factors influence consumption, but environmental variables that appear to greatly influence intake are food availability and variety and energy density and portion size of food.<sup>12</sup> Research has found that when availability, variety, energy density, and portion size increase, intake is heightened.<sup>12</sup> The increased intake appears to

be outside of awareness, is not associated with enhanced satiation, and compensation does not appear to occur over time.

## FACTORS INFLUENCING ENGAGING IN MODERATE- TO VIGOROUS-INTENSITY PHYSICAL ACTIVITY

As with food intake, there are internal and external factors that influence how much moderate- to vigorous-intensity physical activity (MVPA) one engages in. Internally, physical limitations and discomfort and beliefs about how MVPA influences health have been related to amount of MVPA achieved.<sup>13</sup> Mood and, specifically, core affective valence (eg, good/bad feelings) in response to engaging in MVPA are related to future physical activity.<sup>14</sup> Also as engaging in regular MVPA involves consistently making decisions to engage in a behavior that requires costs to achieve the long-term cumulative health benefits, it is theorized that strong executive control and optimized brain structures supporting executive functioning (ie, dorsolateral prefrontal cortex) is an important internal factor.<sup>15</sup>

The social and physical environments are also believed to be factors that influence engaging in MVPA. How supportive other individuals are to MVPA efforts and the potential interaction with others who are active are external factors that can promote physical activity.<sup>13</sup> Different physical environmental dimensions, such as walkability, land use, public transportation availability, safety, and aesthetics, in residential and/or work neighborhoods have also been shown to influence physical activity.<sup>16</sup> Finally, within a home or work setting, the option of engaging in sedentary behaviors, especially those that are screen-based, can also influence MVPA.<sup>17</sup>

## SOCIOECOLOGICAL MODEL OF OBESITY INTERVENTION

The socioecological model provides a framework that proposes that multiple levels of influence can impact energy-balance behaviors and weight outcomes. Levels of influence include intrapersonal factors, community and organizational factors, and government and public policies.<sup>18</sup>

## Intrapersonal-Level Obesity Intervention

The vast majority of research forming an evidence-based approach to obesity treatment has focused on intervention at the individual level, in which treatment targets intrapersonal-level factors that assist with changing energy balance behaviors. The nutrition care process, which includes nutrition assessment, diagnosis, intervention, monitoring, and evaluation, represents an intrapersonal-level of focus. The Academy's evidence-based adult weight-management guidelines from the EAL focus on obesity treatment at the intrapersonal level, incorporating the nutrition care process within its recommendations.

**Assessment.** As with any nutrition assessment, applicable information that can assist in the development of a nutrition diagnosis and intervention for obesity is essential (see [Figure 1](#) for suggested data to collect for assessment). Determining body mass index (BMI; calculated as  $\text{kg/m}^2$ ) is often the first step of obesity treatment, as it identifies whether a client is overweight or obese. Using the current criterion for overweight and obesity, individuals with a BMI  $\geq 25.0$ -29.9 (overweight) or  $\geq 30$  (obese) should be identified and provided with obesity treatment.<sup>1</sup> Other anthropometric and medical measures, such as waist circumference, blood pressure, lipids, and glucose, should be taken to assess for cardiovascular risk.<sup>1</sup> This will assist with matching obesity treatment benefits with risk profiles and making appropriate referrals.<sup>1</sup>

**EAL Recommendation:** "The RDN, in collaboration with other health care professionals, administrators, and/or public policy decision-makers, should ensure that all adult patients have the following measurements at least annually: height and weight to calculate BMI; and waist circumference to determine risk of CVD, type 2 diabetes, and all-cause mortality." (Rating: Fair, Imperative)

**EAL Recommendation:** "The RDN, in collaboration with other health care professionals, administrators, and public policy decision makers, should ensure that overweight or obese adults are referred to an RDN for medical

nutrition therapy (MNT)." (Rating: Fair, Imperative)

Once an RDN initiates the nutrition care process, data about the client (see [Figure 1](#)) should be collected to assist in individualizing MNT. An assessment can include, but is not limited to, dietary intake; social history, including living or housing situation and socioeconomic status; and motivation for weight management. Resting metabolic rate should be determined, and that, combined with activity level and calculation of usual dietary intake in terms of energy and nutrient content, can assist with developing dietary parameters that may be appropriate to target during intervention. In the EAL, physical activity is listed with food- and nutrition-related history, and level of physical activity is required to estimate energy needs. To assist with assessing physical activity, "A Physical Activity Toolkit for Registered Dietitians: Utilizing Resources of Exercise is Medicine," was developed by the Weight Management and Sports, Cardiovascular, and Wellness Nutrition dietetic practice groups, in collaboration with the American College of Sports Medicine.

**EAL Recommendation:** "The RDN should assess the following data in order to individualize the comprehensive weight-management program for overweight and obese adults: food- and nutrition-related history; anthropometric measures; biochemical data, medical tests and procedures; nutrition-focused physical findings; and client history." (Rating: Strong, Imperative)

**EAL Recommendation:** "The RDN should assess the energy intake and nutrient content of the diet." (Rating: Strong, Imperative)

**EAL Recommendation:** "If indirect calorimetry is available, the RDN should use a measured resting metabolic rate (RMR) to determine energy needs in overweight or obese adults." (Rating: Consensus, Conditional)

**EAL Recommendation:** "If indirect calorimetry is not available, the RDN should use the Mifflin-St. Jeor equation using actual weight to estimate RMR in overweight or obese adults." (Rating: Strong, Conditional)

**EAL Recommendation:** "The RDN should multiply the RMR by one of the following physical activity factors to estimate total energy needs: sedentary

(1.0 or more to less than 1.4); low active (1.4 or more to less than 1.6); active (1.6 or more to less than 1.9); and very active (1.9 or more to less than 2.5)." (Rating: Consensus, Imperative)

**EAL Recommendation:** "The RDN should assess motivation, readiness and self-efficacy for weight management based on behavior change theories and models (such as cognitive-behavioral therapy, transtheoretical model, and social cognitive theory/social learning theory)." (Rating: Fair, Imperative)

**Dietary Intervention.** As treating obesity requires achieving a state of negative energy balance, all efficacious dietary interventions for obesity treatment must decrease consumption of energy. There are many dietary approaches that can reduce energy intake, with some approaches more greatly reducing intake than others. However, the degree of weight loss generally reflects the size of the decrease in energy intake achieved. Thus, the reduction in energy intake is the primary factor to address in a dietary intervention for obesity treatment.<sup>1</sup> As many dietary approaches reduce energy intake, a client's preference and health and nutrient status should be taken into consideration when a dietary intervention for obesity treatment is prescribed.<sup>1</sup> See [Figure 2](#) for dietary interventions and a summary of the evidence-base regarding ability to produce weight loss or not, or whether evidence is lacking for conclusions to be drawn.

**EAL Recommendation:** "During weight loss, the RDN should prescribe an individualized diet, including patient preferences and health status, to achieve and maintain nutrient adequacy and reduce caloric intake, based on one of the following caloric reduction strategies: 1,200 kcal to 1,500 kcal/day for women and 1,500 to 1,800 kcal/day for men; energy deficit of approximately 500 kcal/day or 750 kcal/day; one of the evidence-based diets that restricts certain food types (such as high-carbohydrate foods, low-fiber foods, or high-fat foods) in order to create an energy deficit by reduced food intake." (Rating: Strong, Imperative)

**EAL Recommendation:** "For weight loss, the RDN should advise overweight

| Assess                                          |                                                                                                                                                                                                                                                                                                                                                                                                             | Monitor and Evaluate                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Food- and nutrition-related history             | <ul style="list-style-type: none"> <li>• Beliefs and attitudes, including food preferences and motivation</li> <li>• Food environment, including access to fruits and vegetables</li> <li>• Dietary behaviors, including eating out and screen time</li> <li>• Diet experience, including food allergies and dieting history</li> <li>• Medications and supplements</li> <li>• Physical activity</li> </ul> | <ul style="list-style-type: none"> <li>• Beliefs and attitudes, including motivation</li> <li>• Food environment, including access to fruits and vegetables</li> <li>• Dietary behaviors, including eating out and screen time</li> <li>• Medications and supplements</li> <li>• Physical activity</li> </ul> |
|                                                 | <p><b>Anthropometric measurements</b></p> <ul style="list-style-type: none"> <li>• Height, weight, body mass index</li> <li>• Waist circumference</li> <li>• Weight history</li> <li>• Body composition</li> </ul>                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• Weight, body mass index</li> <li>• Waist circumference</li> <li>• Weight history</li> <li>• Body composition</li> </ul>                                                                                                                                              |
| Biochemical data, medical tests, and procedures | <ul style="list-style-type: none"> <li>• Glucose and endocrine profile</li> <li>• Lipid profile</li> </ul>                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• Glucose and endocrine profile</li> <li>• Lipid profile</li> </ul>                                                                                                                                                                                                    |
|                                                 | <p><b>Nutrition-focused physical findings</b></p> <ul style="list-style-type: none"> <li>• Ability to communicate</li> <li>• Affect</li> <li>• Amputations</li> <li>• Appetite</li> <li>• Blood pressure</li> <li>• Body language</li> <li>• Heart rate</li> </ul>                                                                                                                                          | <ul style="list-style-type: none"> <li>• Affect</li> <li>• Appetite</li> <li>• Blood pressure</li> <li>• Body language</li> <li>• Heart rate</li> </ul>                                                                                                                                                       |
| Client history                                  | <ul style="list-style-type: none"> <li>• Appropriateness of weight management in certain populations (such as eating disorders, pregnancy, receiving chemotherapy)</li> <li>• Client and family medical and health history</li> <li>• Social history, including living or housing situation and socioeconomic status</li> </ul>                                                                             |                                                                                                                                                                                                                                                                                                               |

**Figure 1.** Data needed to assess, monitor, and evaluate a comprehensive weight-management program from the Academy of Nutrition and Dietetics' Evidence Analysis Library.

| Diet                                                                 | Investigated using RCTs <sup>a</sup><br>with evidence considered<br>supportive for weight loss | Investigated using RCTs<br>with evidence considered<br>non-supportive for weight loss | Lacking investigation for<br>weight loss using RCTs |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Small, food-based</b>                                             |                                                                                                |                                                                                       |                                                     |
| Increasing fruits and vegetables                                     |                                                                                                | X                                                                                     |                                                     |
| Decreasing sugar-sweetened beverages                                 | X                                                                                              |                                                                                       |                                                     |
| Decreasing fast food                                                 |                                                                                                |                                                                                       | X                                                   |
| <b>Portion control</b>                                               | X                                                                                              |                                                                                       |                                                     |
| <b>Larger-, energy-, macronutrient- and/or dietary pattern-based</b> |                                                                                                |                                                                                       |                                                     |
| Energy-focused                                                       |                                                                                                |                                                                                       |                                                     |
| Low-calorie diet                                                     | X                                                                                              |                                                                                       |                                                     |
| Meal replacement/structured meal plans                               | X                                                                                              |                                                                                       |                                                     |
| Very-low-calorie diet                                                | X                                                                                              |                                                                                       |                                                     |
| Macronutrient-focused                                                |                                                                                                |                                                                                       |                                                     |
| Low-carbohydrate                                                     | X                                                                                              |                                                                                       |                                                     |
| Low glycemic index/load without energy restriction                   |                                                                                                | X                                                                                     |                                                     |
| High protein with energy restriction                                 | X                                                                                              |                                                                                       |                                                     |
| Dietary-pattern focused                                              |                                                                                                |                                                                                       |                                                     |
| Energy density                                                       |                                                                                                |                                                                                       | X                                                   |
| DASH <sup>b</sup> with energy restriction                            | X                                                                                              |                                                                                       |                                                     |
| Mediterranean with energy restriction                                | X                                                                                              |                                                                                       |                                                     |
| Dietary-timing focused                                               |                                                                                                |                                                                                       |                                                     |
| Eating frequency                                                     |                                                                                                |                                                                                       | X                                                   |
| Timing of eating                                                     |                                                                                                |                                                                                       | X                                                   |
| Breakfast consumption                                                |                                                                                                |                                                                                       | X                                                   |

**Figure 2.** Evidence-base for dietary interventions for weight loss in adults. Sources include 2013 American Heart Association, American College of Cardiology, and the Obesity Society Guideline for the Management of Overweight and Obesity in Adults and the Academy of Nutrition and Dietetics' Evidence Analysis Library. <sup>a</sup>RCTs=randomized controlled trials; <sup>b</sup>DASH=Dietary Approaches to Stop Hypertension.

or obese adults that as long as the target reduction in calorie level is achieved, many different dietary approaches are effective.” (**Rating: Strong, Imperative**)

**EAL Recommendation:** “During weight maintenance, the RDN should prescribe an individualized diet (including patient preference and health status) to maintain nutrient adequacy and reduce caloric intake for maintaining a lower body weight.” (**Rating: Strong, Imperative**)

**EAL Recommendation:** “For weight maintenance, the RDN should advise overweight and obese adults that as long as the target reduction in calorie level is achieved, many different dietary approaches are effective.” (**Rating: Strong, Imperative**)

**Small, food-based changes.** It has been proposed that small behavior changes, those that shift energy balance by 100 to 200 kcal/day, may be helpful for weight management.<sup>19</sup> It is important to recognize that this degree of energy deficit is much smaller than what is currently recommended to produce clinically relevant weight loss.<sup>1</sup> It is hypothesized that small behavior changes, such as reducing intake of sugar-sweetened beverages (SSB), may be more feasible and sustainable than larger behavior changes, such as changing macronutrient composition of the diet.

**Fruits and vegetables.** Within the context of promoting healthy diets, the increased consumption of fruits and vegetables has gained recognition, in large part due to the findings of the DASH (Dietary Approaches to Stop Hypertension) and DASH-Sodium RCTs.<sup>20,21</sup> Increasing fruits and vegetables is a dietary change that can reduce dietary energy density, enhance satiation, and assist with decreasing overall energy intake, particularly if fruits and vegetables are consumed instead of other foods higher in energy density.<sup>22</sup> Those RCTs that have examined the influence of solely increasing fruits and vegetables with no other dietary changes on weight management have generally not produced weight loss.<sup>23</sup>

**SSB.** Reducing SSB should be helpful for weight management if compensation to the reduction in energy consumed from SSB does not occur and

if energy-containing beverages are not consumed in place of SSB when SSB are reduced. While few studies have examined the effect of solely reducing SSB on weight loss, an RCT conducted by Tate and colleagues<sup>24</sup> found that replacing caloric beverages with water or diet beverages resulted in weight losses of 2% to 2.5% during a 6-month period. While concerns have been raised about increases in hunger, which may increase overall energy intake when non-nutritive sweetened foods and beverages are consumed, a recent RCT found that consumption of at least 24 oz of non-nutritive sweetened beverages during a 12-week behavioral weight-loss intervention reduced subjective feelings of hunger as compared with a 24-oz water consumption comparison.<sup>25</sup>

**Fast food.** Food prepared away from home, in particular fast food, comprises an increasing amount of the American diet and contributes to the epidemic of obesity.<sup>26</sup> Fast food is generally high in energy density and commonly purchased in large portion sizes, thereby contributing to excessive energy intake.<sup>26</sup> Due to the relationship between fast food and increased energy intake, in the context of a weight-loss dietary regimen, avoidance or reduction of the frequency of consumption of foods away from home is typically recommended. However, no RCT has been conducted to examine whether reducing fast food alone, with no other changes in the diet, produces weight loss.

At this time, research conducted in the area of small, food-based changes indicates that only changes in SSB, and no other small food-based change, can assist with weight management. It is important to note that the weight loss found with reducing SSB alone, while statistically significant, is below the amount of weight loss that is recommended to improve cardiometabolic health.<sup>1</sup>

**Portion-control changes.** RDNs have long endorsed skills that include portion control for lifelong weight management.<sup>27</sup> Portion control can be accomplished in a variety of different ways, including using packages containing a defined amount of energy (eg, complete meals, individual food

items); portion-controlled utensils where food is delivered in specific serving sizes; or communication strategies such as MyPlate, developed as an adjunct to the DGA,<sup>7</sup> to assist with consuming appropriate serving sizes of specific foods. The EAL’s Relationship of Single Serving Portion Size Meals and Weight Management Project states that single-serving portion-sized meals are a tool that can be used as a part of a weight-management program. This project’s key findings were that eating one or more single-serving portion-sized meals per day as part of a weight-management program resulted in a reduction of energy intake and weight loss in adults.

**Larger, energy, macronutrient, and/or dietary pattern-based changes.** Dietary approaches that target larger nutrient (eg, energy and/or macronutrient) and/or dietary pattern-based changes (eg, Mediterranean diet) are predominantly considered efficacious for weight loss and produce the recommended amount of weight loss,<sup>1</sup> as many RCTs investigating these diets have shown that they reduce energy intake enough (500 kcal/day to 750 kcal/day) so that the degree of negative energy balance achieved produces at least a 3% reduction in percent body weight.<sup>1</sup> These dietary interventions have either an explicit energy goal per day or provide an ad libitum approach without a formal energy goal that still produces a reduction in energy intake, usually by restriction or elimination of specific foods and/or food groups, or provision of prescribed foods (eg, meal replacement).<sup>1</sup> Outcomes indicate that all of the larger, energy, macronutrient, and/or dietary pattern-based approaches produce a weight loss of about –4 to –12 kg at 6-month follow-up.<sup>1</sup> After 6 months, slow weight regain occurs, and at 1 year, total weight loss is –4 to –10 kg, and at 2 years, total weight loss is at –3 to –4 kg.<sup>1</sup> As this is the pooled effect of the weight loss achieved with the energy, macronutrient and/or dietary pattern-based change diets, the individual weight-loss outcomes for each diet described in this paper are not reported (except for the very-low-calorie diet [VLCD] as this diet has a lower energy prescription than all other diets; meal replacements, as they are a specific form

of the low-calorie diet [LCD] and their weight loss is included to allow comparison with the LCD; and timing of eating, as this diet was not included in the AHA/ACC/TOS Guideline for the Management of Overweight and Obesity in Adults).<sup>1</sup>

Although no one diet approach that targets larger nutrients or dietary patterns is considered to be more efficacious than another diet approach, some of the diets have differential effects on cardiometabolic outcomes and dietary quality. While research in these differential effects is limited, available research on cardiometabolic outcomes specific to a diet intervention, after controlling for effects attributable to weight loss, and diet quality are described here for the corresponding diet. If measures of cardiometabolic outcomes and diet quality are not reported on in a section, this indicates that there is very little evidence available to report about the influence of the diet alone on these parameters.

**Energy focused.** Two of the most widely investigated dietary prescriptions for weight loss are the LCD and the VLCD. Along with varying in energy goals, these two diets differ in the amount of structure they provide.

**LCD.** An LCD is usually >800 kcal/day, and typically ranges from 1,200 to 1,600 kcal/day.<sup>28</sup> Structure can be increased in the LCD with the use of a meal plan, in which all food choices and portion sizes for these choices for all meals and snacks are provided. Use of meal replacements, usually liquid shakes and bars, containing a known amount of energy and macronutrient content also increase structure in the LCD diet. These methods of increasing structure in the diet are believed to be helpful for adherence to an LCD because they reduce problematic food choices, and decrease challenges with making decisions about what to consume. In addition, meal replacements can enhance dietary adherence via portion control, limiting dietary variety, and convenience.<sup>28-30</sup> Meal plans and the partial meal-replacement plan, which prescribes two portioned-controlled, vitamin/mineral-fortified meal replacements per day, with a reduced energy meal and snack composed of

conventional foods, may produce greater short-term weight loss as compared with an LCD composed of traditional foods.<sup>28,31</sup> For example, a meta-analysis of six studies comparing an LCD composed of conventional foods or meal replacements found a 2.54 kg and 2.43 kg greater weight loss in the meal-replacement group for the 3-month and 1-year follow-ups, respectively.<sup>28</sup>

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN should recommend portion control and meal replacements or structured meal plans as part of a comprehensive weight-management program.” (**Rating: Strong, Imperative**)

**VLCD.** A VLCD provides ≤800 kcal/day and provide a high degree of dietary structure (VLCDs are commonly consumed as liquid shakes).<sup>32,33</sup> The VLCD is designed to preserve lean body mass; usually 70 to 100 g/day of protein or 0.8 to 1.5 g protein/kg of ideal body weight are prescribed.<sup>32</sup> VLCDs are considered to be appropriate only for those with a BMI ≥30, and are increasingly used with individuals before having bariatric surgery to reduce overall surgical risks in those with severe obesity.<sup>32</sup> A meta-analysis of six RCTs comparing weight-loss outcomes of VLCDs to LCDs found that although VLCDs produce significantly greater weight loss in the short-term (4 months),  $-16.1\% \pm 1.6\%$  vs  $-9.7\% \pm 2.4\%$  of initial weight, there was no difference in weight loss between the diets in long-term follow-up (>1 year), VLCD =  $-6.3\% \pm 3.2\%$ ; LCD =  $-5.0\% \pm 4.0\%$ .<sup>32</sup>

**Macronutrient focused.** Many RCTs have been conducted to help determine which mix of macronutrients best promotes weight loss, while including other positive metabolic benefits. What is important to recognize about macronutrient-focused diet prescriptions is that when one macronutrient is altered, there will be a change in the other macronutrients. Thus, prescriptions for macronutrient-focused diets have often targeted changing one macronutrient, allowing the other two macronutrients to change as different food choices are made. The name of the macronutrient-focused diet is usually based on the one macronutrient that is targeted for change.

**Low carbohydrate.** A low-carbohydrate diet is commonly defined as consuming no more than 20 g of carbohydrate per day.<sup>34,35</sup> Energy and other macronutrients are not restricted in low-carbohydrate diets. Once a desired weight is achieved, carbohydrate intake can increase to 50 g per day.<sup>36</sup>

While amount of weight loss achieved is not considered to be different between a low-carbohydrate and low-fat, LCD especially over 12 months or longer, research does suggest that these diets may produce differences in cardiometabolic outcomes during weight loss.<sup>1</sup> For example, a low-fat, LCD produces a greater reduction in low-density lipoprotein cholesterol than a low-carbohydrate diet, while a low-carbohydrate diet produces a greater reduction in triglycerides and a larger increase in high-density lipoprotein cholesterol than a low-fat, LCD.<sup>1</sup>

• **Low-glycemic index/glycemic load.** There is currently no standard definition of a low-glycemic index or low-glycemic load diet. The effectiveness of a low-glycemic index diet without restriction of energy intake on weight loss is fairly poor.<sup>37</sup> With regard to cardiometabolic outcomes, a recent RCT found that when coupled with energy restriction, a low-glycemic index diet controlled glucose and insulin metabolism more effectively than a high-glycemic index, low-fat diet.<sup>38</sup>

**High protein.** A high-protein diet is commonly defined as consuming at least 20% energy from protein, with no standard amount defined for fat or carbohydrate.<sup>39</sup> For weight loss, high-protein diets also include an energy restriction. A high-protein diet is often achieved through consumption of conventional foods, but high-protein, portion-controlled liquid and solid meal-replacement products can also be used on a high-protein diet.

**Dietary pattern focused.** Dietary pattern-focused prescriptions emphasize the importance of the overall diet by providing recommendations about types of foods to consume, rather than providing recommendations about amount of energy or macronutrients, to consume.<sup>7,40</sup> The DGA promotes adopting an eating pattern to assist with weight management and reduce

disease risk.<sup>7</sup> As these diets focus on types of foods to consume and may not produce greater weight loss than other types of diets, they enhance consumption of foods that are generally considered beneficial in the diet and enhance overall dietary quality.<sup>41,42</sup>

**Energy density.** Energy density is the ratio of energy of a food to the weight of a food (kcal/g). Energy density is largely determined by the water content (higher water content lowers energy density), but is also affected by the fiber and fat content (more fiber lowers energy density and less fat lowers energy density) of foods and beverages consumed. As low-energy density foods have fewer kilocalories per gram weight, low-energy density foods allow consumption of a greater weight of food relative to energy consumed, which may assist with appetite control and reducing energy intake.<sup>22,43</sup>

Basic eating research has found that serving meals with foods low in energy density results in decreased meal energy intake.<sup>22</sup> For example, one study reduced energy density by 20% for entrées served at breakfast, lunch, and dinner, on three different days, using three different methods (reducing fat, increasing fruits and vegetables, or adding water to entrées), with a different method used to reduce energy density each day. With the reduction in energy density, energy intake per day decreased, ranging from  $-396 \pm 44$  kcal/day to  $-230 \pm 35$  kcal/day, with the largest decrease occurring when fat was reduced in entrées.<sup>44</sup>

Few RCTs have been conducted to examine the effect of a low-energy density diet on weight loss and currently there is no standard method known to best reduce energy density in the diet.<sup>45</sup> Results from these trials about weight loss are mixed, and this may be a consequence of the methods used to reduce dietary energy density, the degree of reduction in energy density achieved, and whether or not energy restriction was included. To better understand how recommendations to reduce energy density can be implemented, guidelines need to be developed regarding what is considered to be low-energy density and high-energy density (currently no definition exists), how best to lower energy density of the

diet, and how dietary energy density should be calculated (ie, as energy density is greatly influenced by water, dietary energy density varies greatly depending on whether and how beverages are included in calculations and no standard calculation has been determined).<sup>46</sup>

**DASH.** DASH is a dietary pattern that was developed to reduce hypertension in individuals with moderate to high blood pressure. DASH encourages the consumption of fruits, vegetables, whole grains, nuts, legumes, seeds, low-fat dairy products, and lean meats and limits consumption of sodium, in addition to caffeinated and alcoholic beverages.<sup>47</sup> A daily energy limit is not a component of the original DASH diet, but when one is provided with the DASH diet, weight loss occurs.<sup>48,49</sup> The DASH diet combined with weight loss significantly enhances reductions in blood pressure above that achieved by weight loss alone.<sup>49</sup>

**Mediterranean.** There is not a standard definition for the Mediterranean diet, but generally the Mediterranean diet reflects the dietary patterns of Crete, Greece and southern Italy in the early 1960s.<sup>50</sup> The traditional Mediterranean diet was focused on plant-based foods (eg, fruits, vegetables, grains, nuts, seeds), minimally processed foods, olive oil as the primary source of fat, dairy products, fish, and poultry consumed in low to moderate amounts, and minimal amount of red meat.<sup>51</sup> As with the DASH diet, the Mediterranean diet can be prescribed with or without an energy restriction, but if weight loss is desired, it does appear that an energy-restriction component is needed.<sup>52</sup> In addition, the Mediterranean diet may improve cardiovascular risk factors, such as blood pressure, blood glucose, and lipids, more so than a low-fat diet,<sup>53,54</sup> but more research is needed in this area.

In summary, there are several dietary approaches that target larger nutrient (eg, energy and/or macronutrient) and or dietary pattern–based changes (eg, Mediterranean diet) that can produce the recommended amount of weight loss.<sup>1</sup> At this time, as long as the diet helps to reduce energy intake by 500 to 750 kcal/day, there is no one diet that falls into this category that has been

shown to be more efficacious than another at producing clinically meaningful weight loss.

**Dietary-timing focused.** While research on dietary interventions for obesity have predominantly focused on food choices that impact energy, macro- and micronutrient, and food group intake,<sup>55</sup> dietary interventions can also address factors that influence the overall timing of the diet (eg, frequency of consumption, timing of consumption, and breakfast consumption). It is important to note that research on the effect of timing of intake on obesity treatment outcomes is very limited.

**Eating frequency.** Eating frequency is commonly defined as the number of eating occasions (meals and snacks) occurring per day. A greater number of eating occasions consumed increases overall eating frequency. At this time, there is no standardized definition of what constitutes an eating occasion.<sup>56</sup> Common parameters used to define an eating occasion include amount of energy consumed, type of substance ingested (eg, food or beverage), and the amount of time that has elapsed since the start of the previous eating occasion.<sup>56,57</sup> Few RCTs have been conducted that examine the influence of eating frequency on weight loss, and those that have been conducted have not found that a higher eating frequency produces greater weight loss.<sup>56</sup>

**Timing of eating.** When and how much energy you eat during the day can also be important for weight management. Potentially consuming more energy earlier in the day, rather than later in the day, can assist with weight management.<sup>55</sup> The mechanism of action by which timing of eating might assist with weight management is by influencing circadian rhythm.<sup>55</sup> Potentially, eating a greater amount earlier in the day may assist with synchronization of peripheral oscillators with the suprachiasmatic nucleus, assisting with maintenance of an appropriate circadian rhythm.<sup>55</sup>

There is only one RCT that has been conducted to examine timing of energy intake and weight loss.<sup>58</sup> In this 12-week intervention, the overweight and obese women with metabolic

syndrome who were randomized to the group that consumed most of their energy earlier in the day lost more weight ( $-8.7 \pm 1.4$  kg vs  $-3.6 \pm 1.5$  kg).

**Breakfast consumption.** One dietary pattern factor that has been proposed to influence weight status is regular consumption of breakfast.<sup>59</sup> Similar to eating frequency, there is no standardized definition of breakfast, but common parameters that are believed to be important in defining breakfast include time of day of consumption, time of consumption after ending daily sleep, and types of foods and beverages consumed at breakfast. Only three RCTs have examined the influence of breakfast consumption on weight loss, with all trials being of short duration ( $\leq 16$  weeks), and no investigation found greater weight loss with breakfast consumption.<sup>60-62</sup>

Overall, the results of intervention research examining the effect of dietary-timing focused interventions do not suggest that increasing eating frequency or consuming breakfast improve weight-loss outcomes, but consuming most of an individual's energy earlier in the day may enhance weight loss.

**EAL Recommendation:** "For weight loss and weight maintenance, the RDN should individualize the meal pattern to distribute calories at meals and snacks throughout the day, including breakfast." (Rating: Fair, Imperative)

**Activity Intervention.** Activity interventions are designed to enhance energy expenditure, which assists with the achievement of negative energy balance that is required for weight loss. However, it is important to recognize that activity interventions may assist with weight management via other mechanisms that are not well understood (eg, sparing of fat-free mass with weight loss, enhanced ability for energy regulation, and ability to buffer the negative effects of stress on weight).<sup>63</sup> Traditionally, activity interventions have focused on increasing MVPA, as this type of activity has higher energy expenditure than other activities (eg, light physical activity) and also improves cardiovascular health. Recently, focus has turned to

the role of sedentary behaviors and obesity treatment.

**Physical activity.** MVPA is defined as activity that is  $\geq 3.0$  metabolic equivalent units (METs; a MET of 1 is generally considered the RMR).<sup>9</sup> There is a large body of research, including RCTs, examining the influence of MVPA on obesity treatment.<sup>9</sup> While increasing MVPA alone is not believed to be the best strategy for weight loss and produces less weight loss than decreasing energy intake, the combination of increasing MVPA with decreasing energy intake produces the largest weight loss.<sup>9,64</sup> For example, a recent meta-analysis of diet or exercise interventions vs combined behavioral weight-management programs found at 12 months that the combined program had greater weight loss than the diet-only programs (mean difference in weight loss achieved for combined behavioral weight management vs diet only was  $-1.72$  kg) and the exercise-only programs (mean difference in weight loss achieved for combined behavioral weight management vs exercise only was  $-6.29$  kg).<sup>64</sup> However, for weight-loss maintenance, research has consistently demonstrated that a high level of MVPA is imperative.<sup>9</sup> The difference in the roles of MVPA for weight loss and weight-loss maintenance is believed to be due to the degree of energy deficit required. Weight loss requires a larger energy deficit (approximately  $-500$  to  $-1,000$  kcal/day for 1 to 2 lb of weight loss per week), which is challenging to achieve via increased MVPA alone. For weight-loss maintenance, equilibrium of energy intake to expenditure is needed; thus, higher levels of MVPA allow energy intake to be greater, which may help long-term adherence to dietary goals. The current recommendation for physical activity is a minimum of 30 minutes of moderate-intensity activity on most days of the week (150 min/wk).<sup>8</sup> However, higher levels of MVPA ( $>250$  min/week) are recommended for weight-loss maintenance.<sup>9</sup> To enhance cardiovascular outcomes associated with increasing MVPA, ideally minutes spent in MVPA is accumulated in bouts of at least 10 minutes.<sup>5</sup>

**EAL Recommendation:** "For weight loss the RDN should encourage physical

activity as part of a comprehensive weight-management program, individualized to gradually accumulate 150 to 420 minutes or more of physical activity per week, depending on intensity, unless medically contraindicated." (Rating: Consensus, Imperative)

**EAL Recommendation:** "For weight maintenance the RDN should encourage physical activity as part of a comprehensive weight-management program, individualized to gradually accumulate 200 to 300 minutes or more of physical activity per week, depending on intensity, unless medically contraindicated." (Rating: Consensus, Imperative)

**Sedentary behavior.** Sedentary behavior is defined as sitting activities with a very low level of energy expenditure ( $<1.5$  METs).<sup>65</sup> Sedentary behavior occurs in a variety of domains (ie, leisure, occupation, transportation, and recreation), and includes working/playing on the computer or tablet, driving a car, and watching television (TV). Given that greater time spent in sedentary behavior, independent of time performing MVPA, has been associated with increased risk of obesity,<sup>66</sup> it is now recommended that sedentary behavior, particularly leisure screen time (eg, TV watching; computer and tablet use), be reduced in adults to improve weight and health status.<sup>66,67</sup>

There are several mechanisms by which reducing sedentary behavior may assist with weight management. The first is through increasing energy expenditure. Research indicates that when time engaged in sedentary behavior is reduced, while little to none of the newly acquired free time is reallocated to MVPA, a significant amount of time is reallocated to light physical activity (1.5 to 2.9 METs).<sup>68,69</sup> The reallocation of time spent in sedentary behavior to light physical activity may increase overall energy expenditure due to light physical activity's higher MET values as compared with sedentary behavior. The second mechanism is through reducing food consumption. Eating appears to be a complementary behavior to some sedentary behaviors, particularly TV watching.<sup>70</sup> As TV watching is reduced, energy consumed while watching TV decreases, thus

lowering intake.<sup>69</sup> Few RCTs have examined reducing sedentary behavior during obesity treatment, and the two trials that have were of a small sample size (<15 participants) and of short duration (8 weeks), and did not find significantly greater weight loss with the conditions that prescribed reducing sedentary behavior to <10 hours/week of TV watching (comparison was an intervention that prescribed increasing MVPA to 200 minutes/wk).<sup>69</sup>

The research on activity interventions demonstrate that increasing MVPA is an important behavioral target in weight management, particularly in weight-loss maintenance. Additional research is required to understand if reducing sedentary behavior should also be a behavioral target in obesity treatment interventions.

### Behavior-Change Intervention.

Behavior-change theories and models provide an evidence-based approach for changing energy-balance behaviors that are important for obesity treatment.<sup>71</sup> At this time, it is not known what is the best combination of behavior-change strategies and techniques to apply in treating obesity.<sup>72</sup> Instead, it is believed that a variety of strategies from different behavior change theories can be applied to assist with changing behaviors.<sup>71</sup> Evidence-based interventions for behavior change have developed from behavioral theory, which is a theoretical framework that proposes that with the use of learning principles, such as classical and operant conditioning, healthy behaviors can be learned.

### Cognitive behavioral therapy.

Cognitive behavioral therapy (CBT) uses a directive, action-oriented approach and provides skills to help individuals learn to develop functional thoughts and behaviors.<sup>71</sup> CBT proposes that thoughts, feelings, and behaviors interact to impact health outcomes. Cognitive and behavioral strategies are emphasized to effect change. Commonly used strategies in CBT include self-monitoring, goal setting, problem-solving and preplanning, stimulus control, cognitive restructuring, and relapse prevention. Two widely recognized obesity intervention trials, the Diabetes Prevention Program (DPP) and the Look AHEAD trial, provide examples of the use of CBT in assisting

with changing eating and activity behaviors.<sup>73,74</sup> In DPP, the lifestyle intervention received a reduced-energy diet and a physical activity prescription within the context of a CBT intervention.<sup>74</sup> In DPP, during the 2.8 mean years of follow-up, the lifestyle intervention lost 5.6 kg of weight, which was significantly greater than the other two conditions (placebo=−0.1 kg; metformin=−2.1 kg).<sup>74</sup> As mentioned previously, Look AHEAD produced significant weight-loss outcomes in the condition that received the CBT intervention, with significant weight loss reported across time, even up to 8 years follow-up (lifestyle intervention with CBT=−4.7%±0.2%; education comparison=−2.1%±0.2% of initial weight).<sup>5</sup> The materials for the CBT intervention for both DPP and Look AHEAD are available and accessible to the public (DPP: <https://dppos.bsc.gwu.edu/web/dppos/dpp>; Look AHEAD: [www.lookaheadtrial.org/public/home.cfm](http://www.lookaheadtrial.org/public/home.cfm)). RDNs played a large role in intervention in Look AHEAD.<sup>75</sup>

**Motivational interviewing.** Motivational interviewing focuses on the style of interaction between a practitioner and client. Motivational interviewing emphasizes collaboration, evocation, and autonomy.<sup>76</sup> Collaboration guides practitioners to be “supportive partners” rather than “persuasive experts,” which contrasts with the prescriptive, expert-driven style commonly used in dietary interventions. Evocation encourages the practitioner to draw out the client’s personal motives and values regarding behavior change. Finally, autonomy emphasizes a client’s personal choice, in which the responsibility and decisions about behavior changes fall under the client’s, rather than practitioner’s, control. Motivational interviewing emphasizes that the intervention for obesity would be driven by the client, rather than the practitioner. Using this approach, motivational interviewing is believed to enhance motivation and self-efficacy, which are considered to be key for changing, and sustaining, behavior change.<sup>76</sup> Motivational interviewing has an additional benefit, in that it can be delivered at a low intensity (ie, shorter and less frequent dosages).<sup>77</sup> For example, a review of 10 RCTs examining motivational interviewing and obesity treatment found

that participants receiving a median amount of 60 minutes of motivational interviewing in an encounter, with number of encounters ranging from one to five or more, reduced BMI by 0.72 more so than participants only receiving usual care.<sup>77</sup>

### Acceptance and commitment therapy.

A “third wave” of behavioral therapy has developed, which is based on the use of acceptance-based strategies. These strategies shift the focus from reducing the occurrence of aversive internal thoughts and feelings to being able to experience these thoughts and feelings to assist with promotion of behavior that is congruent with personal values.<sup>78</sup> It is believed that these approaches enhance mindfulness, which can enhance understanding of the personal decision that one makes and reduce mindless behavior.<sup>78</sup> One acceptance-based approach that has recently been examined for improving obesity treatment is Acceptance and Commitment Therapy (ACT). While few RCTs have examined ACT and obesity treatment, ACT appears to produce an amount of weight loss similar to CBT and may produce greater weight loss in those more susceptible to eating cues (eg, have greater food-related thoughts and feelings when exposed to external food cues), disinhibited eating, or emotional eating.<sup>78</sup>

The research on behavior change interventions demonstrates that CBT and motivational interviewing effectively change eating and physical activity behaviors so that meaningful weight loss occurs. However, not all individuals respond to obesity treatment, even when CBT and/or motivational interviewing are implemented; thus, additional strategies, such as ACT, continue to be developed to assist with behavior change in obesity treatment.

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN should incorporate one or more of the following strategies for behavior change: self-monitoring; motivational interviewing; structured meal plans and meal replacements and portion control; goal setting; and problem solving.” (**Rating: Strong, Imperative**)

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN may consider using the following

behavior therapy strategies: cognitive restructuring; contingency management; relapse prevention techniques; slowing the rate of eating; social support; stress management; and stimulus control and cue reduction.” (**Rating: Fair, Imperative**)

**Comprehensive Lifestyle Intervention.** Obesity treatment incorporating a dietary prescription that results in an energy deficit of at least 500 kcal/day, a physical activity prescription of at least 150 minutes of MVPA per week, and a structured behavior-change intervention is classified as a lifestyle intervention.<sup>1</sup> Combining all three components—diet, physical activity, and behavioral strategies—in intervention produces greater weight loss than an intervention that uses these same components singularly. The lifestyle interventions of DPP and Look AHEAD that produced significant weight loss are examples of a comprehensive lifestyle intervention.<sup>73,74</sup>

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN should include the following components as part of a comprehensive weight-management program: reduced-calorie diet, increasing physical activity, use of behavioral strategies.” (**Rating: Strong, Imperative**)

**Intensity of Intervention.** According to the 2013 AHA/ACC/TOS Guideline for the Management of Overweight and Obesity in Adults, frequency of contact appears to be an important characteristic of intervention for weight-loss outcomes.<sup>1</sup> Comprehensive, lifestyle intervention, delivered on site, with face-to-face contact, providing an average of one to two treatment sessions per month (eg, 6 to 12 sessions in 6 months), produces about 2 to 4 kg of weight loss in 6 to 12 months, which is significantly greater than usual care (minimal intervention control group).<sup>1</sup> Comprehensive, lifestyle intervention delivered at a high intensity ( $\geq 14$  sessions in 6 months) produces greater weight loss relative to usual care than the weight loss that occurs with comprehensive, lifestyle intervention delivered at low-to-moderate intensity (eg, intervention delivered in  $\leq 12$  sessions in 6 months) relative to usual care.<sup>1</sup>

**EAL Recommendation:** “For weight loss, the RDN should prescribe at least 14 MNT encounters (either individual or group) over a period of at least 6 months.” (**Rating: Strong, Imperative**)

“For weight maintenance, the RDN should prescribe at least monthly MNT encounters over a period of at least 1 year.” (**Rating: Strong, Imperative**)

**eHealth in Intervention.** Interventions that can be delivered without face-to-face contact with the use of technology are believed to have the capability to decrease intervention costs and increase the reach of the intervention for those who are in need of treatment.<sup>79</sup> The development of efficacious technology-based weight-loss interventions are thought to have the potential for great public health impact.<sup>79</sup>

**Computer-based interventions.** The first modern technology-based intervention developed for weight loss was computer-based programs, in which various aspects of the Internet were used. These programs include those with an intervention website, which provided many different Internet-based features (posted education materials, tracking systems, discussion boards, chat rooms, e-mails), or more e-mail-based programs in which interventionists interacted with participants via e-mail. A Cochrane Review of computer-based programs for weight loss found that for interventions lasting 6 months, computer-based interventions produced greater weight loss than minimal interventions ( $-1.5$  kg).<sup>79</sup> However, face-to-face interventions produced greater weight loss than computer-based interventions ( $-2.1$  kg).<sup>79</sup> Only one study in the review reported the cost-effectiveness ratio, thus conclusions could not be drawn about this aspect of computer-based programs.<sup>79</sup> In agreement with this, the 2013 AHA/ACC/TOS Guidelines state that comprehensive interventions delivered onsite by a trained interventionist produce larger weight loss than comprehensive interventions delivered by the Internet or e-mail.<sup>1</sup>

**Smartphone-based interventions.** Unlike computers, smartphones are usually carried by users everywhere they go and are almost always on. These features of use provide the ability for real-time,

on-demand interaction. Thus, it is believed that smartphones provide the opportunity for frequent and interactive feedback, tailored messaging (via text or e-mails), and immediate access to social support.<sup>80</sup> Interactive applications, “apps,” can assist with decision making on behaviors, as they can provide timely feedback on health behaviors in real time.<sup>80</sup> Smartphones are theorized to have the ability to maintain important components of face-to-face interaction (eg, accountability, feedback, social support) without face-to-face time.<sup>80</sup> As this is a new area of research in weight management, it is not clear at this time how efficacious these programs will be, but it is believed that these types of programs will outperform computer-based interventions.<sup>80</sup>

**Supplements.** In a 2009 systematic review of the efficacy and safety of herbal medicines used for obesity treatment, Hasani-Ranjbar and colleagues<sup>81</sup> reported on weight change and body composition outcomes in 17 RCTs. Compounds containing ephedra, *Cissus quadrangularis*, ginseng, bitter melon, and zingiber were found to be helpful in significantly reducing body weight (summary data were not included in the review); however, supplements containing ephedra and bofutsushosan (an oriental herbal medicine) were found to have some adverse effects. Food-based supplements, such as caffeine, carnitine, calcium, choline, chromium, lecithin, fucoxanthin, garcinia cambogia, capsaicin (cayenne pepper), green tea extracts, kelp, taurine, conjugated linoleic acid, psyllium, pyruvate, leucine, forskolin,  $\beta$ -sitosterol, and tea, have been labeled “fat burners” and have been proposed to increase weight loss by increasing fat metabolism.<sup>82</sup> However, according to Jeukendrup and Randall, only caffeine and green tea have shown enhanced fat oxidation, but the effect of the increased fat oxidation on weight management is not clear. All other proposed food-based supplements lack sufficient evidence of increased fat metabolism at this time.<sup>82</sup> In 2013, Hasani-Ranjbar and colleagues<sup>83</sup> reported on another 33 RCTs using herbal- and food-based supplements and suggested that the efficacy and safety of these supplements is still mostly unknown and long-term RCTs are needed to enhance our understanding of the role of supplements and obesity treatment.

One helpful resource regarding supplements comes from the National Center for Complementary and Alternative Medicine, which houses a variety of fact sheets on a number of herbal- and food-based supplements (<http://nccam.nih.gov/health/atoz.htm>).

**Commercial Programs.** Commercial programs are weight-loss programs that are usually not delivered by a health care provider and can provide various options of types of support for weight loss to consumers. Options can include face-to-face programs, prepackaged food, and Internet-based programs. Little research has been conducted on commercial options for weight loss, but what has been conducted suggests that commercial-based, comprehensive weight-loss interventions delivered in face-to-face formats have produced an average weight loss of 4.8 to 6.6 kg at 6 months when conventional foods are consumed and 6.6 to 10.1 kg at 12 months with use of prepackaged food, and that these weight losses are greater than minimal-treatment control interventions.<sup>1</sup> This suggests that commercial programs that provide comprehensive programs may be a viable option for treatment.

**Medications.** Comprehensive lifestyle interventions are efficacious at producing weight loss, however, there is large variability in the ability to implement and maintain changes recommended in these interventions. For those that have difficulty losing weight (BMI  $\geq 30$  or BMI  $\geq 27$  with obesity-related medical issues, such as high blood pressure, high cholesterol, or type 2 diabetes),<sup>84</sup> medications may be helpful for achieving weight loss. There are three medications for obesity treatment approved for long-term use (up to 2 years).<sup>85</sup>

**Orlistat.** Orlistat is a lipase inhibitor that causes dietary fat to be excreted as oil in the stool and is recommended to be taken with a diet containing 30% fat. The nonprescription dose of orlistat provides approximately 80% of the weight loss seen with the prescription dose. Orlistat is not absorbed to any significant degree and the side effects relate to the fat in the stool, including abdominal cramps, flatus with discharge, oily

spotting, and fecal incontinence. Due to the potential loss of fat-soluble vitamins, orlistat should be taken with a vitamin supplement. A meta-analysis concluded that weight loss with orlistat (60 to 120 mg three times/day) was 2.9 kg greater than placebo at 12 months.<sup>86</sup>

**Lorcaserin.** Lorcaserin is an agonist of the serotonin (5-HT) 2c receptor in the hypothalamus and enhances feelings of satiety. Lorcaserin at a dose of 10 mg twice a day resulted in a 3.3% greater weight loss than placebo.<sup>85</sup> Lorcaserin was well tolerated with side effects in  $>5\%$  reported as headaches, dizziness, fatigue, nausea, dry mouth, and constipation. Lorcaserin is a Drug Enforcement Administration schedule IV drug, with low potential for abuse.<sup>85</sup>

**Phentermine/topiramate.** Phentermine, an appetite suppressant, causes a decrease in food intake by stimulating the release of norepinephrine in the hypothalamus. A controlled-release formulation of phentermine/topiramate, a schedule IV drug, is approved for the treatment of obesity. The dosage begins at a low dose for 14 days (3.75 mg phentermine/23 mg topiramate extended-release once a day), transitions to a mid-dose (double the low dose), and then to a high dose (mid-dose twice a day) if weight loss is not achieved after 12 weeks. If 5% weight loss is still not achieved after 12 weeks on the high dose, the medications should be discontinued. Weight loss was 3.5%, 6.2%, and 9.3% greater than placebo in the low, mid, and high doses, respectively.<sup>87,88</sup> Adverse events occurring in  $>5\%$  of patients include paresthesias, dizziness, dysgeusia, insomnia, constipation, and dry mouth. See the section on sleeve gastrectomy for the EAL recommendation for the use of medication.

**Surgery.** While comprehensive lifestyle interventions are considered the mainstay of all weight-management treatment, for patients who are unable to achieve or maintain weight loss that improves health or for obese patients at high medical risk, adjunctive treatments are needed.<sup>1</sup> Bariatric surgery is an option that is increasingly used in those individuals with extreme obesity, or with those with a lower BMI but with obesity-related comorbid conditions.<sup>1</sup>

**Laparoscopic gastric banding.** The lap-band does not permanently alter the anatomy of the gastrointestinal tract, but instead places a thin, inflatable band around the top of the stomach to create a new and smaller stomach pouch. This surgery requires extensive follow-up to make sure the band is properly adjusted. Ten-year follow-up of lap-band surgery indicates maximum weight loss was about 20% at 1 to 2 years, with maintenance of 15% weight loss at 10 years.<sup>89</sup> Popularity of the lap-band has decreased in the United States, primarily due to inferior weight loss, complexity of follow-up, a lower remission rate to diabetes, and a greater need for reoperation due to complications.

**Gastric bypass.** The bypass, long considered the gold standard obesity operation, permanently alters the anatomy of the gastrointestinal tract. In the bypass, a small pouch is created at the top of the stomach and a part of the small intestine, the jejunum, is attached to a small hole in the pouch. Thus, the surgery allows food to bypass part of the stomach and small intestine. The bypass results in a typical weight loss of 35% at 1 to 2 years, which has been shown to be maintained at 30% weight loss at 10 years.<sup>89</sup> The bypass has the highest mortality rate, rate of complications, and the most severe metabolic abnormalities of the three surgeries. With the bypass, there is greater need for protein, iron and vitamin supplementation, and monitoring of calcium and vitamin D levels.<sup>90</sup>

**Sleeve gastrectomy.** The sleeve, the newest of the three bariatric procedures, permanently alters the anatomy of the stomach because a portion of the stomach is removed, producing a tube-shaped stomach or sleeve, and now has data on more than 5 years of follow-up. The sleeve is gaining in popularity, as it produces similar weight loss and remission of type 2 diabetes (80% of patients with diabetes before surgery are able to control their blood glucose levels 5 years after bariatric surgery)<sup>91</sup> as occurs with the bypass, but at lower cost, with lower rates of complications and mortality.<sup>90,92,93</sup> Metabolic complications with the sleeve are also fewer than with the bypass, however, recommendations still include vitamin

supplementation and monitoring of iron, calcium, and vitamin D levels.

For bariatric surgery, the 2013 AHA/ACC/TOS Guideline states that for individuals who are obese, weight loss at 2 to 3 years after bariatric surgery ranges from 20% to 35% of initial weight, with a greater weight loss of 14% to 37% for bariatric surgery as compared with nonsurgical comparators.<sup>12</sup>

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN should implement MNT and coordinate care with an interdisciplinary team of health professionals (may include specialized RDNs, nurses, nurse practitioners, pharmacists, physicians, physician assistants, physical therapists, psychologists, social workers, and so on) especially for patients with obesity-related comorbid conditions. Coordination of care may include collaboration on use of US Food and Drug Administration–approved weight-loss medications; and appropriateness of bariatric surgery for people who have not achieved weight-loss goals with less invasive weight loss-methods.” **(Rating: Consensus, Imperative)**

**Monitoring and Evaluation.** To determine effectiveness of any intervention implemented, outcomes need to be monitored over time and evaluated for degree of success achieved. See Figure 1 for suggested areas to monitor and evaluate for effectiveness of a comprehensive weight-management program.

**EAL Recommendation:** “The RDN should monitor and evaluate the effectiveness of the comprehensive weight-management program for overweight and obese adults, through the following data: food and nutrition-related history; anthropometric measurements; biochemical data, medical tests, and procedures; and nutrition-focused findings.” **(Rating: Strong, Imperative)**

If weight loss is not occurring at the expected rate, total energy needs may need to be reassessed.

**EAL Recommendation:** “For weight loss and weight maintenance, the RDN should monitor and evaluate total energy needs and consider one of the following (if necessary): re-measure RMR using indirect calorimetry; recalculate Mifflin-St. Jeor equation; or re-apply a new physical activity factor to RMR to estimate total energy needs.” **(Rating: Consensus, Imperative)**

## Community-Level Obesity Intervention

Within the socioecological model framework, community-level obesity interventions focus on utilizing and strengthening existing community assets and capacity in changing energy balance behaviors that can produce weight loss. These types of interventions generally focus on increasing capacity for providing and enhancing access to intervention, with community-based organizations and/or interventionists providing the intervention, and/or altering the community environment to assist with promoting energy-balance behaviors helpful for weight management.

One example of a community-level intervention focusing on increasing capacity for providing and increasing access to intervention is the use of YMCAs as a site for delivering intervention. For example, a comprehensive lifestyle intervention modeled after the DPP delivered to community members at high risk for diabetes by YMCA employees produced 6% weight loss at 6 months.<sup>94</sup> A review of faith-based interventions designed for African-American females, which are implemented in faith-based settings in the community and are also designed to increase capacity for providing and access to intervention, also found significant reductions in anthropometric measures across reviewed studies (for studies reporting change in weight, the range of change in weight was  $-3.6$  to  $-9.8$  lb).<sup>95</sup> Another example that increases capacity and access to intervention and that often has a focus on changing the environment is worksite wellness programs. A review of worksite wellness weight-management programs found that those programs that focused on strategies to increase physical activity and change dietary intake were generally successful at assisting with weight maintenance or producing modest weight loss (for studies reporting change in BMI the range of change was  $-0.14$  to  $-1.4$ ).<sup>96</sup>

For changing the community environment, it is hypothesized that environments with a greater density of fast-food outlets and/or lower density of farmers' markets or other types of markets with fresh produce encourage dietary intakes that are high in energy

density and, thus, contribute to excessive energy intake and obesity.<sup>97</sup> In addition, it is proposed that environments with reduced access for physical activity (few greenways, parks, and sidewalks) produce inactivity, which also contributes to obesity.<sup>98</sup> Most of the research in this area is observational, so it is not clear at this time whether changing these environmental factors will reduce the prevalence of obesity.<sup>98</sup> When communities implement these environmental changes to assist with lowering the prevalence of obesity, a “natural experiment” is created, and evaluation is needed to understand how these environmental changes influence weight.

**EAL Recommendation:** “The RDN should recommend use of community resources, such as local food sources, food assistance programs, support systems, and recreational facilities.” **(Rating: Strong, Imperative)**

## Policy-Level Obesity Intervention

Policy-level obesity interventions are generally framed as interventions developed at the federal, state, or local government level that implement broad changes that are believed to help change energy-balance behaviors that can produce weight loss. The broad changes are designed to influence everyone for whom the policy has been developed. Two policy-level interventions that are believed to be helpful for reducing the prevalence of obesity include menu labeling and taxing the cost of certain foods. Menu labeling is under Section 4205 of the Patient Protection and Affordable Health Care Act ([www.gpo.gov/fdsys/pkg/BILLS-111hr3590enr/pdf/BILLS-111hr3590enr.pdf](http://www.gpo.gov/fdsys/pkg/BILLS-111hr3590enr/pdf/BILLS-111hr3590enr.pdf)). Ideally, consumers can use the labeling information on menus to make choices that could assist with reducing intake, provided they are motivated to do so.<sup>99,100</sup> Menu labeling does seem to influence purchasing decisions that cause a reduction in overall energy purchased in some, but not all, consumers in some types of restaurants.<sup>101</sup> For example, women were found to decrease mean amount of energy per purchase at coffee chain restaurants but men did not, and mean amount of energy per purchase did not decrease in burger and sandwich restaurants.<sup>101</sup> More research is needed to

understand what factors influence purchasing decisions in restaurants for menu labeling to have a broader impact.

Another policy-level intervention gaining momentum is creating a tax that can be levied on unhealthy foods (eg, non-nutrient-dense, energy-dense foods) to help reduce their consumption. The tax could also potentially be combined with a plan to subsidize healthier foods, thus potentially increasing consumption of healthy foods. It is not clear at this time how this type of policy would influence eating behavior and obesity, but the little research conducted in this area suggests that small excise taxes are unlikely to affect obesity rates and that while higher excise taxes are likely to reduce obesity in at-risk populations, higher excise taxes are believed to be less politically palatable or sustainable.<sup>102</sup>

### RESPONSIBILITIES OF FOOD AND NUTRITION PRACTITIONERS

To address obesity, it is believed that interventions are needed that can incorporate multiple levels of the socioecological model that can be sustained for many years.<sup>103</sup> Thus, interventions for obesity need to address changing individual-level energy balance behaviors; be delivered in many settings to increase accessibility to intervention; influence the environment in which clients live, work, and play; and impact on policy that can assist with providing a context for supporting engagement in energy-balance behaviors within the population to improve weight management.

#### Understanding the Socioecological Model

Although obesity is a result of a chronic imbalance of energy intake and energy expenditure, it is now recognized that these individual-level behaviors are influenced by determinants at multiple levels, which enhances understanding that individual choices are shaped by the wider context in which they occur.<sup>103</sup> Thus, ecological models—models that incorporate multiple levels or systems—of health promotion are increasingly promoted to address chronic health conditions.<sup>104</sup> For RDNs to be included in the development,

implementation, and evaluation of these interventions, an understanding of the SEM is required. Interventions with a SEM approach will target change at one or more levels, either directly or indirectly, through multi-level, multisectoral interventions.<sup>104</sup> For example, an intervention designed to reduce overweight and obesity in adults might be developed in which a state enacts a law targeting worksites to ensure that worksite cafeterias provide nutrition information about available food choices to employees and provides financial incentives to companies to encourage the development of worksite wellness programs; a company with several worksites develops a wellness program that screens employees for health risks, refers employees who are overweight or obese to an on-site RDN, and provides financial incentives to employees to encourage improving weight status; and the worksite RDN provides MNT, incorporating employees' individualized needs and preferences, to referred employees and incorporates family members into sessions to assist with changing the home environment and increasing family support. This approach incorporates several levels of the socioecological model, allowing them to intersect, and enhance overall weight-management outcomes. To develop an ecological approach, developing collaborative partnerships among all stakeholders is key<sup>104</sup> and should be encouraged within the field of nutrition.

#### Addressing Health Disparities

The prevalence of overweight and obesity continues to remain higher in non-Hispanic black adults and Hispanic adults, as compared with non-Hispanic white adults, indicating a health disparity.<sup>2</sup> To address these disparities, a greater understanding of the multi-level factors associated with energy balance is needed. While energy balance is influenced by a multitude of individual-level factors (eg, genetics, biology, individual behavior, and individual-level social determinants), research suggests that contextual aspects of social determinants, particularly those related to environmental factors, are important to address, as pervasive socioeconomic and racial

inequalities found within environmental contexts may underlie obesity disparities.<sup>105</sup> This suggests that interventions containing multiple levels of the socioecological model will be more effective at reducing health disparities.

#### Addressing Weight Bias

Individuals with overweight and obesity can encounter weight bias in health care settings by health professionals.<sup>106</sup> Weight bias is demonstrated when health care professionals have beliefs that those with obesity are lazy, noncompliant to intervention, and lack self-control.<sup>106</sup> Those experiencing weight bias from health care professionals are more likely to avoid health screenings, cancel appointments, demonstrate maladaptive eating behaviors, and experience poorer outcomes when receiving treatment for overweight or obesity.<sup>107,108</sup> Thus, RDNs should ensure that health care experiences for individuals with overweight or obesity are free of weight bias. Ensuring that RDNs understand the complex etiology of obesity, thus that there are contributors to obesity that are outside of personal control, and the difficulties around achieving significant, sustainable weight loss, may increase empathy regarding the challenges of obesity treatment and reduce weight bias.<sup>108</sup>

#### Scope of Practice

Integrated ecological-based interventions will provide solutions that cover multiple jurisdictions, requiring a wide range of skills.<sup>103</sup> No one profession will be able to provide all skills required for the development, implementation, and evaluation of these interventions to address obesity. Thus, rather than acting independently, RDNs will need to develop relationships with others to be involved in the SEM approach. These relationships will include traditional health care partners, such as physicians, pharmacists, and psychologists, but also nontraditional partners, such as city planners, architects, and legislators. Within these relationships, the role of the RDN is to provide expertise in the area of nutrition, which includes MNT and related areas, community and public health nutrition, foodservice systems, school

nutrition, and sustainable resilient healthy food and water systems.<sup>109</sup>

### REIMBURSEMENT FOR OBESITY TREATMENT INVOLVING MNT

Reimbursement for MNT provided by RDNs is essential to the field of dietetics.<sup>110</sup> The Patient Protection and Affordable Health Care Act provides coverage for nutrition services in the area of obesity counseling for adults.<sup>111</sup> However, the role of the RDN in providing nutrition services covered by the Patient Protection and Affordable Health Care Act is open to interpretation by those paying for these services.<sup>110</sup> In addition, the Centers for Medicare & Medicaid Services provides coverage for Intensive Behavioral Counseling for Obesity for eligible Medicare beneficiaries.<sup>112</sup> As with Patient Protection and Affordable Health Care Act, the role of the RDN in Intensive Behavioral Counseling for Obesity is not covered. While RDNs are not specifically designated as the sole providers of MNT under these reimbursement strategies, RDNs can provide services and receive reimbursement. Third-party payers use a standardized numeric coding set, and within this system the MNT codes, which include those for obesity, describe the services of RDN. The diagnostic codes are usually determined by the referring physician, as it is not within the scope of practice for a RDN to make a medical diagnosis.<sup>110</sup> However, the exception to this is in the case of BMI codes, as BMI represents a mathematical calculation based on measurements that are within the RDN's scope of practice to perform.<sup>113</sup> In a recent survey of coding practices of RDNs collected by the Academy, of those RDNs who completed the survey, obesity was the second highest disease or condition from which reimbursement was received from third-party payers.<sup>110</sup> Only diabetes was ranked higher than obesity for receiving reimbursement from third-party players from responding RDNs.<sup>110</sup>

### ROLE OF THE RDN AND NUTRITION AND DIETETICS TECHNICIAN, REGISTERED, IN TREATMENT OF OVERWEIGHT AND OBESITY IN ADULTS

Changing dietary intake so that a reduction in energy intake occurs is a

key component of obesity treatment.<sup>1</sup> Thus, the expertise of the RDN and nutrition and dietetics technician, registered (NDTR) is essential for the development, implementation, and evaluation of any intervention designed to reduce overweight and obesity.

#### MNT

The Academy's definition of MNT is broader than other entities.<sup>114</sup> MNT, as defined by the Academy, is an individualized approach to disease management that incorporates the nutrition care process and is provided by an RDN.<sup>114</sup> Thus, when treatment for overweight and obesity is being delivered at the individual level, the role of the RDN, along with the NDTR, is to provide evidence-based intervention that incorporates the nutrition care process.

#### Multidisciplinary Teams

As stated earlier, interventions for overweight and obesity that incorporate any level of the socioecological model will require an intervention that includes more than just a focus on dietary intake. A multidisciplinary approach to disease treatment, especially in the case of obesity and chronic disease, is recommended.<sup>115</sup> The type of intervention will designate what other disciplines should be involved, and what other training an RDN and NDTR may benefit from.

#### Medicare and Intensive Behavioral Counseling

The Centers for Medicare & Medicaid Services approved the provision of intensive behavioral counseling for obesity when delivered by qualified primary care and other select practitioners.<sup>112</sup> Intensive behavioral counseling includes a maximum of 22 face-to-face sessions over 12 months, but a weight-loss goal of 3 kg must be met by 6 months in order for counseling sessions to continue to 12 months. Frequency of contact is one face-to-face visit every week for the first month, one face-to-face visit every other week for months 2 to 6, and one face-to-face visit every month for months 7 to 12 if the weight-loss goal has been met. Each visit is to include the five As approach adopted by the US Preventive Services

Task Force. The five As are: 1) assess: ask about behavioral health risk(s) and factors affecting choice of behavior change goals or methods; 2) advise: provide specific and personalized behavior change advice; 3) agree: collaboratively select appropriate treatment goals and methods that take into account the client's values and motivation to changes; 4) assist: aid the client in achieving goals by incorporating behavior change techniques, supplemented with adjunctive medical treatments when appropriate; and 5) arrange: schedule follow-up sessions so that ongoing assistant and support can be provided.

While RDNs are not specifically outlined as a practitioner for delivery of intensive behavioral counseling, if an RDN provides care under conditions specified under the regulation, services can be billed by the one of the specified providers. RDNs developing relationships with the specified providers (general practice, family practice, internal medicine, obstetrics/gynecology, pediatric medicine, geriatric medicine, nurse practitioner, certified clinical nurse specialist, and physician assistant) may create avenues for RDNs to provide treatment for obesity that is reimbursed.

Wadden and colleagues<sup>116</sup> conducted a systematic review of behavioral counseling for overweight and obese primary care patients from RCTs published between 1980 and 2014, finding no studies in which primary care practitioners delivered counseling that followed the Centers for Medicare & Medicaid Services guidelines. However, the investigators found that trained interventionists (eg, those trained in lifestyle intervention, which included RDNs) succeeded in producing weight loss within patients from primary care.

#### Advocacy

To address the obesity epidemic, interventions need to include larger environmental and policy changes, or public health initiatives, that will provide opportunities to support and behaviors that assist with weight management.<sup>117</sup> These types of strategies have shown previous success at addressing public health concerns (eg, reducing smoking, increasing seat belt use).<sup>118</sup> To develop these strategies, advocacy from RDNs and NDTRs is

required. One advocacy effort in the area of obesity that is particularly focused on nutrition is having accessible healthy and affordable foods, which is especially important to address health disparities.<sup>119</sup> To assist RDNs and NDTRs with advocacy, the Academy has developed the Grassroots Manager. The Grassroots Manager assists RDNs with communicating with their legislators, elected officials, and others who may have the ability to influence policy and legislation that can assist with reducing obesity.

### Outcome Data

The role of diet in obesity treatment is established. However, the role of food and nutrition practitioners in obesity treatment is not well documented, thus the need to include an RDN and NDTR in planning or implementing obesity treatment is not clear to all stakeholders. RDNs and NDTRs can assist with documenting the importance of their role in obesity treatment by collecting outcomes related to dietary change and health status. Comparison of outcomes can be made between interventions including RDNs and those not, and with the relationship between frequency of contact with RDNs and outcomes. Thus, to support establishing the role of RDNs and NDTRs in obesity treatment, all practitioners are encouraged to collect and examine outcomes data. To help increase capacity in this effort, RDNs and NDTRs are encouraged to develop partnerships with others that may have skills that are needed in documenting the importance of the RDN in obesity treatment.

### CONCLUSIONS

The high prevalence of overweight and obesity in the United States negatively affects the health of the population, thus reducing the prevalence of overweight and obesity is considered to be a public health priority.<sup>4</sup> Weight loss of only 3% to 5% that is maintained has the ability to produce clinically relevant health improvement, with larger amounts of weight loss reducing additional risk factors for CVD. Successful treatment of overweight and obesity in adults requires the ability of adopting and maintaining lifestyle behaviors, which contribute to both sides of the energy-balance equation. Lifestyle

behaviors are influenced by several factors at differing levels of the socioecological model, which include factors at the intrapersonal, community and organizational, and government and public level.<sup>18</sup> To address obesity, it is proposed that several factors at differing levels need to be targeted to assist with the development and maintenance of behaviors that are necessary for weight loss and successful weight-loss maintenance.<sup>18</sup> The RDN and NDTR, as part of a multidisciplinary team, need to be current and skilled in weight management to effectively assist and lead efforts that can reduce the obesity epidemic. Due to the many factors and levels of the socioecological model that need to be addressed, these teams will include traditional health care partners, but also nontraditional partners. Within these relationships the role of the RDN is to provide expertise in the area of nutrition, which includes MNT and related areas, community and public health nutrition, foodservice systems, school nutrition, and sustainable resilient healthy food and water systems.<sup>109</sup>

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# 成人肥胖食养指南 (2024 年版)

国家卫生健康委办公厅

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# 成人肥胖食养指南

## 一、前言

肥胖是一种慢性代谢性疾病，近些年来，全球超重和肥胖率正快速增长，已成为威胁人类健康的严重问题。根据《中国居民营养与慢性病状况报告（2020年）》显示，我国18岁及以上居民超重率、肥胖率分别为34.3%、16.4%，其中18~44岁、45~59岁和60岁及以上居民肥胖率分别为16.4%、18.3%和13.6%，我国居民肥胖率呈上升趋势。肥胖不但导致较高的过早死亡风险，还与各种慢性非传染性疾病的发生相关，包括2型糖尿病、脑卒中、冠心病、高血压、呼吸系统疾病、骨关节炎和胆结石等。肥胖甚至还与多种肿瘤的发生相关。2019年全国11.98%的心血管疾病死亡归因于高体质指数（BMI），死亡人数为54.95万。肥胖的流行以其高昂的医疗费用为国民经济带来了沉重的负担。有研究预测，到2030年我国成年人超重肥胖率可达65.3%，归因于超重肥胖的医疗费用可能为4180亿元人民币，约占全国医疗费用总额的21.5%，未来中国城乡居民超重肥胖率及其所造成的经济负担将呈上升趋势。因此，肥胖防控已刻不容缓。

肥胖的发生虽然受遗传、环境和社会文化等因素共同影响，但根本原因是机体的能量摄入大于能量消耗，从而导致多余的能量以脂肪的形式在体内贮存。膳食营养和身体活动是肥胖防治的两大重要影响因素。减肥关键三分靠动，七分靠吃。以“辨证施膳”为核心的中医食养是在中医辨证施治

指导下的非药物调养方法，强调根据体质、病因、病机、证候，给予不同食养方案，具有调和气血、平衡人体阴阳、辅助疾病防治的作用。针对肥胖患者的不同体质，选取不同特性的食物或食药物质，有助于达到减重效果，维持健康体重。

为预防和控制我国人群肥胖的发生发展，改善肥胖患者的体重，调整日常膳食结构，提高居民营养健康水平，发展传统食养服务，根据《健康中国行动（2019—2030年）》和《国民营养计划（2017—2030年）》相关要求，制定本指南。本指南以食养为基础，依据现代营养学理论和相关证据，以及我国传统医学的理论和调养方案，提出具有多学科优势互补的成人肥胖患者食养基本原则和食谱示例。本指南主要面向基层卫生工作者（包括营养指导人员）、无合并症和并发症的成人肥胖患者，为肥胖防控提供食养指导。肥胖合并其他急性或慢性病的患者或有并发症者，在医生或营养指导人员等专业人员的指导下，也可参考本指南，根据患者具体情况设计个性化食养方案。

## **二、疾病特点与分型**

### **（一）肥胖定义与判定。**

肥胖是人体脂肪积聚过多达到危害健康程度的一种慢性代谢性疾病，是因能量摄入超过能量消耗或机体代谢改变而导致体重过度增长的一种状态。根据肥胖病因及发病机制分为单纯性肥胖和继发性肥胖。无明显内分泌、代谢病病因可寻者为单纯性肥胖；继发于神经-内分泌-代谢紊乱基础上的肥胖症为继发性肥胖。体质指数（BMI）和腰围（WC）是

常用判断超重和肥胖程度的指标。我国健康成年人的 BMI 正常范围为  $18.5\text{kg/m}^2 \leq \text{BMI} < 24.0\text{kg/m}^2$ ， $24.0\text{kg/m}^2 \leq \text{BMI} < 28.0\text{kg/m}^2$  为超重， $\text{BMI} \geq 28.0\text{kg/m}^2$  为肥胖， $\text{BMI} < 18.5\text{kg/m}^2$  为体重过低。 $85\text{cm} \leq$  成年男性 WC  $< 90\text{cm}$ ， $80\text{cm} \leq$  成年女性 WC  $< 85\text{cm}$  可判断为中心型肥胖前期；成年男性 WC  $\geq 90\text{cm}$ ，成年女性 WC  $\geq 85\text{cm}$  可判断为中心型肥胖。

## （二）中医对肥胖的认识及分型。

中医学将肥胖归属于“脂人”“膏人”“肥人”等范畴，记载最早见于《黄帝内经》，《灵枢·卫气失常》篇将人之肥瘦分为“有肥、有膏、有肉”，肥胖病因多与年龄、体质、饮食、情志、劳逸因素有关。中医认为，肥胖属本虚标实证，辨证涉及痰、湿、热等病理因素，常兼夹痰湿、血瘀、气郁等标实之证，其病位多在脾胃，与肾气虚关系密切，并可涉及五脏。常见辨证分型及临床表现如下：

**胃热火郁证：**肥胖多食，消谷善饥，大便不爽，甚或干结，尿黄，或有口干口苦，喜饮水，舌质红，苔黄，脉数。

**痰湿内盛证：**形体肥胖，身体沉重，肢体困倦，脘痞胸满，可伴头晕，口干而不欲饮，大便黏滞不爽，嗜食肥甘醇酒，喜卧懒动，舌质淡胖或大，苔白腻或白滑，脉滑。

**气郁血瘀证：**肥胖懒动，喜太息，胸闷胁满，面晦唇暗，肢端色泽不鲜，甚或青紫，可伴便干，失眠，男子性欲下降甚至阳痿，女子月经不调、量少甚或闭经，经血色暗或有血块，舌质暗或有瘀斑瘀点，舌苔薄，脉弦或涩。

**脾虚不运证：**肥胖臃肿，神疲乏力，身体困重，脘腹痞

闷，或有四肢轻度浮肿，晨轻暮重，劳则尤甚，饮食如常或偏少，既往多有暴饮暴食史，小便不利，大便溏或便秘，舌质淡胖，边有齿印，苔薄白或白腻，脉濡细。

**脾肾阳虚证：**形体肥胖，易于疲劳，四肢不温，甚或四肢厥冷，喜食热饮，小便清长，舌淡胖，舌苔薄白，脉沉细。

### 三、食养原则和建议

根据营养科学理论、中医理论和目前膳食相关肥胖科学研究文献证据，在专家组共同讨论、建立共识的基础上，对成人肥胖患者的日常食养提出 6 条原则和建议。包括：1. 控制总能量摄入，保持合理膳食。2. 少吃高能量食物，饮食清淡，限制饮酒。3. 纠正不良饮食行为，科学进餐。4. 多动少静，睡眠充足，作息规律。5. 食养有道，合理选择食药物质。6. 安全减重，达到并保持健康体重。

## 成人肥胖食养原则和建议



### （一）控制总能量摄入，保持合理膳食。

控制总能量摄入和保持合理膳食是体重管理的关键。控制总能量摄入，可基于不同人群每天的能量需要量（表1），推荐每日能量摄入平均降低30%~50%或降低500~1000kcal，或推荐每日能量摄入男性1200~1500kcal、女性1000~1200kcal的限能量平衡膳食；另一方面也可根据不同个体基础代谢率和身体活动相应的实际能量需要量，分别给予超重和肥胖个体85%和80%的摄入标准，以达到能量负平衡，同时能满足能量摄入高于人体基础代谢率的基本需求，帮助减重、减少体脂。临床上还可根据身高（cm）-105计算出理想体重（kg），再乘以能量系数15~35kcal/kg（一般卧床者15kcal/kg、轻身体活动者20~25kcal/kg、中身体活动者30kcal/kg、重身体活动者35kcal/kg），计算成人个体化的

一日能量。以上方法可根据实际需要任选其一用来指导超重肥胖患者膳食，达到控制总能量摄入的目标。

合理膳食应在控制总能量摄入的同时保障食物摄入多样化和平衡膳食，保证营养素的充足摄入，必要时补充复合营养素补充剂。三大宏量营养素的供能比分别为脂肪 20%~30%，蛋白质 15%~20%，碳水化合物 50%~60%。一日三餐合理分配饮食，推荐早中晚三餐供能比为 3:4:3。鼓励主食以全谷物为主，至少占谷物的一半，适当增加粗粮并减少精白米面摄入；保障足量的新鲜蔬果摄入，蔬菜水果品种多样化，但要减少高糖水果及高淀粉含量蔬菜的摄入；动物性食物应优先选择脂肪含量低的食材，如瘦肉、去皮鸡胸肉、鱼虾等；应优先选择低脂或脱脂奶类。

必要时，可在医生或营养指导人员等专业人员指导下，选用高蛋白膳食、低碳水化合物膳食、间歇式断食膳食或营养代餐等其他膳食减重干预措施，具体方法可参考《中国超重/肥胖医学营养治疗指南（2021）》及《中国居民肥胖防治专家共识》。

表 1 中国居民成人膳食能量需要量(单位: kcal/d)

|      | 低强度身体活动水平 | 中等强度身体活动水平 | 高强度身体活动水平 |
|------|-----------|------------|-----------|
| 成年男性 | 1950~2150 | 2400~2550  | 2800~3000 |
| 成年女性 | 1600~1700 | 1950~2100  | 2300~2450 |

注：摘自《中国居民膳食营养素参考摄入量 2023 版》

（二）少吃高能量食物，饮食清淡，限制饮酒。

高能量食物通常是指提供 400kcal/100g 以上能量的食物，如油炸食品、含糖烘焙糕点、糖果、肥肉等；全谷物、

蔬菜和水果一般为低能量食物。经常摄入高能量食物与体重增加及肥胖有关，减少高能量食物摄入有助于控制膳食总能量。因此，减重期间应少吃高能量食物，多吃富含膳食纤维的食物，如全谷物食物、蔬菜等。

减重期间饮食要清淡，严格控制脂肪/油、盐、添加糖的摄入量，每天食盐摄入量不超过 5g，烹调油不超过 20~25g，添加糖的摄入量最好控制 25g 以下。首先，应减少烹饪过程中烹调油、盐、糖用量，多选用蒸、煮、熘及水滑等烹调方式，少油煎炸，并减少高脂肪食物用量。其次，采购时主动阅读食品的营养标签，选择脂肪、碳水化合物和（或）糖、钠含量低的食物，尽量不选或少选油炸食品、加工肉制品、含糖烘焙糕点、蜜饯、糖果、冰淇淋及含糖饮料等。

每克酒精可产生约 7kcal 能量，远高于同质量的碳水化合物和蛋白质产生的能量值。酒精除可以带来能量以外，其他对人体有用的营养素含量极少。因此，在减重期间应严格限制饮酒。

### （三）纠正不良饮食行为，科学进餐。

科学选择，进餐规律，定时定量，养成良好饮食行为是维持健康体重的基础。在控制总能量摄入的基础上保持一日三餐的时间相对固定，定时定量规律进餐，可避免过度饥饿引起的饱食中枢反应迟缓而导致进食过量。重视早餐，不漏餐，晚餐勿过晚进食，建议在 17:00~19:00 进食晚餐，晚餐后不宜再进食任何食物，但可以饮水。如饮水后仍饥饿难忍或有低血糖风险者，可以适当选择进食少许低能量高膳食

纤维食物。

不暴饮暴食，控制随意进食零食、饮料，避免夜宵。不论在家或在外就餐，都应根据个人的生理条件和身体活动量，力求做到饮食有节制、科学搭配，进行标准化、定量的营养配餐，合理计划每日餐次和能量分配来安排全天膳食。进餐宜细嚼慢咽，摄入同样食物，细嚼慢咽有利于减少总食量。另外，减缓进餐速度可以增加饱腹感，降低饥饿感。适当改变进餐顺序也是一种简单、易行、有效的减重方法。按照蔬菜-肉类-主食的顺序进餐，也有助于减少高能量食物的进食量。

#### （四）多动少静，睡眠充足，作息规律。

身体活动不足或缺乏和久坐的静态生活方式是肥胖发生的重要原因。身体活动通过增加能量消耗，调节机体脂肪、蛋白质和碳水化合物代谢，养成不易发胖的体质等途径达到减重效果。肥胖患者减重的运动原则是中低强度有氧运动为主，抗阻运动为辅。每周进行 150~300 分钟中等强度的有氧运动，每周 5~7 天，至少隔天运动 1 次；抗阻运动每周 2~3 天，隔天 1 次，每次 10~20 分钟。每周通过运动消耗能量 2000kcal 或以上。减重过程是重塑良好生活方式的过程。首先要培养兴趣，把运动变为习惯。应当认识到运动是一个减重、改善健康的机会，而不是浪费时间。通过增加日常身体活动、有计划安排运动，循序渐进，逐渐增进运动量，达到每周的建议量。运动减重贵在坚持，选择和培养自己喜欢的运动方式，持之以恒，把天天运动融入日常生活。尽可能减

少静坐和被动视屏时间，每天静坐和被动视屏时间要控制在2~4小时以内。对于长期静坐或伏案工作者，每小时要起来活动3~5分钟。

经常熬夜、睡眠不足、作息无规律可引起内分泌紊乱，脂肪代谢异常，增加肥胖风险，导致“过劳肥”。肥胖患者应按昼夜生物节律，保证每日7小时左右的睡眠时间，建议在夜里11点之前上床睡觉。

#### （五）食养有道，合理选择食药物质。

遵循“药食同源”理论，结合中医辨证分型论治，胃热火郁证采用具有清胃热、消导滞作用的食药物质，如铁皮石斛、麦芽等；痰湿内盛证采用化痰消滞作用的食药物质，如薏苡仁、橘皮、砂仁等；气郁血瘀证采用理气化瘀作用的食药物质，如橘皮、山楂、当归等；脾虚不运证采用健脾益气作用的食药物质，如茯苓、山药、莲子等；脾肾阳虚证采用温阳补虚作用的食药物质，如小茴香、山药、肉桂等。

#### （六）安全减重，达到并保持健康体重。

科学减重需遵照循序渐进的原则，使大脑思维、体脂肪、肌肉和各个器官适应新能量状态，逐步达到新平衡。减重速度并非越快越好，过快的减重速度易对机体器官组织造成损伤，甚至危及生命。短期内快速减重，体重的降低主要是由于机体水分的丢失而非脂肪组织的减少，一旦恢复正常饮食，身体为了维持正常运作，将重新补充水分，体重会快速反弹。孕妇、乳母、老年人及患有慢性代谢性疾病的人群，应在医生或营养指导人员等专业人员的指导下科学减重，避免不合

理的减重对健康造成损害。

较为理想的减重目标应该是 6 个月内减少当前体重的 5%~10%，合理的减重速度为每月减 2~4kg。减重速度因人而异，一般分为 3 种情况：第一种是体重平稳下降，每周减 0.5~1kg；第二种是减重初期的 1~2 个月体重无明显变化，之后体重才开始下降，而且下降速度较快；第三种是体重最初下降较快，可达每周下降 1~2kg，随后体重停止下降，进入为期数周甚至数月的平台期，突破平台期后体重继续下降。

为避免减重速度过快对机体造成损害，同时也增加减重者的信心，建议在减重初始时设立体重减轻约每周 0.5kg 的目标，但随着机体非脂肪组织的减少，机体对能量变化的反应减弱，需要增加能量消耗或进一步限制能量摄入来继续减轻体重。

在减重过程中应注意自我监测，不仅包括对体重变化的监测，还应包含食物摄入量以及身体活动情况的监测。自我监测可以提高减重者对减重行为的自我意识，从而有助于减重计划的维持和成功。同时，减重的过程中不只要关注体重的变化，更要关注体脂率和肌肉量的变化，做到减少肌肉的流失，维持机体的肌肉量和基础代谢率。减重者应清楚地了解减重的过程和机体正常的生理变化，循序渐进，逐步减至正常体重。

## 附录 1

# 成人肥胖患者的食物选择

### 一、食物选择

科学合理选择食物，对于成功减重来说至关重要。减重过程中在控制总能量摄入的基础上，应注意食物选择的多样化与合理化，保证平衡膳食。

#### （一）谷薯类的选择。

谷薯类对于机体健康而言至关重要，建议每日总摄入量在 150 ~ 300g。全谷物是碳水化合物、膳食纤维和 B 族维生素的重要来源，增加全谷物摄入有助于维持正常体重，延缓体重增长，还可降低全因死亡、2 型糖尿病、心血管疾病、结直肠癌等的风险。全谷类和杂豆可以提供更多的 B 族维生素、矿物质、膳食纤维等营养成分，对控制肥胖具有重要作用。建议肥胖患者每日摄入全谷物和杂豆 50 ~ 150g，如营养素密度较高的黑米、玉米等。在主食的选择上要粗细搭配，避免长期单纯地摄入粗粮或细粮。薯类含有丰富的淀粉、膳食纤维，并含有维生素和矿物质，建议肥胖患者每天摄入薯类 50 ~ 100g。

#### （二）蔬菜和水果类的选择。

减重人群应增加每日新鲜蔬菜摄入量，要保证 300 ~ 500g（生重）甚至更多，其中深色蔬菜的摄入量应占 1/2 以上。深色蔬菜指深绿色、橘红色和紫红色蔬菜等，具有营养优势，尤其是其富含的  $\beta$ -胡萝卜素，是膳食维生素 A 的主

要来源。深绿色蔬菜有菠菜、油菜等；橘红色蔬菜如胡萝卜、西红柿；紫红色菜如紫甘蓝、红苋菜等。蔬菜的种类有上千种，含有的营养素和植物化学物种类也各不相同，因此挑选和购买蔬菜时要多变换，每天至少达到 3~5 种。建议每天食用水果宜在 200g 左右，同时减少高糖分水果的食用，如榴莲、香蕉、荔枝、鲜枣等，且不宜饮用果汁。

### （三）肉类、水产品 and 蛋类的选择。

减重期间适宜选择高蛋白、低脂肪的肉类和水产品。作为优质蛋白质来源的鱼虾蟹贝等水产品的脂肪含量较低，且含有较多的不饱和脂肪酸，建议每周至少食用 2 次或者一周总量吃够 280~525g，相当于每天摄入量为 40~75g。以猪牛羊鸡为代表的畜禽肉，建议每周不要超过 500g，大概每天不超过 70g。猪、牛、羊肉要选择纯瘦肉。建议不要完全不吃红肉，避免发生贫血。蛋类摄入量要保证每周 280~350g（≤7 个鸡蛋）。

### （四）奶豆类的选择。

推荐减重期间每天喝低脂或脱脂牛奶 300~500mL。有乳糖不耐受的减重者可以选择无添加糖的低脂酸奶或无乳糖产品。如饮奶不足，注意增加优质蛋白质和钙的摄入。

减重期间适宜选择豆腐、不加糖的豆浆和豆腐脑等豆制品，每天摄入大豆 15~25g，避免选择油炸类以及含盐较高的豆制品。

### （五）坚果类的选择。

坚果属于高能量食物，但含有较高水平的不饱和脂肪酸、

维生素 E 等营养素，故适量摄入有益健康，但其能量应该计入一日三餐的总能量之中。推荐每周平均 50 ~ 70g（平均每天 10g 左右），首选原味坚果。如果摄入过多，应减少一日三餐中其他食物摄入量。

此外，减重人群还要警惕食物中那些“看不见”的脂肪。很多人认为烹调用油是膳食脂肪的唯一来源，其实日常食用的很多食物中都含有脂肪，却常常容易被忽视。肉类、动物内脏、坚果中均含有较多“看不见”的脂肪。这些“看不见”的脂肪容易导致膳食脂肪过量摄入，进而造成肥胖。

总之，减重期间应注意选择适宜的食物，控制不利于减重且有损健康的食物摄入，最终实现既维护机体健康，又能将体重减至理想水平的目标。

表 1.1 各类食物选择举例

| 分类  | 优选食物                                | 限量食物                                           | 不宜食物                                                             |
|-----|-------------------------------------|------------------------------------------------|------------------------------------------------------------------|
| 谷薯类 | 蒸煮烹饪、粗细搭配的杂米饭、杂粮面等                  | 精白米面类、粉丝、年糕等                                   | 高油烹饪及加工的谷薯类，如油条、炸薯条、方便面、干脆面、面制辣条等；添加糖、奶油、黄油的点心，如奶油蛋糕、黄油面包、奶油爆米花等 |
| 蔬菜类 | 叶菜类、瓜茄类、鲜豆类、花芽类、菌藻类等                | 部分高淀粉含量的蔬菜，如莲藕等                                | 高油、盐、糖烹饪及加工的蔬菜，如炸藕夹、油焖茄子、油炸的果蔬脆等                                 |
| 水果类 | 绝大部分浆果类、核果类、瓜果类等水果，如柚子、蓝莓、草莓、苹果、樱桃等 | 含糖量比较高的水果，如冬枣、山楂、榴莲、香蕉、荔枝、甘蔗、龙眼、芒果等            | 各类高糖分的水果罐头、果脯等                                                   |
| 畜禽类 | 畜类脂肪含量低的部位，如里脊、腱子肉等；少脂禽类，如胸脯肉、去皮腿肉等 | 畜类脂肪含量相对高的部位，如牛排、小排、肩部肉等；带皮禽类；较多油、盐、糖烹饪及加工的畜禽类 | 畜类脂肪含量高的部位，如肥肉、五花肉、蹄膀、牛腩等；富含油脂的内脏，如大肠、肥鹅肝等；高油、盐、糖烹饪及加工的畜禽类       |

|     |                          |                          |                                      |
|-----|--------------------------|--------------------------|--------------------------------------|
| 水产类 | 绝大部分清蒸或水煮水产类             | 较多油、盐、糖等烹饪的水产类，如煎带鱼、糖醋鱼等 | 蟹黄和（或）蟹膏等富含脂肪和胆固醇的水产部位；油炸、腌制的水产类及其制品 |
| 豆类  | 大豆和杂豆制品，如豆腐、无糖豆浆等        | 添加少量糖和（或）油的豆制品等          | 油、盐、糖含量高的加工豆制品，如兰花豆、油炸豆腐、豆腐乳、豆制辣条    |
| 蛋乳类 | 蒸煮蛋类、脱脂及低脂乳制品，如脱脂牛奶、无糖酸奶 | 少油煎蛋、含少量添加糖的乳制品          | 含有大量添加糖的乳制品                          |
| 饮料类 | 白水、淡茶水等                  | 不加糖的鲜榨果汁                 | 含糖及甜味饮料、加入植脂末或糖的奶茶、果汁饮料              |
| 坚果类 | 无添加油、盐、糖的原味坚果            | 添加少量油、盐、糖调味的坚果           | 添加大量油、盐、糖等调味的坚果                      |

## 二、不同证型食药物质推荐

表 1.2 成人肥胖不同证型食药物质推荐

| 中医证型  | 食药物质                        | 备注                                                                      |
|-------|-----------------------------|-------------------------------------------------------------------------|
| 胃热火郁证 | 铁皮石斛、麦芽、鲜芦根、荷叶              | 1. 在限定使用范围和剂量内作为食药物质；<br>2. 食用方法请咨询医生、营养指导人员等专业人员；<br>3. †仅作为香辛料和调味品使用。 |
| 痰湿内盛证 | 砂仁、芡实、党参、白扁豆、茯苓、山药、莲子、薏苡仁   |                                                                         |
| 气郁血瘀证 | 当归†、桃仁、佛手、砂仁、山楂             |                                                                         |
| 脾虚不运证 | 山药、莲子、白扁豆、黄芪、麦芽、砂仁、茯苓、木瓜、大枣 |                                                                         |
| 脾肾阳虚证 | 山药、黄芪、肉桂、干姜                 |                                                                         |

附录 2

常见食物交换表

表 2.1 ~ 2.6 根据中国营养学会发布的《食物交换份》(T/CNSS 020—2023)，列举了 6 类食物的换算量，使用者可参考食物交换表和食谱示例，相互交换、合理搭配。

表 2.1 谷薯杂豆类食物交换表（/份）

| 食物种类               |     | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例                            |
|--------------------|-----|-----------|--------------|------------|-----------|--------------|---------------------------------|
|                    |     |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                                 |
| 谷物（初级农产品）          |     | 25        | 90           | 2.5        | 0.5       | 19.0         | 大米、面粉、玉米面、杂粮等（干、生、非加工类制品）       |
| 主食制品               | 面制品 | 35        | 90           | 2.5        | 0.4       | 18.0         | 馒头、花卷、大饼、烧饼、面条（湿）、面包等           |
|                    | 米饭  | 75        | 90           | 2.0        | 0.2       | 19.4         | 粳米饭，籼米饭等                        |
| 全谷物                |     | 25        | 90           | 2.5        | 0.7       | 18.0         | 糙米、全麦、玉米粒（干）、高粱、小米、荞麦、黄米、燕麦、青稞等 |
| 杂豆类                |     | 25        | 90           | 5.5        | 0.5       | 15.0         | 绿豆、赤小豆、芸豆、蚕豆、豌豆、眉豆等             |
| 粉条、粉丝、淀粉类          |     | 25        | 90           | 0.3        | 0.0       | 21.2         | 粉条、粉丝、团粉、玉米淀粉等                  |
| 糕点和油炸类             |     | 20        | 90           | 1.4        | 2.6       | 13.0         | 蛋糕、江米条、油条、油饼等                   |
| 薯芋类*               |     | 100       | 90           | 1.9        | 0.2       | 20.0         | 马铃薯、甘薯、木薯、山药、芋头、大薯、豆薯等          |
| *每份薯芋类食品的质量为可食部质量。 |     |           |              |            |           |              |                                 |

表 2.2 蔬菜类食物交换表<sup>a</sup>（/份）

| 食物种类                                                                                                                                                           |                 | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|--------------|------------|-----------|--------------|-------------------------------|
|                                                                                                                                                                |                 |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                               |
| 蔬菜类（综合） <sup>b</sup>                                                                                                                                           |                 | 250       | 90           | 4.5        | 0.7       | 16.0         | 所有常见蔬菜（不包含干、腌制、罐头类制品）         |
| 嫩茎叶花菜类                                                                                                                                                         | 深色 <sup>c</sup> | 300       | 90           | 7.3        | 1.2       | 14.0         | 油菜、芹菜、乌菜、菠菜、鸡毛菜、香菜、萝卜缨、茴香、苋菜等 |
|                                                                                                                                                                | 浅色              | 330       | 90           | 7.2        | 0.5       | 14.2         | 大白菜、奶白菜、圆白菜、娃娃菜、菜花、白笋、竹笋等     |
| 茄果类                                                                                                                                                            |                 | 375       | 90           | 3.8        | 0.7       | 18.0         | 茄子、西红柿、柿子椒、辣椒、西葫芦、黄瓜、丝瓜、南瓜等   |
| 根茎类                                                                                                                                                            |                 | 300       | 90           | 3.2        | 0.5       | 19.2         | 红萝卜、白萝卜、胡萝卜、水萝卜等（不包括马铃薯、芋头）   |
| 蘑菇类                                                                                                                                                            | 鲜               | 275       | 90           | 7.6        | 0.6       | 14.0         | 香菇、草菇、平菇、白蘑、金针菇、牛肝菌等鲜蘑菇       |
|                                                                                                                                                                | 干               | 30        | 90           | 6.6        | 0.8       | 17.0         | 香菇、木耳、茶树菇、榛蘑等干制品              |
| 鲜豆类                                                                                                                                                            |                 | 250       | 90           | 6.3        | 0.7       | 15.4         | 豇豆、扁豆、四季豆、刀豆等                 |
| <sup>a</sup> 表中给出的每份食品质量均为可食部质量。<br><sup>b</sup> 如果难以区分蔬菜种类（如混合蔬菜），可按照蔬菜类（综合）的质量进行搭配。<br><sup>c</sup> 深色嫩茎叶花菜类特指胡萝卜素含量 $\geq 300 \mu\text{g}/100\text{g}$ 的蔬菜。 |                 |           |              |            |           |              |                               |

表 2.3 水果类食物交换表<sup>a</sup>（/份）

| 食物种类                                              | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例                          |
|---------------------------------------------------|-----------|--------------|------------|-----------|--------------|-------------------------------|
|                                                   |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                               |
| 水果类（综合） <sup>b</sup>                              | 150       | 90           | 1.0        | 0.6       | 20.0         | 常见新鲜水果（不包括干制、糖渍、罐头类制品）        |
| 柑橘类                                               | 200       | 90           | 1.7        | 0.6       | 20.0         | 橘子、橙子、柚子、柠檬                   |
| 仁果、核果、瓜果类                                         | 175       | 90           | 0.8        | 0.4       | 21.0         | 苹果、梨、桃、李子、杏、樱桃、甜瓜、西瓜、黄金瓜、哈密瓜等 |
| 浆果类                                               | 150       | 90           | 1.4        | 0.5       | 20.0         | 葡萄、石榴、柿子、桑椹、草莓、无花果、猕猴桃等       |
| 枣和热带水果类                                           | 75        | 90           | 1.1        | 1.1       | 18.0         | 各类鲜枣、芒果、荔枝、桂圆、菠萝、香蕉、榴莲、火龙果等   |
| 果干类                                               | 25        | 90           | 0.7        | 0.3       | 19.0         | 葡萄干、杏干、苹果干等                   |
| <sup>a</sup> 表中给出的每份食品质量均为可食部的质量。                 |           |              |            |           |              |                               |
| <sup>b</sup> 如果难以区分水果种类（如混合水果），可按照水果类（综合）的质量进行搭配。 |           |              |            |           |              |                               |

表 2.4 肉蛋水产品类食物交换表<sup>a</sup>（/份）

| 食物种类                  | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例                      |
|-----------------------|-----------|--------------|------------|-----------|--------------|---------------------------|
|                       |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                           |
| 畜禽肉类（综合） <sup>b</sup> | 50        | 90           | 8.0        | 6.7       | 0.7          | 常见畜禽肉类                    |
| 畜肉类（脂肪含量≤5%）          | 80        | 90           | 16.0       | 2.1       | 1.3          | 纯瘦肉、牛里脊、羊里脊等              |
| 畜肉类（脂肪含量6%~15%）       | 60        | 90           | 11.5       | 5.3       | 0.3          | 猪里脊、羊肉（胸脯肉）等              |
| 畜肉类（脂肪含量16%~35%）      | 30        | 90           | 4.5        | 7.7       | 0.7          | 前臀尖、猪大排、猪肉（硬五花）等          |
| 畜肉类（脂肪含量≥35%）         | 10        | 90           | 0.2        | 8.9       | 0.0          | 肥肉、板油等                    |
| 禽肉类                   | 50        | 90           | 8.8        | 6.0       | 0.7          | 鸡、鸭、鹅、火鸡等                 |
| 蛋类                    | 60        | 90           | 7.6        | 6.6       | 1.6          | 鸡蛋、鸭蛋、鹅蛋、鹌鹑蛋等             |
| 水产类（综合）               | 90        | 90           | 14.8       | 2.9       | 1.7          | 常见淡水鱼，海水鱼，虾、蟹、贝类、海参等      |
| 鱼类                    | 75        | 90           | 13.7       | 3.2       | 1.0          | 鲤鱼、草鱼、鲢鱼、鳙鱼、黄花鱼、带鱼、鲳鱼、鲈鱼等 |
| 虾蟹贝类                  | 115       | 90           | 15.8       | 1.5       | 3.1          | 河虾、海虾、河蟹、海蟹、河蚌、蛤蜊、蛏子等     |

<sup>a</sup>表中给出的每份食品质量均为可食部的质量，必要时需进行换算。

<sup>b</sup>如果难以区分畜禽肉类食物种类（如混合肉），可按照畜禽肉类（综合）的质量进行搭配。内脏类（肚、舌、肾、肝、心、肫等）胆固醇含量高，食物营养成分差异较大，如换算每份相当于70g，换算后需复核营养素的变化是否符合要求。

表 2.5 坚果类食物交换表<sup>a</sup>（/份）

| 食物种类               | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例                                |
|--------------------|-----------|--------------|------------|-----------|--------------|-------------------------------------|
|                    |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                                     |
| 坚果（综合）             | 20        | 90           | 3.2        | 5.8       | 6.5          | 常见的坚果、种子类                           |
| 淀粉类坚果（碳水化合物≥40%）   | 25        | 90           | 2.5        | 0.4       | 16.8         | 板栗、白果、芡实、莲子                         |
| 高脂类坚果（脂肪≥40%）      | 15        | 90           | 3.2        | 7.7       | 2.9          | 花生仁、西瓜子、松子、核桃、葵花子、南瓜子、杏仁、榛子、开心果、芝麻等 |
| 中脂类坚果类（脂肪为20%~40%） | 20        | 90           | 3.2        | 6.5       | 5.3          | 腰果、胡麻子、核桃（鲜）、白芝麻等                   |

<sup>a</sup>表中给出的每份食品质量均为可食部的质量。

表 2.6 大豆、乳及其制品食物交换表（/份）

| 食物种类    |     | 质量<br>(g) | 提供能量和营养成分    |            |           |              | 食物举例            |
|---------|-----|-----------|--------------|------------|-----------|--------------|-----------------|
|         |     |           | 能量<br>(kcal) | 蛋白质<br>(g) | 脂肪<br>(g) | 碳水化合物<br>(g) |                 |
| 大豆类     |     | 20        | 90           | 6.9        | 3.3       | 7.0          | 黄豆、黑豆、青豆        |
| 豆粉      |     | 20        | 90           | 6.5        | 3.7       | 7.5          | 黄豆粉             |
| 豆腐      | 北豆腐 | 90        | 90           | 11.0       | 4.3       | 1.8          | 北豆腐             |
|         | 南豆腐 | 150       | 90           | 9.3        | 3.8       | 3.9          | 南豆腐             |
| 豆皮、豆干   |     | 50        | 90           | 8.5        | 4.6       | 3.8          | 豆腐干、豆腐丝、素鸡、素什锦等 |
| 豆浆      |     | 330       | 90           | 8.0        | 3.1       | 8.0          | 豆浆              |
| 液态乳     | 全脂  | 150       | 90           | 5.0        | 5.4       | 7.4          | 全脂牛奶等           |
|         | 脱脂  | 265       | 90           | 9.3        | 0.8       | 12.2         | 脱脂牛奶等           |
| 发酵乳（全脂） |     | 100       | 90           | 2.8        | 2.6       | 12.9         | 发酵乳             |
| 乳酪      |     | 25        | 90           | 5.6        | 7.0       | 1.9          | 奶酪、干酪           |
| 乳粉      |     | 20        | 90           | 4.0        | 4.5       | 10.1         | 全脂奶粉            |

### 附录 3

## 不同地区食谱示例

成人肥胖患者适用的全天食谱（除括号内除特殊标明外，均以可食部生重计算），按照成人肥胖食养指南的基本原则，结合各地食物资源和人群膳食特点进行设计。每个地区、每个季节分别提供了 1200kcal、1400kcal、1600kcal 三个能量水平的食谱。使用者可参照食养原则和建议，结合食物交换表，根据具体情况进行合理搭配。本示例食谱仅作为举例说明和参考，具体到每个个体可根据身高、体重及身体活动水平计算并调整，患者可寻求医生或营养指导人员等专业人员进行指导。

### 一、东北地区

东北地区居民饮食以米面、畜禽肉及奶类（牧区）为主，烹饪方式以炖菜为主，肥厚实在，味重色浓。本系列食谱遵循成人肥胖患者食养原则，合理搭配东北地区特色食材，尊重本地区传统饮食文化，保留特色饮食，并控制油、盐、糖使用量。东北地区四季食谱示例见表 3.1。

表 3.1 东北地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                            |                                                                                 |
|--------------------------------------------------|---------------------------------------------------------------------------------|
| 早餐                                               | 馒头（面粉 50g）<br>煮鸡蛋（鸡蛋 50g）<br>低脂牛奶（250mL）<br>凉拌菠菜（菠菜 100g）                       |
| 加餐                                               | 苹果（200g）                                                                        |
| 中餐                                               | 二米饭（大米 30g，小米 20g）<br>铁锅炖鱼（草鱼 50g，北豆腐 50g，白菜 100g，黄芪*5g，八角茴香*3g）                |
| 晚餐                                               | 菜包饭（生菜 100g，大米 30g，小米 20g，猪里脊肉 50g，土豆 30g）<br>西兰花虾皮萝卜汤（西兰花 100g，白萝卜 30g，虾皮 10g） |
| 油、盐                                              | 全天总用量：植物油 15g，盐 < 5g                                                            |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 64g，碳水化合物 164g 及脂肪 |                                                                                 |

40g; 宏量营养素占总能量比约为: 蛋白质 20%, 碳水化合物 52%, 脂肪 28%。

2. \*为食谱中用到的食药物质, 如黄芪、八角茴香。

### 春季食谱 2 (总能量约 1400kcal)

|     |                                                                                                                      |
|-----|----------------------------------------------------------------------------------------------------------------------|
| 早餐  | 玉米面发糕 (玉米面粉 30g, 面粉 20g)<br>煮鸡蛋 (鸡蛋 50g)<br>无糖豆浆 (250mL)<br>凉拌芹菜 (芹菜 100g)                                           |
| 加餐  | 鸭梨 (200g)                                                                                                            |
| 中餐  | 二米饭 (大米 30g, 小米 20g)<br>蒜苔炒肉 (猪里脊肉 50g, 蒜苔 100g)<br>尖椒土豆片 (尖椒 50g, 土豆 50g)<br>决明子海带豆腐汤 (决明子*10g, 海带【水发】50g, 南豆腐 50g) |
| 加餐  | 无糖酸奶 (100g)                                                                                                          |
| 晚餐  | 羊肉荞面 (荞麦面粉 30g, 面粉 20g, 羊瘦肉 50g, 土豆 50g, 香菇【鲜】50g)<br>素炒油麦菜 (油麦菜 100g)                                               |
| 油、盐 | 全天总用量: 植物油 20g, 盐 < 5g                                                                                               |

注: 1. 本食谱提供能量约为 1400kcal, 其中蛋白质 64g, 碳水化合物 203g 及脂肪 43g; 宏量营养素占总能量比约为: 蛋白质 18%, 碳水化合物 55%, 脂肪 27%。

2. \*为食谱中用到的食药物质, 如决明子。

### 春季食谱 3 (总能量约 1600kcal)

|     |                                                                                          |
|-----|------------------------------------------------------------------------------------------|
| 早餐  | 杂粮粥 (绿豆 10g, 糙米 10g, 大米 30g, 小米 20g)<br>煮鸡蛋 (鸡蛋 50g)<br>凉拌海带 (海带【水发】50g)                 |
| 加餐  | 无糖酸奶 (100g)                                                                              |
| 中餐  | 二米饭 (大米 50g, 小米 20g)<br>当归羊肉炖萝卜 (当归*6g, 羊瘦肉 100g, 白萝卜 100g)<br>韭菜炒豆芽 (绿豆芽 100g, 韭菜 100g) |
| 加餐  | 樱桃 (200g)                                                                                |
| 晚餐  | 黄芪茯苓粥 (黄芪*3g, 茯苓*10g, 大米 70g)<br>香菇炒油菜 (猪里脊肉 80g, 香菇【鲜】50g, 油菜 100g)                     |
| 油、盐 | 全天总用量: 植物油 25g, 盐 < 5g                                                                   |

注: 1. 本食谱提供能量约为 1600kcal, 其中蛋白质 76g, 碳水化合物 231g 及脂肪 48g; 宏量营养素占总能量比约为: 蛋白质 18%, 碳水化合物 56%, 脂肪 26%。

2. \*为食谱中用到的食药物质, 如当归、黄芪、茯苓, 当归仅做香辛料和调味品使用。

### 夏季食谱 1 (总能量约 1200kcal)

|    |                                                                                           |
|----|-------------------------------------------------------------------------------------------|
| 早餐 | 锅贴 (玉米面粉 20g, 小米面 20g, 鸡蛋 20g, 低脂牛奶 50mL)<br>煮鸡蛋 (鸡蛋 50g)<br>小葱拌豆腐 (小葱 20g, 豆腐 50g)       |
| 加餐 | 葡萄 (100g)                                                                                 |
| 中餐 | 莜面鱼鱼 (莜麦面粉 50g)<br>羊肉土豆香菇汤 (羊肉 50g, 土豆 100g, 香菇【鲜】50g)<br>蒜炒茼蒿 (茼蒿 100g)<br>紫苏茶 (紫苏叶*10g) |

|                                                                                                                             |                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 晚餐                                                                                                                          | 三豆薏苡仁粥（绿豆 10g，黑豆 10g，赤小豆*10g，薏苡仁*10g，大米 20g）<br>凉拌苦菜（苦菜 100g）<br>肉炒蒜苔（蒜苔 100g，猪里脊肉 50g）                                           |
| 油、盐                                                                                                                         | 全天总用量：植物油 15g，盐 < 5g                                                                                                              |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 65g，碳水化合物 170g 及脂肪 41g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 51%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如紫苏、薏苡仁、赤小豆。 |                                                                                                                                   |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                                |                                                                                                                                   |
| 早餐                                                                                                                          | 煮玉米（玉米【带棒】150g）<br>低脂牛奶（250mL）<br>煮鸡蛋（鸡蛋 50g）<br>西兰花拌木耳（西兰花 100g，木耳【水发】20g）                                                       |
| 加餐                                                                                                                          | 西瓜（200g）                                                                                                                          |
| 中餐                                                                                                                          | 沙葱猪肉水饺（面粉 100g，沙葱 100g，猪里脊肉 50g）<br>凉拌秋葵（秋葵 100g）                                                                                 |
| 加餐                                                                                                                          | 桑椹枸杞玫瑰茶（桑椹【干】*10g，枸杞子*10 颗，玫瑰【干】5 朵）                                                                                              |
| 晚餐                                                                                                                          | 莲子百合粥（大米 50g，百合【干】*10g，莲子*15g，枸杞子*10 颗）<br>蒜泥茄子（茄子 100g）<br>无糖酸奶（100g）                                                            |
| 油、盐                                                                                                                         | 全天总用量：植物油 20g，盐 < 5g                                                                                                              |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 65g，碳水化合物 205g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 55%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如桑椹、枸杞子、百合等。 |                                                                                                                                   |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                                                   |
| 早餐                                                                                                                          | 蔬菜饼（面粉 60g，西兰花 100g，鸡蛋 30g）<br>牛奶燕麦粥（低脂牛奶 250mL，燕麦片 50g）<br>洋葱拌海带（洋葱 50g，海带【水发】50g）                                               |
| 加餐                                                                                                                          | 杏（200g）                                                                                                                           |
| 中餐                                                                                                                          | 二米饭（大米 30g，小米 20g）<br>尖椒炒肉（尖椒 100g，猪里脊肉 30g）<br>小炒素三鲜（白玉菇 50g，木耳【水发】20g，芹菜 50g）<br>白萝卜黄芪牛肉汤（牛肉 30g，西红柿 50g，白萝卜 100g，生姜*10g，黄芪*5g） |
| 加餐                                                                                                                          | 无糖酸奶（100g）                                                                                                                        |
| 晚餐                                                                                                                          | 鸡丝凉面（面粉 100g，鸡胸肉 50g，黄瓜 50g，芝麻酱 10g）<br>干煸豆角（豆角 100g）                                                                             |
| 油、盐                                                                                                                         | 全天总用量：植物油 25g，盐 < 5g                                                                                                              |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 73g，碳水化合物 226g 及脂肪 54g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 54%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如生姜、黄芪。      |                                                                                                                                   |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                                                   |
| 早餐                                                                                                                          | 蒸南瓜（南瓜 150g）<br>低脂牛奶（250mL）                                                                                                       |

|                                                                                                                           |                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|                                                                                                                           | 茶叶蛋（鸡蛋 50g）<br>青椒拌豆干（柿子椒 50g，豆腐干 50g）                                                       |
| 加餐                                                                                                                        | 猕猴桃（200g）                                                                                   |
| 中餐                                                                                                                        | 二米饭（大米 30g，小米 20g）<br>土豆豆角炖茄子（土豆 50g，豆角 100g，茄子 100g，猪里脊肉 50g）<br>老虎菜（尖椒 50g，大葱 30g，香菜 50g） |
| 晚餐                                                                                                                        | 桂圆红枣小米粥（桂圆【干】*10g，大枣*10g，鲜山药*50g，小米 40g）<br>蘸酱菜（小葱 50g，水萝卜 50g，胡萝卜 50g，苦苣 100g，豆腐皮 50g）     |
| 油、盐                                                                                                                       | 全天总用量：植物油 15g，盐 < 5g                                                                        |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 55g，碳水化合物 181g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 55%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如桂圆、大枣、山药。 |                                                                                             |
| <b>秋季食谱 2（总能量约 1400kcal）</b>                                                                                              |                                                                                             |
| 早餐                                                                                                                        | 椒盐花卷（面粉 50g，花椒*5g）<br>低脂牛奶（250mL）<br>凉拌藕片（藕片 50g）                                           |
| 加餐                                                                                                                        | 鸭梨（200g）                                                                                    |
| 中餐                                                                                                                        | 二米饭（大米 30g，小米 20g）<br>小鸡炖蘑菇（鸡肉 50g，红菇【干】20g，生姜*10g）<br>炝炒西葫芦（西葫芦 100g）                      |
| 加餐                                                                                                                        | 无糖酸奶（100g）                                                                                  |
| 晚餐                                                                                                                        | 玉米饼（玉米面粉 50g）<br>大拌凉皮（面皮 50g，黄瓜 50g，胡萝卜 50g）<br>清蒸鲈鱼（鲈鱼 50g）                                |
| 油、盐                                                                                                                       | 全天总用量：植物油 20g，盐 < 5g                                                                        |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 62g，碳水化合物 221g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 59%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如花椒、生姜。    |                                                                                             |
| <b>秋季食谱 3（总能量约 1600kcal）</b>                                                                                              |                                                                                             |
| 早餐                                                                                                                        | 发糕（玉米面粉 30g，面粉 50g）<br>豆腐脑（150g）<br>西芹腐竹（西芹 50g，腐竹【水发】30g）                                  |
| 加餐                                                                                                                        | 柚子（200g）                                                                                    |
| 中餐                                                                                                                        | 二米饭（大米 30g，小米 20g）<br>藕王排骨炖苞米（猪排骨【带骨】70g，玉米【带棒】100g，藕片 50g，大枣*2 颗）<br>蘑菇炒白菜（白菜 100g，鲜蘑 50g） |
| 加餐                                                                                                                        | 无糖酸奶（100g）                                                                                  |
| 晚餐                                                                                                                        | 炸酱面（面粉 80g，胡萝卜 50g，西红柿 50g，黄瓜 50g，黄豆芽 50g）<br>昆布豆腐汤（昆布【干】*10g、北豆腐 50g）                      |
| 油、盐                                                                                                                       | 全天总用量：植物油 25g，盐 < 5g                                                                        |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 65g，碳水化合物 224g 及脂肪 55g；宏量营养素占总能量比约为：蛋白质 16%，碳水化合物 54%，脂肪 30%。                               |                                                                                             |

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| 2.*为食谱中用到的食药物质，如大枣、昆布。                                                                      |                                                                                                                                |
| <b>冬季食谱 1（总能量约 1200kcal）</b>                                                                |                                                                                                                                |
| 早餐                                                                                          | 蒸山药（鲜山药*50g）<br>低脂牛奶（250mL）<br>茶叶蛋（鸡蛋 50g）<br>芝麻菠菜（菠菜 50g，白芝麻 10g）                                                             |
| 加餐                                                                                          | 冬枣（100g）                                                                                                                       |
| 中餐                                                                                          | 二米饭（大米 30g，小米 20g）<br>猪肉炖酸菜（猪里脊肉 50g，酸菜 100g）<br>清肺小炒（土豆 50g，尖椒 50g，木耳【水发】50g，胡萝卜 50g）                                         |
| 晚餐                                                                                          | 红枣发糕（全麦面粉 50g，大枣*2 颗）<br>藜麦沙拉（藜麦 20g，生菜 50g，苦苣 50g，紫甘蓝 50g，鲜虾仁 50g）                                                            |
| 油、盐                                                                                         | 全天总用量：植物油 15g，盐<5g                                                                                                             |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 56g，碳水化合物 167g 及脂肪 36g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 54%，脂肪 27%。 |                                                                                                                                |
| 2.*为食谱中用到的食药物质，如山药、大枣。                                                                      |                                                                                                                                |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                |                                                                                                                                |
| 早餐                                                                                          | 杂粮煎饼（面粉 30g，荞麦面粉 20g，鸡蛋 50g，生菜 50g）<br>无糖豆浆（200mL）                                                                             |
| 加餐                                                                                          | 鸭梨（200g）                                                                                                                       |
| 中餐                                                                                          | 东北一锅出（全麦面粉 50g，玉米【带棒】50g，豆角 50g，茄子 50g，白菜 50g，猪里脊肉 50g）<br>青椒西葫芦（西葫芦 50g，柿子椒 100g）<br>砂仁芡实鲫鱼汤（砂仁*6g，芡实*5g，莲子【去芯，干】*15g，鲫鱼 50g） |
| 晚餐                                                                                          | 打卤面（面粉 50g，黄瓜 50g，黄花菜【水发】50g，木耳【水发】50g，土豆 50g）<br>韭菜炒豆芽（黄豆芽 100g，韭菜 50g）                                                       |
| 油、盐                                                                                         | 全天总用量：植物油 20g，盐<5g                                                                                                             |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 75g，碳水化合物 206g 及脂肪 42g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。 |                                                                                                                                |
| 2.*为食谱中用到的食药物质，如砂仁、芡实、莲子。                                                                   |                                                                                                                                |
| <b>冬季食谱 3（总能量约 1600kcal）</b>                                                                |                                                                                                                                |
| 早餐                                                                                          | 三明治（全麦面包 100g，煮鸡蛋 50g，生菜 50g）<br>低脂牛奶（250mL）<br>什锦蔬菜沙拉（洋葱 50g，生菜 50g，柿子椒 50g，紫菜头 50g，黄瓜 50g）                                   |
| 加餐                                                                                          | 橙子（200g）                                                                                                                       |
| 中餐                                                                                          | 玉米面馒头（玉米面粉 30g，面粉 30g）<br>清蒸鲈鱼（鲈鱼 100g）<br>辣炒莴笋丝（莴笋 100g，尖椒 50g）<br>山药香菇汤（鲜山药*50g，西红柿 50g，香菇【鲜】30g）                            |
| 加餐                                                                                          | 无糖酸奶（100g）                                                                                                                     |
| 晚餐                                                                                          | 玉米粥（大米 20g，玉米粒【鲜】50g）                                                                                                          |

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|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|                                                                                                                     | 蒜蓉西兰花（西兰花 100g）<br>木耳拌干豆腐（木耳【水发】50g，干豆腐 50g） |
| 油、盐                                                                                                                 | 全天总用量：植物油 25g，盐 < 5g                         |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 74g，碳水化合物 217g 及脂肪 55g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 52%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如山药。 |                                              |

## 二、西北地区

西北居民喜食面食，主食以小麦、玉米和其它杂粮为主，肉类以牛、羊肉为主，瓜果丰富，绿叶蔬菜相对较少。居民夏季喜清淡素食，冬季喜酸辣咸厚味食品。较多居民日常饮水量不足，对于肥胖人群尤其应保障充足日常饮水量。本系列食谱在遵循肥胖患者食养原则的基础上，采用食物交换份法，合理搭配西北地区各季特色食材编制而成。西北地区四季食谱示例见表 3.2。

表 3.2 西北地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                                                                                                        |                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 早餐                                                                                                                           | 煮玉米（玉米【带棒】200g）<br>杂粮粥（赤小豆* 10g，小米 10g，大米 10g）<br>煮鸡蛋（鸡蛋 50g）<br>凉拌木耳胡萝卜丝（胡萝卜 100g，木耳【干】10g）           |
| 加餐                                                                                                                           | 低脂羊奶（250mL）                                                                                            |
| 中餐                                                                                                                           | 杂粮饭（大米 25g，薏苡仁*25g，紫米 25g）<br>猪肉白菜豆腐炖粉条（粉条【干】25g，北豆腐 50g，猪后腿肉 35g，白菜 200g）<br>香菇炒青菜（小青菜 100g，香菇【鲜】20g） |
| 加餐                                                                                                                           | 橘子（200g）<br>腰果仁（10g）                                                                                   |
| 晚餐                                                                                                                           | 清炒芹菜（芹菜 100g）<br>羊肉汤（羊瘦肉 25g，面粉 15g，小葱 5g，生姜*2g，花椒*1g）                                                 |
| 油、盐                                                                                                                          | 全天总用量：植物油 12g，盐<5g                                                                                     |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 50g，碳水化合物 180g 及脂肪 35g；宏量营养素占总能量比约为：蛋白质 16%，碳水化合物 58%，脂肪 26%。<br>2. *为食谱中用到的食药物质，如赤小豆、薏苡仁、生姜等。 |                                                                                                        |
| 春季食谱 2（总能量约 1400kcal）                                                                                                        |                                                                                                        |
| 早餐                                                                                                                           | 杂粮花卷（面粉 25g，玉米面粉 25g）<br>鸡蛋羹（鸡蛋 50g）<br>小葱拌豆腐（嫩豆腐 50g，香葱 20g）                                          |
| 加餐                                                                                                                           | 低脂酸奶（100g）                                                                                             |
| 中餐                                                                                                                           | 糙米饭（糙米 35g，大米 40g）<br>红烧牛肉（牛瘦肉 60g，胡萝卜 100g，土豆 100g，生姜*2g）<br>芹菜腐竹炒肉（芹菜 100g，腐竹【干】20g，猪瘦肉 50g）         |
| 加餐                                                                                                                           | 苹果（200g）                                                                                               |
| 晚餐                                                                                                                           | 莜麦汤面（莜麦面粉 50g）                                                                                         |

|                                                                                                                            |                                                                                                                 |
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|                                                                                                                            | 凉拌三丝（胡萝卜 100g，海带丝【湿】10g，豆腐皮【干】30g）                                                                              |
| 油、盐                                                                                                                        | 全天总用量：植物油 12g，盐 < 5g                                                                                            |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 199g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如生姜。        |                                                                                                                 |
| <b>春季食谱 3（总能量约 1600kcal）</b>                                                                                               |                                                                                                                 |
| 早餐                                                                                                                         | 菜包子（面粉 50g，莲花白 50g，柿子椒 50g）<br>煮鸡蛋（鸡蛋 50g）<br>无糖豆浆（200mL）                                                       |
| 加餐                                                                                                                         | 巴旦木仁（10g）                                                                                                       |
| 中餐                                                                                                                         | 杂粮馒头（面粉 35g，玉米面粉 40g）<br>虾仁菜团子（小青菜 100g，冻虾仁 75g）<br>素炒油菜腐竹（油菜 100g，腐竹【干】40g）<br>卤鸡腿（去皮鸡腿 25g，生姜*5g，橘皮*5g，肉桂*5g） |
| 加餐                                                                                                                         | 苹果（200g）<br>低脂牛奶（250mL）                                                                                         |
| 晚餐                                                                                                                         | 菠菜肉丝面（菠菜 100g，荞麦面粉 25g，猪瘦肉 25g）<br>炒豆芽（黄豆芽 100g）                                                                |
| 油、盐                                                                                                                        | 全天总用量：植物油 12g，盐 < 5g                                                                                            |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 79g，碳水化合物 206g 及脂肪 50g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如生姜、橘皮、肉桂。  |                                                                                                                 |
| <b>夏季食谱 1（总能量约 1200kcal）</b>                                                                                               |                                                                                                                 |
| 早餐                                                                                                                         | 烙饼（面粉 50g）<br>煮鸡蛋（鸡蛋 50g）<br>凉拌小菜（胡萝卜丝 50g，紫甘蓝 50g，绿豆芽 50g）<br>莲子百合羹（莲子*【去芯，干】10g，百合【干】*10g）                    |
| 加餐                                                                                                                         | 低脂羊奶（250mL）                                                                                                     |
| 中餐                                                                                                                         | 洋芋叉叉（面粉 50g，土豆 100g）<br>香菇油菜（油菜 100g，香菇【鲜】20g）<br>红烧鲫鱼（鲫鱼 60g，豆豉 20g）                                           |
| 加餐                                                                                                                         | 西瓜（200g）<br>葡萄（100g）                                                                                            |
| 晚餐                                                                                                                         | 杂粮粥（赤小豆*等杂豆 10g，小米 10g，大米 10g）<br>素炒西兰花（西兰花 100g，胡萝卜 50g，木耳【干】10g）<br>西葫芦炒肉（西葫芦 100g，猪瘦肉 50g）                   |
| 油、盐                                                                                                                        | 全天总用量：植物油 12g，盐 < 5g                                                                                            |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 56g，碳水化合物 148g 及脂肪 38g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 51%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如赤小豆、百合、莲子。 |                                                                                                                 |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                               |                                                                                                                 |
| 早餐                                                                                                                         | 蒸南瓜（南瓜 200g）<br>蒸山药（鲜山药*50g）<br>煮鸡蛋（鸡蛋 50g）                                                                     |

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|                                                                                                                             | 低脂牛奶（250mL）                                                                                                   |
| 加餐                                                                                                                          | 板栗仁（25g）                                                                                                      |
| 中餐                                                                                                                          | 杂粮饭（大米 25g，薏苡仁*20g，紫米 20g）<br>凉拌黄瓜豆腐丝（黄瓜 100g，豆腐丝 50g）<br>西兰花炒肉（西兰花 100g，猪瘦肉 50g）<br>红枣枸杞羹（大枣【干】*20g，枸杞子*10g） |
| 加餐                                                                                                                          | 水蜜桃（150g）<br>草莓（50g）                                                                                          |
| 晚餐                                                                                                                          | 西红柿牛肉面（面粉 50g，西红柿 100g，牛瘦肉 50g）<br>香菇炒青菜（小青菜 100g，香菇【鲜】20g）                                                   |
| 油、盐                                                                                                                         | 全天总用量：植物油 10g，盐<5g                                                                                            |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 68g，碳水化合物 182g 及脂肪 47g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 51%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如山药、薏苡仁、大枣等。 |                                                                                                               |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                               |
| 早餐                                                                                                                          | 杂粮馒头（面粉 35g，玉米面粉 20g）<br>煮鸡蛋（鸡蛋 50g）<br>大拌菜（紫甘蓝 50g，胡萝卜 50g，黄瓜 50g）<br>无糖豆浆（200mL）                            |
| 加餐                                                                                                                          | 干核桃仁（10g）<br>低脂酸奶（150g）                                                                                       |
| 中餐                                                                                                                          | 糙米饭（糙米 50g，紫米 25g）<br>清炒莴笋豆干（莴笋 100g，豆腐干 75g）<br>蒜蓉油麦菜（油麦菜 100g）<br>清蒸鱼（鲈鱼 80g）<br>菊花茶（菊花*5g）                 |
| 加餐                                                                                                                          | 柚子（100g）<br>木瓜*（100g）                                                                                         |
| 晚餐                                                                                                                          | 臊子面（面粉 75g，牛瘦肉 50g，香菇【鲜】20g，豆腐 50g，木耳【干】5g，油菜 10g）                                                            |
| 油、盐                                                                                                                         | 全天总用量：植物油 10g，盐<5g                                                                                            |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 81g，碳水化合物 205g 及脂肪 50g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如菊花、木瓜。      |                                                                                                               |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                               |
| 早餐                                                                                                                          | 鸡蛋杂粮饼（面粉 25g，玉米面粉 25g，鸡蛋 50g，葱花 10g）<br>红枣桂圆羹（大枣【干】*25g，桂圆【干】*25g）<br>炒豆芽（黄豆芽 100g）                           |
| 加餐                                                                                                                          | 低脂酸奶（150g）                                                                                                    |
| 中餐                                                                                                                          | 鸡丝豆角炒莜面（莜麦面粉 75g，豆角 50g，鸡胸肉 50g）<br>素炒菜花（菜花 100g）<br>凉拌菜（生菜 50g，黄瓜 50g）                                       |
| 加餐                                                                                                                          | 猕猴桃（100g）<br>圣女果（100g）                                                                                        |

|                                                                                                                        |                                                                                                                                       |
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| 晚餐                                                                                                                     | 面片汤（面粉 25g）<br>豆腐皮炒茼蒿（茼蒿 50g，豆皮【干】50g）<br>西兰花炒肉（西兰花 100g，猪瘦肉 50g）                                                                     |
| 油、盐                                                                                                                    | 全天总用量：植物油 12g，盐 < 5g                                                                                                                  |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 59g，碳水化合物 157g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 52%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如大枣、桂圆。 |                                                                                                                                       |
| <b>秋季食谱 2（总能量约 1400kcal）</b>                                                                                           |                                                                                                                                       |
| 早餐                                                                                                                     | 肉夹馍（面粉 25g，猪瘦肉 50g）<br>山药粥（鲜山药*50g，大米 25g）<br>凉拌黄瓜（黄瓜 100g）                                                                           |
| 加餐                                                                                                                     | 榛子仁（10g）                                                                                                                              |
| 中餐                                                                                                                     | 杂粮饭（大米 45g，玉米糝 45g）<br>豆角烧茄子（豇豆 50g，土豆 30g，茄子 50g）<br>大拌菜（紫甘蓝 60g，胡萝卜 20g，黄瓜 20g，嫩豆腐 100g）<br>紫菜蛋花虾皮汤（小青菜 50g，鸡蛋 10g，紫菜【干】5g，虾皮【干】2g） |
| 加餐                                                                                                                     | 甜瓜（100g）<br>柑橘（100g）                                                                                                                  |
| 晚餐                                                                                                                     | 鸡丝豆角米皮（鸡胸肉 50g，豆角 50g，米粉 50g）<br>煮鸡蛋（鸡蛋 50g）<br>低脂羊奶（250mL）                                                                           |
| 油、盐                                                                                                                    | 全天总用量：植物油 10g，盐 < 5g                                                                                                                  |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 68g，碳水化合物 182g 及脂肪 47g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 51%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如山药。    |                                                                                                                                       |
| <b>秋季食谱 3（总能量约 1600kcal）</b>                                                                                           |                                                                                                                                       |
| 早餐                                                                                                                     | 八宝粥（赤小豆*5g，白扁豆*5g，绿豆 5g，芸豆 5g，小米 10g，大米 25g）<br>西红柿炒蛋（鸡蛋 50g，西红柿 100g）                                                                |
| 加餐                                                                                                                     | 南瓜子（10g）<br>豆奶（大豆粉 25g）                                                                                                               |
| 中餐                                                                                                                     | 油泼面（面粉 90g，油辣子 2g）<br>腐竹炒西葫芦（西葫芦 100g，腐竹【干】20g）<br>红烧鸡块（鸡胸肉 50g，胡萝卜 100g，土豆 20g）                                                      |
| 加餐                                                                                                                     | 火龙果（100g）<br>橙子（100g）                                                                                                                 |
| 晚餐                                                                                                                     | 臊子面（面粉 75g，羊瘦肉 50g，香菇【鲜】20g，豆腐 25g，木耳【干】5g，油菜 50g）<br>豆干炒西兰花（西兰花 100g，豆腐干 50g）<br>蒸南瓜（南瓜 200g）                                        |
| 油、盐                                                                                                                    | 全天总用量：植物油 12g，盐 < 5g                                                                                                                  |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 78g，碳水化合物 219g 及脂肪 45g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。                            |                                                                                                                                       |

|                                                                                             |                                                                                                              |
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| 2.*为食谱中用到的食药物质，如赤小豆、白扁豆。                                                                    |                                                                                                              |
| <b>冬季食谱 1（总能量约 1200kcal）</b>                                                                |                                                                                                              |
| 早餐                                                                                          | 锅盔辣子馍（面粉 25g，油辣子 2g）<br>煮鸡蛋（鸡蛋 50g）<br>清炒豆芽（黄豆芽 100g）<br>豆腐脑（豆腐 100g）                                        |
| 加餐                                                                                          | 红李子（100g）<br>低脂酸奶（100g）                                                                                      |
| 中餐                                                                                          | 杂粮饼（面粉 50g，玉米面粉 25g）<br>冬瓜炖排骨（冬瓜 100g，猪排骨【带骨】80g）<br>芹菜炒香干（芹菜 100g，豆腐干 50g）<br>莲子百合羹（百合【干】*20g，莲子【去芯，干】*10g） |
| 加餐                                                                                          | 砂糖橘（100g）                                                                                                    |
| 晚餐                                                                                          | 羊肉汤面（面粉 50g，羊肉 25g，土豆 30g，胡萝卜 50g，西红柿 20g，小白菜 30g）<br>炒青菜（小油菜 100g）                                          |
| 油、盐                                                                                         | 全天总用量：植物油 12g，盐 < 5g                                                                                         |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 60g，碳水化合物 161g 及脂肪 35g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 54%，脂肪 26%。 |                                                                                                              |
| 2.*为食谱中用到的食药物质，如百合、莲子。                                                                      |                                                                                                              |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                |                                                                                                              |
| 早餐                                                                                          | 菜包子（面粉 25g，雪菜【干】50g，茄子 50g）<br>煮鸡蛋（鸡蛋 50g）<br>红薯山药粥（红薯 50g，鲜山药*20g，大米 25g）<br>小葱拌豆腐（嫩豆腐 50g，香葱 20g）          |
| 加餐                                                                                          | 低脂酸奶（100g）<br>苹果（100g）                                                                                       |
| 中餐                                                                                          | 杂粮饭（大米 25g，薏苡仁*25g，紫米 25g）<br>清蒸虾仁（冻虾仁 70g）<br>羊肉汤（西葫芦 100g，胡萝卜 100g，羊瘦肉 25g，小茴香*2g，肉桂*5g）<br>豆奶（大豆粉 20g）    |
| 加餐                                                                                          | 丰水梨（200g）                                                                                                    |
| 晚餐                                                                                          | 肉丝面（面粉 50g，油菜 100g，猪瘦肉 25g）<br>醋熘白菜（白菜 100g）                                                                 |
| 油、盐                                                                                         | 全天总用量：植物油 15g，盐 < 5g                                                                                         |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 56g，碳水化合物 189g 及脂肪 44g；宏量营养素占总能量比约为：蛋白质 16%，碳水化合物 55%，脂肪 29%。 |                                                                                                              |
| 2.*为食谱中用到的食药物质，如山药、小茴香、肉桂等。                                                                 |                                                                                                              |
| <b>冬季食谱 3（总能量约 1600kcal）</b>                                                                |                                                                                                              |
| 早餐                                                                                          | 杂粮馒头（面粉 40g，玉米面粉 25g）<br>圆白菜炒腐竹（圆白菜 100g，腐竹【干】20g）<br>虾皮紫菜鸡蛋羹（虾皮【干】10g，紫菜【干】5g，鸡蛋 50g）                       |
| 加餐                                                                                          | 开心果仁（10g）                                                                                                    |

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|                                                                                                                         | 低脂羊奶（250mL）                                                                          |
| 中餐                                                                                                                      | 羊肉泡馍（羊瘦肉 50g，面粉 50g，粉丝【干】25g）<br>凉拌三丝（胡萝卜丝 100g，海带丝【湿】50g，豆腐丝 50g）<br>清炒豆芽（绿豆芽 100g） |
| 加餐                                                                                                                      | 苹果（200g）<br>香蕉（100g）                                                                 |
| 晚餐                                                                                                                      | 葱花饼（面粉 75g，大葱 10g）<br>西红柿炖牛腩（西红柿 100g，牛腩 50g）<br>红枣枸杞羹（大枣【干】*20g，枸杞子【干】*10g）         |
| 油、盐                                                                                                                     | 全天总用量：植物油 12g，盐 < 5g                                                                 |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 79g，碳水化合物 206g 及脂肪 51g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如大枣、枸杞子。 |                                                                                      |

### 三、华北地区

华北地区多数地方喜面食及畜禽肉，蔬菜和水产类摄入不多，厚重咸口菜品居多。本系列食谱遵循肥胖患者食养原则，合理搭配华北地区各季特色食材，尊重本地区传统饮食文化，保留特色饮食，增加了蔬菜及水产品的摄入，按照四季分明的特点强调了应季食物的选择，并控制油、盐、糖使用量。华北地区四季食谱示例见表 3.3。

表 3.3 华北地区四季食谱

| 春季食谱 1（总能量约 1200kcal）                                                                                                      |                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 早餐                                                                                                                         | 山药粉鸡蛋软饼（山药粉*50g，全麦面粉 10g，脱脂牛奶 50mL，鸡蛋 50g）<br>桔梗香葱拌春笋（桔梗*20g，香葱 10g，春笋 100g）<br>脱脂牛奶（250mL）<br>黄心猕猴桃（100g）                  |
| 中餐                                                                                                                         | 芡实玉米饭（玉米粒【鲜】20g，芡实*10g，大米 50g）<br>肉丝炒仔姜（猪肉 25g，仔姜*80g，青蒜 10g）<br>蒜蓉炒娃娃菜（娃娃菜 150g）<br>虾皮冬瓜海带汤（虾皮 3g，冬瓜 100g，海带【水发】30g，香菜 5g） |
| 晚餐                                                                                                                         | 紫薯馒头（紫薯 30g，全麦面粉 50g）<br>虾仁炒西兰花（鲜虾仁 50g，西兰花 70g）<br>鸡毛菜氽丸子（猪瘦肉 30g，鸡毛菜 50g，蟹味菇 20g，枸杞子*5g）                                  |
| 油、盐                                                                                                                        | 全天总用量：植物油 24g，盐<5g                                                                                                          |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 57g，碳水化合物 173g 及脂肪 30g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 58%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如山药、桔梗、芡实等。 |                                                                                                                             |
| 春季食谱 2（总能量约 1400kcal）                                                                                                      |                                                                                                                             |
| 早餐                                                                                                                         | 荠菜鲜肉馄饨（面粉 50g，荠菜 50g，猪里脊肉 30g，香菜 5g）<br>牛奶蒸蛋羹（脱脂牛奶 110mL，鸡蛋 50g）<br>虾皮拌圆白菜（圆白菜 100g，虾皮 2g）                                  |
| 中餐                                                                                                                         | 紫米饭（紫米 30g，大米 20g）<br>红烧带鱼（带鱼 50g，葱姜 5g，香菜 10g）<br>醋烹豆芽（绿豆芽 100g，红柿子椒 10g）<br>桃仁香橙酸奶（核桃仁 5g，香橙 50g，无糖酸奶 150g）               |
| 晚餐                                                                                                                         | 猪肉茄丁面（猪瘦肉 15g，鲜切面 100g，茄子 80g，香菇【鲜】30g，香葱 10g）<br>雪里蕻烧豆腐（豆腐 50g，雪里蕻 15g，青蒜叶 20g）<br>粉蒸蒲公英（蒲公英【鲜】*80g，玉米面粉 15g，小米辣 5g）       |

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|                                                                                                                              | 无糖黑豆浆（250mL）                                                                                                                  |
| 油、盐                                                                                                                          | 全天总用量：油 17g，盐 < 5g                                                                                                            |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 68g，碳水化合物 191g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 56%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如蒲公英。         |                                                                                                                               |
| <b>春季食谱 3（总能量约 1600kcal）</b>                                                                                                 |                                                                                                                               |
| 早餐                                                                                                                           | 菠菜糊塌子（小菠菜 50g，全麦面粉 40g）<br>蒸山药（鲜山药*60g）<br>香椿炒鸡蛋（香椿 30g，鸡蛋 50g）<br>脱脂牛奶（300mL）                                                |
| 中餐                                                                                                                           | 藜麦赤豆饭（藜麦 10g，大米 50g，赤小豆*10g）<br>小白菜氽丸子（鸡胸肉 50g，小白菜 50g，鲜蘑菇 20g，枸杞子*3g）<br>清炒油麦菜（油麦菜 130g）<br>苹果（200g）                         |
| 晚餐                                                                                                                           | 茴香羊肉饺子（全麦面粉 95g，茴香苗 80g，羊肉 50g，香葱 10g）<br>木耳炒油菜（木耳【水发】20g，油菜 100g）<br>百合炒西芹（西芹 100g，鲜百合*20g）<br>饺子汤（300g）                     |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐 < 5g                                                                                                          |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 74g，碳水化合物 227g 及脂肪 41g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 59%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如山药、赤小豆、枸杞子等。 |                                                                                                                               |
| <b>夏季食谱 1（总能量约 1200kcal）</b>                                                                                                 |                                                                                                                               |
| 早餐                                                                                                                           | 香葱鸡蛋软饼（全麦面粉 25g，牛奶 100mL，鸡蛋 50g，香葱 10g）<br>胡萝卜鲍菇炒青笋（胡萝卜 20g，杏鲍菇 50g，青笋 80g）<br>水果奶昔（红心火龙果 100g，无糖酸奶 150g）                     |
| 中餐                                                                                                                           | 芡实燕麦糙米饭（黑米 40g，芡实*10g，燕麦米 10g）<br>肉末豆腐蒸槐花（猪肉 20g，北豆腐 20g，槐花*100g）<br>蒜蓉拍黄瓜（嫩黄瓜 150g）<br>虾皮冬瓜紫菜汤（虾皮 3g，冬瓜 150g，紫菜 3g，香菜 5g）    |
| 晚餐                                                                                                                           | 蒸土豆南瓜（黄瓤土豆 100g，栗面南瓜 100g）<br>仔姜桔梗拌西葫芦（泡仔姜*20g，桔梗*20g，西葫芦 100g）<br>香菇蒸仔鸡（鸡腿肉 70g，香菇【水发】20g，莲子【鲜】*20g）<br>赤豆薏米水（赤小豆*5g，薏苡仁*5g） |
| 油、盐                                                                                                                          | 全天总用量：植物油 15g，盐 < 5g                                                                                                          |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 57g，碳水化合物 173g 及脂肪 30g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 58%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如芡实、槐花、姜等。    |                                                                                                                               |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                                 |                                                                                                                               |
| 早餐                                                                                                                           | 马齿苋菜团子（粗玉米面粉 20g，面粉 10g，豆面粉 5g，马齿苋*80g，猪肉 10g，香葱 5g）<br>煮鸡蛋（鸡蛋 50g）<br>脱脂牛奶（250mL）                                            |

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|                                                                                                                              | 虾皮拌菠菜（菠菜 120g，虾皮 3g）                                                                                                           |
| 中餐                                                                                                                           | 糙米饭（糙米 40g，大米 20g）<br>豉香蒸鲈鱼（淡水鲈鱼 60g，葱姜丝 5g，香菜 10g）<br>蛤蜊豆腐汤（蛤蜊【带壳】50g，小白菜 50g，南豆腐 40g）<br>桃子（150g）                            |
| 晚餐                                                                                                                           | 肉片豆角焖面（猪瘦肉 20g，鲜切面 60g，土豆 50g，香菇【鲜】30g，豆角 80g）<br>清炒豌豆苗（豌豆苗 100g，红柿子椒 10g）<br>凉拌苦瓜（苦瓜 80g，泡姜*5g，小米辣 3g）<br>绿豆汤（绿豆 5g）          |
| 油、盐                                                                                                                          | 全天总用量：植物油 21g，盐<5g                                                                                                             |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 70g，碳水化合物 187g 及脂肪 38g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如马齿苋、姜。       |                                                                                                                                |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                 |                                                                                                                                |
| 早餐                                                                                                                           | 鸡蛋青菜包子（鸡蛋 40g，油菜 50g，全麦面粉 50g）<br>煮玉米（玉米【带棒】100g）<br>银芽海带拌豆腐丝（绿豆芽 80g，海带【水发】50g，豆腐丝 35g，柿子椒 10g）<br>脱脂牛奶（300mL）                |
| 中餐                                                                                                                           | 藜麦赤豆饭（藜麦 10g，大米 40g，赤小豆*13g）<br>小白菜氽丸子（鸡胸肉 50g，小白菜 50g，蘑菇【鲜】20g，枸杞子*3g）<br>蒜蓉炒油麦菜（油麦菜 100g）<br>苹果（200g）                        |
| 晚餐                                                                                                                           | 山药紫米饭（紫米 55g，铁棍山药*100g）<br>虾仁香菇炒鸡毛菜（鲜虾仁 50g，香菇【鲜】20g，鸡毛菜 80g）<br>百合蒸南瓜（南瓜 150g，百合【鲜】*15g）<br>无糖黑豆浆（300mL）                      |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐<5g                                                                                                             |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 76g，碳水化合物 218g 及脂肪 44g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 57%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如赤小豆、枸杞子、山药等。 |                                                                                                                                |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                                 |                                                                                                                                |
| 早餐                                                                                                                           | 奶香馒头（脱脂牛奶 20g，全麦面粉 40g）<br>金针菇炒豆芽（绿豆芽 50g，黄瓜 30g，金针菇 50g，香菜 5g）<br>脱脂牛奶（230mL）                                                 |
| 中餐                                                                                                                           | 芡实紫米饭（紫米 45g，芡实*10g）<br>清炒虾仁（鲜虾仁 50g，黄瓜 40g，胡萝卜 10g）<br>清炒南瓜尖（嫩南瓜尖 100g）<br>枸杞酸奶（枸杞子原浆*10g，无糖酸奶 150g）                          |
| 晚餐                                                                                                                           | 猪肉茴香包子（全麦面粉 40g，茴香苗 50g，猪瘦肉 20g，香葱 10g）<br>小白菜炖豆腐（小白菜 100g，北豆腐 30g，香菇【鲜】20g）<br>凉拌马齿苋（马齿苋*120g）<br>虾皮萝卜丝汤（白萝卜 50g，虾皮 3g，香菜 5g） |

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| 油、盐                                                                                                                         | 全天总用量：植物油 16g，盐 < 5g                                                                                                                 |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 59g，碳水化合物 164g 及脂肪 32g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 57%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如芡实、枸杞子、马齿苋。 |                                                                                                                                      |
| <b>秋季食谱 2（总能量 1400kcal）</b>                                                                                                 |                                                                                                                                      |
| 早餐                                                                                                                          | 虾皮萝卜丝菜团子（粗玉米面粉 50g，虾皮 5g，白萝卜 40g，胡萝卜 10g）<br>茶叶蛋（鸡蛋 50g）<br>脱脂牛奶（250mL）<br>鸡肝拌菠菜（菠菜 100g，鸡肝【熟】10g）                                   |
| 中餐                                                                                                                          | 山药蒸米饭（鲜山药*100g，糙米 50g，赤小豆*10g）<br>醋椒鲈鱼（鲈鱼 50g，花椒*2g，细粉丝 15g，南豆腐 40g，葱姜 5g）<br>清炒蒿子秆（蒿子秆 100g）<br>雪梨银耳莲子羹（雪梨 50g，银耳【干】5g，大枣*5g，莲子*5g） |
| 晚餐                                                                                                                          | 金银花卷（全麦面粉 40g，玉米面粉 15g）<br>肉末炒茄丝（茄子 100g，猪肉 20g，香葱 10g）<br>木耳炒小白菜（小白菜 100g，木耳【水发】20g）<br>海米冬瓜紫菜汤（海米 3g，冬瓜 50g，紫菜 3g，香菜 5g）           |
| 油、盐                                                                                                                         | 全天总用量：植物油 19g，盐 < 5g                                                                                                                 |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 64g，碳水化合物 198g 及脂肪 36g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 59%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如山药、赤小豆、花椒等。 |                                                                                                                                      |
| <b>秋季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                                                      |
| 早餐                                                                                                                          | 八宝粥（紫米 20g，白芸豆 5g，赤小豆*5g，大米 10g，薏苡仁*5g，大枣*5g）<br>桂花蒸山药（桂花【干】1g，鲜山药*100g）<br>豆浆蒸蛋羹（鸡蛋 50g，豆浆 100mL）<br>尖椒炒豆皮（尖椒 50g，豆腐皮 20g）          |
| 中餐                                                                                                                          | 二米饭（藜麦 15g，大米 50g）<br>酸汤菊花鱼片（黑鱼 60g，莴笋 50g，绿豆芽 50g，野山椒 5g，黄菊花【鲜】*5g，木耳【水发】20g）<br>蒜蓉炒盖菜（盖菜 100g）                                     |
| 晚餐                                                                                                                          | 麻酱黄瓜丝拌面（面条 100g，黑芝麻酱 5g，黄瓜 50g，心里美萝卜 30g）<br>韭菜炒八爪鱼（八爪鱼 75g，韭菜 60g，红辣椒 5g）<br>拍黄瓜（嫩黄瓜 100g）<br>桃肉酸奶（无糖酸奶 200g，油蟠桃 200g）              |
| 油、盐                                                                                                                         | 全天总用量：植物油 20g，盐 < 5g                                                                                                                 |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 77g，碳水化合物 227g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 57%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如赤小豆、大枣、山药等。 |                                                                                                                                      |
| <b>冬季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                                                      |
| 早餐                                                                                                                          | 桂花山药软饼（桂花【干】1g，山药泥*80g，全麦面粉 35g）<br>肉丝炒萝卜丝（白萝卜 100g，猪里脊肉丝 15g，香菜 5g）                                                                 |

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|                                                                                                                            | 脱脂牛奶（200mL）                                                                                                                             |
| 中餐                                                                                                                         | 赤豆黄精紫米饭（紫米 45g，黄精*10g，赤小豆*10g）<br>彩椒炒鸡丁（鸡肉 30g，香菇【鲜】10g，柿子椒 100g）<br>白灼西兰花（西兰花 100g）<br>无糖黑豆浆（250mL）                                    |
| 晚餐                                                                                                                         | 西红柿鸡蛋面（荞麦面粉 50g，鸡蛋 40g，西红柿 50g，香葱 10g）<br>白菜烧豆腐（白菜 100g，北豆腐 30g，鲜辣椒 5g）<br>粉蒸蒿子秆（蒿子秆 120g，玉米面粉 20g）<br>豆芽海带汤（黄豆芽 30g，海带【水发】50g，金针菇 25g） |
| 油、盐                                                                                                                        | 全天总用量：植物油 18g，盐<5g                                                                                                                      |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 59g，碳水化合物 156g 及脂肪 34g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 26%。<br>2. *为食谱中用到的食药物质，如山药、黄精、赤小豆。 |                                                                                                                                         |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                                               |                                                                                                                                         |
| 早餐                                                                                                                         | 南瓜窝头（粗玉米面粉 40g，栗面南瓜 50g，黄豆粉 10g）<br>蒸蛋羹（鸡蛋 50g）<br>脱脂牛奶（250mL）<br>虾皮炒菠菜（菠菜 150g，虾皮 3g）                                                  |
| 中餐                                                                                                                         | 土豆蒸米饭（土豆 100g，糙米 40g，鹰嘴豆 10g）<br>豆腐焖草鱼（草鱼 50g，豆豉*3g，辣椒 3g，北豆腐 40g，葱姜 5g）<br>无糖黑豆浆（200mL）<br>柚子（200g）                                    |
| 晚餐                                                                                                                         | 茯苓发糕（茯苓粉*15g，全麦面粉 35g）<br>肉末炒黄豆芽（黄豆芽 120g，鸡肉 15g，香葱 10g）<br>清炒小白菜（小白菜 150g，胡萝卜 10g）<br>海米萝卜紫菜汤（海米 2g，白萝卜 50g，紫菜 2g，香菜 5g）               |
| 油、盐                                                                                                                        | 全天总用量：植物油 18g，盐<5g                                                                                                                      |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 68g，碳水化合物 186g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 55%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如豆豉、赤小豆、茯苓。 |                                                                                                                                         |
| <b>冬季食谱 3（总能量约 1600kcal）</b>                                                                                               |                                                                                                                                         |
| 早餐                                                                                                                         | 杂粮粥（小米 20g，白扁豆*10g，赤小豆*10g）<br>蒸铁棍山药（鲜山药*100g）<br>牛奶蒸蛋羹（鸡蛋 50g，脱脂牛奶 100mL）<br>香干炒菠菜（菠菜 120g，香干 20g）                                     |
| 中餐                                                                                                                         | 豆浆蒸杂粮饭（藜麦 20g，大米 50g，白豌豆 20g，豆浆 100mL）<br>酸汤余牛柳（牛肉 40g，莴笋 50g，绿豆芽 60g，野山椒 3g，木耳【水发】20g）<br>蒜蓉炒蒿子秆（蒿子秆 100g）<br>橙肉酸奶（无糖酸奶 200g，脐橙 200g）  |
| 晚餐                                                                                                                         | 腰豆香芋紫米饭（紫米 60g，红腰豆 10g，荔浦芋头 100g）<br>萝卜丝余海虾（鲜海虾【毛重】137g，白萝卜 100g，香菜 5g）<br>醋溜白菜（大白菜 100g）                                               |

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| 油、盐                                                                                                                         | 全天总用量：植物油 25g，盐 < 5g |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 78g，碳水化合物 231g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 58%，脂肪 22%。<br>2. *为食谱中用到的食药物质，如白扁豆、赤小豆、山药。 |                      |

## 四、华东地区

华东大部分地区主食以大米为主，有较丰富的湖鲜、河鲜等水产品，口味偏清淡，具有东方健康膳食模式的特点。本系列食谱遵循成人肥胖患者食养原则，合理搭配华东地区特色食材，尊重本地区传统饮食文化，保留特色饮食，并控制油、盐、糖使用量。华东地区四季食谱示例见表 3.4。

表 3.4 华东地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                                                                                                       |                                                                                                                                                         |
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| 早餐                                                                                                                          | 蒸山药+紫薯（鲜山药【毛重】*80g，紫薯【毛重】80g）<br>脱脂牛奶（200mL）<br>香菜水炒蛋（鸡蛋 55g，香菜 10g）<br>拍黄瓜（黄瓜 80g）                                                                     |
| 加餐                                                                                                                          | 樱桃番茄（80g）                                                                                                                                               |
| 中餐                                                                                                                          | 杂粮饭（藜麦 20g，薏苡仁*20g，大米 30g）<br>蒜香草头（草头 130g，大蒜 5g）<br>春笋肉片（春笋 80g，瘦肉 15g）<br>盐水虾（明虾【毛重】50g，生姜*5g）<br>紫菜汤（紫菜【干】5g）                                        |
| 加餐                                                                                                                          | 草莓（80g）                                                                                                                                                 |
| 晚餐                                                                                                                          | 燕麦饭（燕麦 30g，大米 30g）<br>清炒平菇（平菇【鲜】80g）<br>凉拌马兰头（香干 10g，马兰头 100g）<br>豆豉蒸鲈鱼（鲈鱼 60g，生姜*5g，淡豆豉*8g）<br>西红柿汤（西红柿 25g）                                           |
| 油、盐                                                                                                                         | 全天总用量：植物油 15g，盐<5g                                                                                                                                      |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 62g，碳水化合物 167g 及脂肪 35g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如山药、薏苡仁、生姜等。 |                                                                                                                                                         |
| 春季食谱 2（总能量约 1400kcal）                                                                                                       |                                                                                                                                                         |
| 早餐                                                                                                                          | 贝果汉堡（鸡蛋 50g，全麦贝果 60g，生菜 20g，西红柿 30g）<br>酸奶（200g）                                                                                                        |
| 加餐                                                                                                                          | 苹果【毛重】（100g）                                                                                                                                            |
| 中餐                                                                                                                          | 赤豆小米饭（赤小豆*15g，小米 10g，粳米 35g）<br>清炒水芹菜（水芹菜 120g）<br>香菇滑鸡（香菇【鲜】40g，鸡腿肉 20g）<br>香拌牛肉（牛肉 45g，香菜 10g，小米辣 3g，生姜*3g，洋葱 15g，木耳【干】5g）<br>昆布豆腐汤（昆布【干】*5g，嫩豆腐 10g） |

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| 加餐                                                                                                                          | 火龙果（80g）                                                                                                                                  |
| 晚餐                                                                                                                          | 杂粮饭（黑米 15g，粳米 30g）<br>炒芦笋（芦笋 100g）<br>荠菜蘑菇肉片（荠菜 120g，口蘑 30g，猪瘦肉 30g）<br>菠菜蒸蛋糕（菠菜 30g，鸡蛋 50g）<br>竹荪黄瓜汤（竹荪【干】10g，黄瓜 30g）                    |
| 油、盐                                                                                                                         | 全天总用量：植物油 20g，盐 < 5g                                                                                                                      |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 195g 及脂肪 42g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如赤小豆、昆布。     |                                                                                                                                           |
| <b>春季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                                                           |
| 早餐                                                                                                                          | 杂粮粥（酸枣仁*5g，黄豆 10g，藜麦 5g，糙米 20g，玉米粒【干】15g）<br>脱脂牛奶（250mL）<br>水炒蛋（鸡蛋 50g）<br>炒青菜（青菜 80g）                                                    |
| 加餐                                                                                                                          | 桑椹*（90g）                                                                                                                                  |
| 中餐                                                                                                                          | 红薯小米饭（红薯 15g，小米 10g，粳米 30g）<br>清炒花菜（菜花 130g，胡萝卜 20g）<br>茶树菇老鸭（茶树菇【干】30g，鸭肉 50g，生姜*5g，白果【干】*5g）<br>茄汁鱼片（黑鱼 40g，生姜*5g）<br>平菇汤（平菇 20g）       |
| 加餐                                                                                                                          | 橙子【毛重】（90g）                                                                                                                               |
| 晚餐                                                                                                                          | 凉拌荞麦面皮（荞麦面皮【熟】110g，牛腱子肉 60g，木耳【干】5g，黄瓜 100g，金针菇【鲜】30g，绿豆芽 25g，桑叶【鲜】*15g）<br>紫菜虾皮汤（紫菜【干】5g，虾皮 5g）                                          |
| 油、盐                                                                                                                         | 全天总用量：植物油 25g，盐 < 5g                                                                                                                      |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 81g，碳水化合物 218g 及脂肪 50g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如酸枣仁、桑椹、生姜等。 |                                                                                                                                           |
| <b>夏季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                                                           |
| 早餐                                                                                                                          | 三明治（全麦吐司 80g，鸡蛋 50g，生菜 20g，紫甘蓝 20g，西红柿 20g，低脂沙拉酱 5g）<br>脱脂牛奶（200mL）                                                                       |
| 加餐                                                                                                                          | 猕猴桃【毛重】（70g）                                                                                                                              |
| 中餐                                                                                                                          | 燕麦黑米饭（粳米 25g，黑米 10g，燕麦米 15g）<br>草菇西兰花（草菇【鲜】50g，西兰花 60g）<br>芹菜香干（芹菜 50g，香干 20g）<br>彩椒牛里脊（柿子椒 40g，牛里脊肉 45g，黑胡椒*1g）<br>薏苡仁冬瓜汤（薏苡仁*5g，冬瓜 80g） |
| 加餐                                                                                                                          | 山竹【毛重】（80g）                                                                                                                               |
| 晚餐                                                                                                                          | 小米红薯饭（小米 10g，红薯 20g，粳米 20g）<br>蒜泥空心菜（空心菜 130g）<br>荷塘月色（鲜虾仁 30g，木耳【干】5g，荷兰豆 30g，芦笋 30g，白果【干】*10g）                                          |

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|                                                                                                                              | 西葫芦肉丝（猪里脊肉 20g，西葫芦 40g）<br>丝瓜百合汤（丝瓜 50g，百合【干】*5g）                                                                                                                      |
| 油、盐                                                                                                                          | 全天总用量：植物油 15g，盐<5g                                                                                                                                                     |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 60g，碳水化合物 182g 及脂肪 30g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 57%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如薏苡仁、百合、黑胡椒等。 |                                                                                                                                                                        |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                                 |                                                                                                                                                                        |
| 早餐                                                                                                                           | 煮玉米（水果玉米【带棒】180g）<br>低脂牛奶（200mL）<br>煮鸡蛋（鸡蛋 50g）<br>李子【毛重】（80g）                                                                                                         |
| 加餐                                                                                                                           | 香瓜【毛重】（80g）                                                                                                                                                            |
| 中餐                                                                                                                           | 燕麦芡实饭（粳米 30g，芡实*【干】10g，燕麦 20g）<br>蒜泥苋菜（红苋菜 130g）<br>紫苏花蛤（紫苏【鲜】*15g，花蛤【毛重】150g）<br>仔姜炒牛肉（仔姜*50g，牛里脊肉 40g）<br>冬瓜昆布虾汤（冬瓜 60g，昆布*【干】15g，鲜虾仁 20g）                           |
| 加餐                                                                                                                           | 桃子【毛重】（70g）                                                                                                                                                            |
| 晚餐                                                                                                                           | 鸡丝荞麦凉面（荞麦面条 120g，鸡胸肉 40g，木耳【干】5g，杏鲍菇【鲜】30g，黄豆芽 20g，菠菜 60g，柿子椒 10g）<br>绿豆汤（绿豆 10g，大枣*【干】10g）                                                                            |
| 油、盐                                                                                                                          | 全天总用量：植物油 20g，盐<5g                                                                                                                                                     |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 216g 及脂肪 33g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 59%，脂肪 21%。<br>2. *为食谱中用到的食药物质，如紫苏、姜、大枣等。    |                                                                                                                                                                        |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                 |                                                                                                                                                                        |
| 早餐                                                                                                                           | 全麦刀切（90g）<br>无糖豆浆（200mL）<br>赤子水煮荷包蛋（鸡蛋 50g，枸杞子*5g）<br>樱桃【毛重】（60g）                                                                                                      |
| 加餐                                                                                                                           | 猕猴桃【毛重】（70g）                                                                                                                                                           |
| 中餐                                                                                                                           | 燕麦黑米饭（粳米 40g，黑米 20g，燕麦 30g）<br>蒸秋葵（秋葵 100g）<br>鞭笋炒肉（鞭笋 50g，木耳【干】5g，猪瘦肉 20g）<br>清蒸小黄鱼（小黄鱼 40g，生姜*5g）<br>西湖莼菜牛肉汤（牛里脊肉 10g，莼菜 20g）                                        |
| 加餐                                                                                                                           | 无花果【毛重】（60g）                                                                                                                                                           |
| 晚餐                                                                                                                           | 黑豆小米饭（粳米 40g，黑豆 15g，小米 25g）<br>清炒南瓜藤（南瓜藤 120g）<br>苦瓜酿虾滑（苦瓜 80g，虾滑 30g）<br>什锦拌鸡丝（茭白 40g，葫芦 30g，鸡胸肉 25g，胡萝卜 15g，木耳【干】5g，花椒*2g）<br>三鲜汤（金针菇【鲜】15g，西红柿 30g，嫩豆腐 10g，贻贝【干】5g） |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐<5g                                                                                                                                                     |

注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 82g，碳水化合物 237g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。  
2. \*为食谱中用到的食药物质，如生姜、枸杞子、花椒。

#### 秋季食谱 1（总能量约 1200kcal）

|     |                                                                                                                                                 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 馒头（45g）<br>煮鸡蛋（鸡蛋 50g）<br>桃胶银耳牛奶羹（桃胶【干】5g，银耳【干】5g，莲子*【干】5g，牛奶 200mL）                                                                            |
| 加餐  | 鸭梨【毛重】（100g）                                                                                                                                    |
| 中餐  | 黑米饭（黑米 20g，粳米 25g）<br>蒜泥木耳菜（木耳菜 120g）<br>西芹百合虾仁（西芹 50g，百合*【鲜】20g，鲜虾仁 30g）<br>葫芦肉片（葫芦【去皮】40g，猪瘦肉 20g）<br>西红柿蛋花汤（西红柿 30g，紫菜【干】5g）                 |
| 加餐  | 杨桃（50g）                                                                                                                                         |
| 晚餐  | 板栗饭（板栗 15g，粳米 25g）<br>清炒红薯藤叶（红薯藤叶 120g）<br>洋葱香芹牛肉丝（牛里脊肉 40g，洋葱 40g，香芹 40g，黑胡椒*2g）<br>葱油蛭子（蛭子【毛重】150g，生姜 5g）<br>三鲜汤（香菇【鲜】20g，嫩豆腐 10g，牡蛎肉【鲜】*10g） |
| 油、盐 | 全天总用量：植物油 15g，盐 < 5g                                                                                                                            |

注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 60g，碳水化合物 180g 及脂肪 31g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 56%，脂肪 24%。  
2. \*为食谱中用到的食药物质，如百合、莲子、黑胡椒等。

#### 秋季食谱 2（总能量约 1400kcal）

|     |                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 肉包（70g）<br>咸豆花（150g）<br>煮鸡蛋（鸡蛋 50g）                                                                                                                               |
| 加餐  | 芭乐【毛重】（80g）                                                                                                                                                       |
| 中餐  | 燕麦红薯饭（燕麦 20g，红薯 30g，粳米 40g）<br>蒜泥生菜（生菜 130g）<br>圆椒藕带（柿子椒 35g，藕带 55g）<br>盐水河虾（河虾 70g、生姜*5g）<br>玉竹老鸭汤（玉竹【干】*5g，老鸭 40g，橘皮*3g，生姜*5g，大枣 5g）                            |
| 加餐  | 车厘子【毛重】（80g）<br>无糖酸奶（180g）                                                                                                                                        |
| 晚餐  | 山药米饭（鲜山药*25g，粳米 45g）<br>手撕包心菜（圆白菜 160g）<br>凉拌素什锦（木耳【干】5g，金针菇 20g，芹菜 80g，香干 10g）<br>西红柿炖牛肉（西红柿 50g，牛腱子肉 50g，生姜*5g，山楂【干】5g，花椒*3g）<br>竹荪三鲜汤（竹荪【干】5g，杏鲍菇 20g，猪瘦肉 15g） |
| 油、盐 | 全天总用量：植物油 10g，盐 < 5g                                                                                                                                              |

注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 190g 及脂肪 44g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 27%。  
2. \*为食谱中用到的食药物质，如玉竹、橘皮、生姜等。

### 秋季食谱 3（总能量约 1600kcal）

|     |                                                                                                                                      |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 青菜鸡蛋荞麦面（荞麦面条 100g，上海青 50g，鸡蛋 50g，西红柿 40g）<br>酸奶（200g）                                                                                |
| 加餐  | 木瓜*（60g）                                                                                                                             |
| 中餐  | 二米饭（藜麦 15g，粳米 40g）<br>清炒四季豆（四季豆 100g）<br>田园小炒（白果【干】*20g，荷兰豆 40g，胡萝卜 15g，木耳【干】5g）<br>清蒸鲳鱼（鲳鱼 80g、生姜*5g）<br>西红柿豆腐汤（西红柿 30g，嫩豆腐 15g）    |
| 加餐  | 橘子【毛重】（80g）                                                                                                                          |
| 晚餐  | 赤小豆饭（赤小豆*20g，粳米 30g）<br>炒油麦菜（油麦菜 110g）<br>凉拌昆布（昆布【干】*30g）<br>清蒸梭子蟹（梭子蟹【毛重】140g，生姜*5g）<br>蛤蜊冬瓜排骨汤（蛤蜊【毛重】60g，冬瓜 40g，黄精*10g，猪小排【带骨】50g） |
| 油、盐 | 全天总用量：植物油 15g，盐 < 5g                                                                                                                 |

注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 80g，碳水化合物 221g 及脂肪 48g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 27%。  
2. \*为食谱中用到的食药物质，如木瓜、白果、昆布等。

### 冬季食谱 1（总能量约 1200kcal）

|     |                                                                                                                                                  |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 花卷（55g）<br>豆腐脑（100g）<br>茶叶蛋（鸡蛋 50g）<br>脱脂牛奶（150mL）                                                                                               |
| 加餐  | 凤梨（60g）                                                                                                                                          |
| 中餐  | 藜麦薏米饭（薏苡仁*15g，藜麦 10g，粳米 25g）<br>醋溜辣白菜（大白菜 110g）<br>香菇冬笋（冬笋 50g，香菇【鲜】60g）<br>萝卜炖羊肉（白萝卜 60g，羊后腿肉 30g，生姜*10g，小茴香*5g）<br>黄瓜紫菜汤（黄瓜 40g，紫菜【干】3g）       |
| 加餐  | 文旦（70g）                                                                                                                                          |
| 晚餐  | 黑米饭（黑米 15g，小米 20g，粳米 25g）<br>鸭血豆腐（鸭血 30g，豆腐 20g）<br>蒜苔牛肉（蒜苔 60g，牛瘦肉 25g）<br>柠香鸡腿肉（鸡腿肉【去皮】30g，洋葱 10g，香菜 5g，柠檬 10g，小米辣 3g）<br>菠菜蘑菇汤（蘑菇 20g，菠菜 20g） |
| 油、盐 | 全天总用量：植物油 18g，盐 < 5g                                                                                                                             |

注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 59g，碳水化合物 173g 及脂肪 32g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 55%，脂肪 26%。  
2. \*为食谱中用到的食药物质，如薏苡仁、生姜、小茴香。

#### 冬季食谱 2（总能量约 1400kcal）

|     |                                                                                                                                                        |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 冬菜虾仁小馄饨（冬菜虾仁小馄饨 80g，青菜 30g，紫菜 3g）<br>无糖酸奶（180g）                                                                                                        |
| 加餐  | 金红桃【毛重】（70g）                                                                                                                                           |
| 中餐  | 二米饭（糙米 35g，粳米 35g）<br>清炒娃娃菜（娃娃菜 130g，木耳【干】5g）<br>彩椒牛里脊（牛里脊肉 20g，柿子椒 50g）<br>紫苏蒸香螺（香螺【毛重】80g，紫苏【干】*5g，生姜*5g）<br>赤子千金汤（千张 10g，西红柿 50g，金针菇 15g，枸杞子【干】*3g） |
| 加餐  | 橘子【毛重】（70g）                                                                                                                                            |
| 晚餐  | 青稞饭（青稞米 20g，小米 10g，粳米 40g）<br>香菇青菜（香菇【鲜】20g，青菜 130g）<br>蒜苗炒冬笋（蒜苗 40g，冬笋 60g）<br>盐水虾（基围虾 50g，生姜*5g）<br>鲫鱼豆腐汤（鲫鱼 25g，豆腐 30g，白萝卜 30g，生姜*5g）               |
| 油、盐 | 全天总用量：植物油 20g，盐 < 5g                                                                                                                                   |

注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 69g，碳水化合物 200g 及脂肪 39g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。  
2. \*为食谱中用到的食药物质，如枸杞子、紫苏、生姜。

#### 冬季食谱 3（总能量约 1600kcal）

|     |                                                                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 蒸老南瓜【毛重】（老南瓜 200g）<br>煮鸡蛋（鸡蛋 50g）<br>燕麦牛奶（燕麦 30g，牛奶 150mL）                                                                                                   |
| 加餐  | 柚子（80g）                                                                                                                                                      |
| 中餐  | 糙米土豆饭（糙米 25g，土豆 20g，粳米 40g）<br>蒜泥茼蒿（茼蒿 180g）<br>杏鲍菇牛柳（杏鲍菇 60g，牛肉 30g）<br>拌三丝（莴笋 50g，昆布【干】15g，金针菇 30g）<br>黄精虫草花炖鸡（黄精*10g，虫草花【干】10g，鸡肉 20g）                    |
| 加餐  | 苹果【毛重】（100g）                                                                                                                                                 |
| 晚餐  | 赤小豆玉米饭（赤小豆*20g，玉米粒【干】20g，粳米 40g）<br>清炒杭白菜（香菇【干】15g，杭白菜 180g）<br>滑口千张（千张 50g，柿子椒 50g）<br>清蒸大闸蟹（大闸蟹【毛重】120g、生姜*5g）<br>补气猪心汤（猪心 20g，大枣*5g，枸杞子【干】*3g，当归*5g，姜*5g） |
| 油、盐 | 全天总用量：植物油 20g，盐 < 5g                                                                                                                                         |

注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 83g，碳水化合物 219g 及脂肪 49g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。  
2. \*为食谱中用到的食药物质，如黄精、赤小豆、昆布等，当归仅做香辛料和调味品使用。

## 五、华中地区

华中地区居民主食以米面为主，蔬菜种类多样，水果丰富，饮食口味偏辣、油盐重。本系列食谱遵循成人肥胖患者食养原则，合理搭配华中地区特色食材，尊重本地区传统饮食文化，保留特色饮食，并控制油、盐、糖使用量。华中地区四季食谱示例见表 3.5。

表 3.5 华中地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                                                                    |                                                                                                                |
|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 早餐                                                                                       | 红薯（200g）<br>牛奶（160mL）<br>麻油素捆鸡（素捆鸡 30g，尖椒 50g）<br>木耳荷兰豆（木耳【水发】50g，荷兰豆 30g）                                     |
| 中餐                                                                                       | 花生糙米饭（花生 15g，糙米 25g，大米 25g）<br>瘦肉饼蒸蛋（猪瘦肉 30g，鸡蛋 50g）<br>烫生菜（生菜 200g）<br>枸杞猪肝汤（猪肝 25g，枸杞子*10g）                  |
| 加餐                                                                                       | 猕猴桃（100g）                                                                                                      |
| 晚餐                                                                                       | 藜麦小米饭（藜麦 30g，大米 15g）<br>蒸鲈鱼（鲈鱼 50g）<br>香菇炒菜心（香菇【鲜】100g，广东菜心 50g）<br>炒油麦菜（油麦菜 100g）                             |
| 油、盐                                                                                      | 全天总用量：油 15g，盐 < 5g                                                                                             |
| 注：本食谱提供能量约为 1200kcal，其中蛋白质 61g，碳水化合物 163g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 51%，脂肪 29%。 |                                                                                                                |
| 2.*为食谱中用到的食药物质，如枸杞子。                                                                     |                                                                                                                |
| 春季食谱 2（总能量约 1400kcal）                                                                    |                                                                                                                |
| 早餐                                                                                       | 虾米馄饨（馄饨皮 60g，虾仁 30g）<br>酸辣白菜（小米辣 10g，大白菜 200g）                                                                 |
| 中餐                                                                                       | 杂粮米饭（大米 60g，冻玉米粒 120g）<br>麻辣豆腐（小米辣 10g，南豆腐 100g）<br>干锅花菜（胡萝卜 100g，辣椒 15g，菜花 160g）<br>牛肉冬瓜汤（牛瘦肉 50g，冬瓜 80g）     |
| 加餐                                                                                       | 低脂牛奶（180mL）                                                                                                    |
| 晚餐                                                                                       | 杂粮米饭（黑米 25g，大米 35g）<br>辣椒炒鸡肉（尖椒 80g，鸡胸肉 50g）<br>西兰花炒香菇（西兰花 100g，香菇【鲜】60g）<br>山药菌菇汤（鲜山药*30g，香菇【鲜】25g，白玉菇【鲜】25g） |
| 油、盐                                                                                      | 全天总用量：油 20g，盐 < 5g                                                                                             |

注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 72g，碳水化合物 207g 及脂肪 37g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 57%，脂肪 23%。  
2. \*为食谱中用到的食药物质，如山药。

### 春季食谱 3（总能量约 1600kcal）

|     |                                                                                                            |
|-----|------------------------------------------------------------------------------------------------------------|
| 早餐  | 煮玉米（糯玉米【带棒】304g）<br>低脂牛奶（250mL）<br>鸡蛋（50g）<br>苹果（150g）                                                     |
| 中餐  | 红薯紫米饭（红薯 150g，紫米 35g）<br>大蒜红椒炒河蚌肉（红柿子椒 30g，河蚌肉 120g）<br>韭菜炒圆白菜（韭菜 20g，圆白菜 100g）<br>冬虫草炖鸭子（去皮鸭肉 50g，虫草花 5g） |
| 加餐  | 橘子（100g）                                                                                                   |
| 晚餐  | 藜麦赤小豆饭（藜麦 15g，赤小豆*30g）<br>蒸排骨腐竹（猪小排 50g，腐竹【水发】40g）<br>黄瓜西红柿汤（黄瓜 50g，西红柿 50g）<br>红椒荷兰豆（红柿子椒 50g，荷兰豆 80g）    |
| 油、盐 | 全天总用量：油 20g，盐 < 5g                                                                                         |

注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 79g，碳水化合物 216g 及脂肪 49g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 54%，脂肪 27%。  
2. \*为食谱中用到的食药物质，如赤小豆。

### 夏季食谱 1（总能量约 1200kcal）

|     |                                                                                        |
|-----|----------------------------------------------------------------------------------------|
| 早餐  | 牛奶枸杞燕麦片粥（牛奶 250mL，枸杞子*5g，燕麦片 35g）<br>蒸香干（香干 35g）<br>煸碎豆角（豆角 50g）                       |
| 中餐  | 紫薯香菇干蒸去皮鸡（紫薯 150g，香菇【干】25g，鸡胸肉 50g）<br>大葱柿子椒百叶（柿子椒 50g，牛百叶（黑）30g）<br>白灼秋葵（秋葵 100g）     |
| 加餐  | 黄桃（100g）                                                                               |
| 晚餐  | 绿豆薏米粥（绿豆 25g，薏苡仁*25g）<br>焖小黄鱼（小黄鱼 40g）<br>杏鲍菇胡萝卜丝（鲜杏鲍菇 100g，胡萝卜 50g）<br>拌红薯叶（红薯叶 100g） |
| 油、盐 | 全天总用量：植物油 15g，盐 < 5g                                                                   |

注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 65g，碳水化合物 184g 及脂肪 33g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 57%，脂肪 23%。  
2. \*为食谱中用到的食药物质，如枸杞子，薏苡仁。

### 夏季食谱 2（总能量约 1400kcal）

|    |                                                                       |
|----|-----------------------------------------------------------------------|
| 早餐 | 低脂奶赤小豆薏米羹（低脂牛奶 100mL，赤小豆*25g，薏苡仁*30g）<br>茶盐鸡蛋（鸡蛋 50g）<br>蒸茄子（茄子 100g） |
| 中餐 | 芸豆大米饭（芸豆 20g，大米 60g）<br>干香菇蒸去皮鸭（香菇【干】25g，去皮鸭肉 40g）<br>盐水煮毛豆（毛豆 25g）   |

|                                                                                                                             |                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                             | 苋菜汤（苋菜 150g）                                                                                                            |
| 加餐                                                                                                                          | 桃子（100g）                                                                                                                |
| 晚餐                                                                                                                          | 山药红米饭（鲜山药*150g，红米 25g）<br>剁椒蒸鱼头（鱼头 35g）<br>红椒四季豆猪肉丝（干辣椒 10g，四季豆 100g，猪肉 30g）<br>炒空心菜（空心菜 100g）                          |
| 油、盐                                                                                                                         | 全天总用量：植物油 20g，盐 < 5g                                                                                                    |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 74g，碳水化合物 204g 及脂肪 38g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 56%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如赤小豆、薏苡仁、山药。 |                                                                                                                         |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                                         |
| 早餐                                                                                                                          | 虾仁三明治（全麦吐司 50g，土豆泥 100g，鲜虾仁 50g，牛油果 20g，酸奶 30g，生菜 30g）<br>红枣姜茶（大枣*5g，生姜*5g）                                             |
| 中餐                                                                                                                          | 杂粮米饭（大米 50g，荞麦 37g）<br>凉拌麻辣鸡丝（柿子椒 20g，鸡胸肉 50g）<br>苦瓜炒蛋（苦瓜 100g，鸡蛋 50g）<br>蚝油生菜（生菜 150g）<br>酸菜豆腐汤（酸菜 15g，豆腐 30g，金针菇 20g） |
| 加餐                                                                                                                          | 低脂牛奶（160mL）                                                                                                             |
| 晚餐                                                                                                                          | 杂粮饭（大米 40g，燕麦 25g）<br>剁椒鲢鱼（剁辣椒 30g，鲢鱼 80g）<br>酸辣白菜（大白菜 150g）<br>银耳莲子汤（银耳【干】15g，大枣*6g，莲子【鲜】*3g）                          |
| 油、盐                                                                                                                         | 全天总用量：植物油 20g，盐 < 5g                                                                                                    |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 82g，碳水化合物 214g 及脂肪 51g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如大枣、生姜、莲子。   |                                                                                                                         |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                                         |
| 早餐                                                                                                                          | 赤小豆莲子（赤小豆*25g，莲子【鲜】*25g）<br>低脂牛奶（180mL）<br>煮鸡蛋（鸡蛋 50g）<br>炒西兰花（西兰花 100g）                                                |
| 中餐                                                                                                                          | 煮玉米（水果玉米【带棒】200g）<br>韭菜花红椒炒河蚌肉（韭菜花 10g，红柿子椒 10g，河蚌 100g）<br>五香毛豆（毛豆 100g）<br>丝瓜汤（丝瓜 100g）                               |
| 加餐                                                                                                                          | 梨（100g）                                                                                                                 |
| 晚餐                                                                                                                          | 青稞绿豆粥（青稞 25g，绿豆 25g）<br>豆豉辣椒蒸草鱼块（豆豉*5g，辣椒 5g，草鱼块 100g）<br>炒豆角（豆角 100g）<br>清炒木耳菜（木耳菜 100g）                               |
| 油、盐                                                                                                                         | 全天总用量：植物油 15g，盐 < 5g                                                                                                    |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 62g，碳水化合物 144g 及脂肪                                                                            |                                                                                                                         |

40g; 宏量营养素占总能量比约为: 蛋白质 20%, 碳水化合物 50%, 脂肪 30%。

2.\*为食谱中用到的食药物质, 如赤小豆、莲子、豆豉。

### 秋季食谱 2 (总能量约 1400kcal)

|     |                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------|
| 早餐  | 红枣紫米藜麦粥 (大枣*10g, 紫米 25g, 藜麦 25g)<br>低脂牛奶 (180mL)<br>茶盐鸡蛋 (鸡蛋 50g)<br>云耳炒洋葱 (木耳【干】20g, 洋葱 100g)               |
| 中餐  | 花豆高粱饭 (红花豆 50g, 高粱米 50g)<br>红椒茭白兔肉 (红柿子椒 25g, 茭白 25g, 兔肉 50g)<br>西红柿豆腐汤 (西红柿 50g, 豆腐 50g)<br>拌红薯叶 (红薯叶 100g) |
| 加餐  | 苹果 (100g)                                                                                                    |
| 晚餐  | 芋头 (芋头 250g)<br>酱椒蒸鱼 (鳕鱼 50g)<br>炒豆角 (豆角 100g)<br>韭菜豆芽 (韭菜 50g, 绿豆芽 50g)                                     |
| 油、盐 | 全天总用量: 植物油 20g, 盐 < 5g                                                                                       |

注: 1. 本食谱提供能量约为 1400kcal, 其中蛋白质 72g, 碳水化合物 209g 及脂肪 37g; 宏量营养素占总能量比约为: 蛋白质 20%, 碳水化合物 57%, 脂肪 23%。

2.\*为食谱中用到的食药物质, 如大枣。

### 秋季食谱 3 (总能量约 1600kcal)

|     |                                                                                                                                          |
|-----|------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐  | 牛肉米粉 (湿米粉 130g, 牛瘦肉 50g, 上海青 150g)                                                                                                       |
| 中餐  | 杂粮米饭 (大米 70g, 黑米 40g)<br>西兰花炒虾仁 (西兰花 90g, 冻虾仁 90g)<br>爆炒圆白菜 (黄柿子椒 30g, 圆白菜 150g)<br>蒜蓉广东菜心 (广东菜心 150g)<br>鱼头豆腐汤 (鱼头 40g, 豆腐 30g, 生姜*10g) |
| 加餐  | 低脂牛奶 (180mL)                                                                                                                             |
| 晚餐  | 蒸南瓜 (南瓜 350g)<br>生菜卷清蒸千张金针菇 (生菜 80g, 千张 40g, 金针菇 80g)<br>青菜豆腐鸡蛋汤 (上海青 30g, 豆腐 30g, 鸡蛋 50g)                                               |
| 油、盐 | 全天总用量: 植物油 20g, 盐 < 5g                                                                                                                   |

注: 1. 本食谱提供能量约为 1600kcal, 其中蛋白质 80g, 碳水化合物 216g 及脂肪 50g; 宏量营养素占总能量比约为: 蛋白质 19%, 碳水化合物 53%, 脂肪 28%。

2.\*为食谱中用到的食药物质, 如生姜。

### 冬季食谱 1 (总能量约 1200kcal)

|    |                                                                                                  |
|----|--------------------------------------------------------------------------------------------------|
| 早餐 | 煮玉米 (糯玉米【带棒】304g)<br>西红柿 (200g)<br>凉拌海带丝 (海带丝【湿】100g)<br>鸡蛋 (50g)                                |
| 中餐 | 杂粮米饭 (大米 50g, 燕麦 25g)<br>家常南豆腐 (南豆腐 50g)<br>彩椒大葱鸡胸肉 (柿子椒 60g, 大葱 5g, 鸡胸肉 30g)<br>炒西兰花 (西兰花 100g) |

|                                                                                                                                            |                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 加餐                                                                                                                                         | 低脂牛奶（180mL）                                                                                                                             |
| 晚餐                                                                                                                                         | 蒸山药（鲜山药*300g）<br>清蒸基围虾（去皮基围虾 40g）<br>凉拌竹笋（竹笋 100g）<br>豆豉煮冬苋菜（豆豉 5g，苋菜 100g）                                                             |
| 油、盐                                                                                                                                        | 全天总用量：植物油 15g，盐 < 5g                                                                                                                    |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 60g，碳水化合物 178g 及脂肪 32g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 58%，脂肪 23%。<br>2. *为食谱中用到的食药物质，如山药。                        |                                                                                                                                         |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                                                               |                                                                                                                                         |
| 早餐                                                                                                                                         | 蒸山药（鲜山药*250g）<br>牛奶（250mL）<br>清炒芥菜（芥菜 100g）                                                                                             |
| 中餐                                                                                                                                         | 赤小豆薏米粥（赤小豆*25g，薏苡仁*25g）<br>芹菜炒香干（芹菜 50g，香干 60g）<br>清炒萝卜（胡萝卜 50g，青萝卜 100g）<br>当归生姜羊肉汤（当归*5g，生姜 10g，羊瘦肉 30g）                              |
| 加餐                                                                                                                                         | 苹果（150g）                                                                                                                                |
| 晚餐                                                                                                                                         | 芋头红米饭（芋头 150g，红米 35g）<br>剁椒蒸鱼头（鱼头 50g，剁辣椒 15g）<br>红椒四季豆里脊肉丝（红柿子椒 20g，四季豆 30g，猪里脊肉 50g）<br>茼蒿菜（茼蒿菜 150g）                                 |
| 油、盐                                                                                                                                        | 全天总用量：植物油 20g，盐 < 5g                                                                                                                    |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 72g，碳水化合物 184g 及脂肪 46g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 51%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如山药、赤小豆、薏苡仁等，当归仅做香辛料和调味品使用。 |                                                                                                                                         |
| <b>冬季食谱 3（总能量约 1600kcal）</b>                                                                                                               |                                                                                                                                         |
| 早餐                                                                                                                                         | 玉米面饼（玉米面粉 70g）<br>肉末鸡蛋羹（猪肉 15g，鸡蛋 50g）<br>清炒油麦菜（油麦菜 150g）<br>无糖豆浆（黄豆【干】15g）                                                             |
| 中餐                                                                                                                                         | 杂粮米饭（大米 50g，藜麦 35g）<br>剁椒鱼块（干辣椒 5g，花椒 3g，剁辣椒 20g，草鱼 50g）<br>芹菜炒牛柳（芹菜 150g，牛瘦肉 35g）<br>酸菜金针菇（酸菜 20g，金针菇 130g）<br>薏苡仁藕香汤（薏苡仁*25g，莲藕 100g） |
| 加餐                                                                                                                                         | 低脂牛奶（100mL）                                                                                                                             |
| 晚餐                                                                                                                                         | 杂粮米饭（大米 30g，赤小豆*25g）<br>虾仁滑蛋（冻虾仁 30g，鸡蛋 30g）<br>青椒炒香菇（尖椒 60g，香菇【鲜】130g）<br>冬瓜海带汤（冬瓜 30g，海带【鲜】30g）                                       |
| 油、盐                                                                                                                                        | 全天总用量：植物油 20g，盐 < 5g                                                                                                                    |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 81g，碳水化合物 231g 及脂肪                                                                                           |                                                                                                                                         |

44g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 56%，脂肪 24%。  
2.\*为食谱中用到的食药物质，如薏苡仁、赤小豆。

## 六、西南地区

西南地区居民主要以大米和糯米为主食，肉类以禽畜肉为主，口味重，大多喜辣、麻、酸。本系列食谱遵循成人肥胖患者食养原则，合理搭配西南地区特色食材，尊重本地区传统饮食文化，保留特色饮食，并控制油、盐、糖使用量。西南地区四季食谱示例见表 3.6。

表 3.6 西南地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                                                                                                    |                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 早餐                                                                                                                       | 煮玉米（玉米【带棒】150g）<br>脱脂牛奶（250mL）<br>煮鸡蛋（50g）                                            |
| 加餐                                                                                                                       | 车厘子（250g）                                                                             |
| 中餐                                                                                                                       | 三鲜米粉（小白菜 200g，木耳【干】25g，海带【湿】25g，草鱼 65g，米粉【干】35g）                                      |
| 加餐                                                                                                                       | 无糖豆浆（黄豆 12g）                                                                          |
| 晚餐                                                                                                                       | 杂粮米饭（大米 25g，薏苡仁*25g）<br>莴笋炒兔丁（莴笋 200g，兔肉 50g，生姜*2g）<br>木瓜拌菜（木瓜*50g，胡萝卜 50g，春笋【鲜】50g）  |
| 油、盐                                                                                                                      | 全天总用量：植物油 24g，盐 < 5g                                                                  |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 61g，碳水化合物 155g 及脂肪 38g；宏量营养素占总能量比为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如薏苡仁、姜、木瓜。 |                                                                                       |
| 春季食谱 2（总能量约 1400kcal）                                                                                                    |                                                                                       |
| 早餐                                                                                                                       | 红油米线（米粉【干】50g，绿豆芽 100g，辣椒油 5g）<br>无糖豆浆（黄豆 20g）<br>煮鸡蛋（鸡蛋 50g）                         |
| 中餐                                                                                                                       | 杂粮米饭（玉米糝 15g，大米 60g，枸杞子【干】*3g）<br>葱香鲫鱼（鲫鱼 100g，小葱 10g，花椒*2g）<br>青椒茄子（茄子 100g，尖椒 100g） |
| 加餐                                                                                                                       | 草莓（200g）                                                                              |
| 晚餐                                                                                                                       | 白饼夹肉（胡萝卜 70g，牛瘦肉 50g，面粉 70g）<br>炆炒茼蒿（茼蒿 200g）                                         |
| 油、盐                                                                                                                      | 全天总用量：植物油 25g，盐 < 5g                                                                  |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 65g，碳水化合物 188g 及脂肪 45g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 54%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如枸杞子、花椒。  |                                                                                       |
| 春季食谱 3（总能量约 1600kcal）                                                                                                    |                                                                                       |
| 早餐                                                                                                                       | 三明治（面粉 60g，鸡蛋 50g，生菜 100g）                                                            |

|                                                                                                                              |                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|                                                                                                                              | 燕麦酸奶水果碗（燕麦片 25g，无糖酸奶 150g，猕猴桃 50g）                                                               |
| 中餐                                                                                                                           | 杂粮米饭（黑米 75g，黑豆 10g）<br>素炒韭菜（韭菜 200g）<br>辣子鸡（鸡【去皮，带骨】75g，干辣椒 25g，花椒*5g）                           |
| 晚餐                                                                                                                           | 素酸辣粉（甘薯粉条【干】70g，瓢儿白 200g）<br>卤牛肉（牛腱子肉 35g）<br>紫苏拌豆腐（紫苏叶*25g，豆腐 100g）                             |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐<5g                                                                               |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 79g，碳水化合物 210g 及脂肪 50g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 52%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如花椒、紫苏。       |                                                                                                  |
| <b>夏季食谱 1（总能量约 1200kcal）</b>                                                                                                 |                                                                                                  |
| 早餐                                                                                                                           | 蒸红薯（甘薯 150g）<br>鸡蛋羹（鸡蛋 50g）<br>脱脂牛奶（250mL）                                                       |
| 加餐                                                                                                                           | 李子（200g）                                                                                         |
| 中餐                                                                                                                           | 杂粮米饭（大米 45g，玉米糝 15g）<br>红烧鳊鱼（鳊鱼 70g，尖椒 100g，黄瓜 150g，八角茴香*2g）<br>水煮时蔬（油麦菜 150g）                   |
| 晚餐                                                                                                                           | 土豆泥（土豆 200g）<br>炒空心菜（空心菜 200g）<br>竹荪炖鸡（竹荪【干】25g，鸡【去皮，带骨】60g，枸杞子【干】*10g，生姜*2g）                    |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐<5g                                                                               |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 59g，碳水化合物 175g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 57%，脂肪 29%。<br>2. *为食谱中用到的食药物质，如八角茴香、枸杞子、生姜。 |                                                                                                  |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                                 |                                                                                                  |
| 早餐                                                                                                                           | 杂粮馒头（面粉 40g，枸杞子【干】*5g，葡萄干 10g）<br>脱脂牛奶（250mL）                                                    |
| 加餐                                                                                                                           | 红香蕉苹果（150g）                                                                                      |
| 中餐                                                                                                                           | 杂粮粥（大米 50g，玉米糝 5g，百合【干】*5g，莲子*5g）<br>黄瓜木耳炒肉片（黄瓜 75g，木耳【水发】50g，猪瘦肉 75g）<br>炒青椒茄子（茄子 100g，尖椒 100g） |
| 晚餐                                                                                                                           | 酸辣荞麦面（荞麦面粉 65g）<br>耙耙菜（四季豆 100g，茄子 100g）<br>水煮肉片（猪瘦肉 75g，生菜 200g）                                |
| 油、盐                                                                                                                          | 全天总用量：植物油 25g，盐<5g                                                                               |
| 注：1. 本食谱提供能量约为 1400Kcal，其中蛋白质 68g，碳水化合物 189g 及脂肪 41g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 55%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如百合、莲子、枸杞子。   |                                                                                                  |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                                 |                                                                                                  |
| 早餐                                                                                                                           | 杂粮煎饼（面粉 15g，玉米面粉 25g，核桃仁【干】10g）<br>蒸山药（鲜山药*150g）                                                 |

|                                                                                                                             |                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                                                                                                                             | 无糖酸奶（200g）                                                                                      |
| 加餐                                                                                                                          | 李子（50g）                                                                                         |
| 中餐                                                                                                                          | 杂粮米饭（黑米 50g，黑米 25g）<br>耙耙菜（四季豆 100g，茄子 100g）<br>泡椒芹菜牛肉丝（泡椒 25g，水芹菜 150g，牛瘦肉 75g）                |
| 加餐                                                                                                                          | 红香蕉苹果（150g）                                                                                     |
| 晚餐                                                                                                                          | 杂粮米饭（玉米糝 15g，大米 50g）<br>韭菜炒豆腐干（卤豆腐干 20g，韭菜 200g）<br>葱油手撕鸡（鸡胸肉【去皮】75g，小葱 30g）                    |
| 油、盐                                                                                                                         | 全天总用量：植物油 25g，盐 < 5g                                                                            |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 73g，碳水化合物 206g 及脂肪 53g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 52%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如山药。         |                                                                                                 |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                 |
| 早餐                                                                                                                          | 燕麦粥（燕麦片 50g，脱脂牛奶 200mL）<br>拌芹菜（芹菜 100g）<br>煮鸡蛋（鸡蛋 50g）                                          |
| 加餐                                                                                                                          | 橙子（100g）                                                                                        |
| 中餐                                                                                                                          | 杂粮饭（大米 30g、薏苡仁*20g）<br>拌三丝（木耳【水发】50g，胡萝卜 150g，海带【干】10g）<br>椒香蒸鱼（桂鱼 50g、黄豆芽 50g，花椒*5g）           |
| 晚餐                                                                                                                          | 杂粮饭（大米 30g、薏苡仁*20g）<br>手撕圆白菜（圆白菜 150g）<br>药膳烧鸡（乌骨鸡【去皮，带骨】50g，橘皮*5g，鲜蘑菇 100g，茯苓*5g）；             |
| 油、盐                                                                                                                         | 全天总用量：植物油 24g，盐 < 5g                                                                            |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 62g，碳水化合物 150g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 50%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如花椒、茯苓、薏苡仁等。 |                                                                                                 |
| <b>秋季食谱 2（总能量约 1400kcal）</b>                                                                                                |                                                                                                 |
| 早餐                                                                                                                          | 燕麦粥（燕麦片 60g，脱脂牛奶 200mL）<br>早餐拌菜（冬笋【鲜】150g）<br>煮鸡蛋（鸡蛋 50g）                                       |
| 中餐                                                                                                                          | 杂粮饭（大米 50g，高粱米 15g）<br>炒儿菜（儿菜 200g）<br>鱼香肉丝（猪瘦肉 50g，木耳【水发】50g，胡萝卜 50g）                          |
| 晚餐                                                                                                                          | 杂粮饭（大米 45g，玉米糝 15g）<br>凉拌鱼腥草（鱼腥草*50g，海带【湿】50g，胡萝卜 50g）<br>枸杞豆腐鱼（鲈鱼 50g，嫩豆腐 50g，枸杞子*5g，莴笋叶 200g） |
| 油、盐                                                                                                                         | 全天总用量：植物油 25g，盐 < 5g                                                                            |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 185g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 28%。<br>2. *为食谱中用到的食药物质，如枸杞子、鱼腥草。    |                                                                                                 |
| <b>秋季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                 |

|                                                                                                                         |                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 早餐                                                                                                                      | 燕麦粥（燕麦片 50g，脱脂牛奶 250mL）<br>早餐拌菜（秋葵 200g）<br>煮鸡蛋（鸡蛋 50g）                                   |
| 中餐                                                                                                                      | 杂粮饭（大米 75g，玉米糝 20g）<br>热拌时蔬（红菜苔 200g）<br>白油肉片（猪瘦肉 50g，木耳【水发】50g，莴笋 50g，生姜*5g）             |
| 晚餐                                                                                                                      | 杂粮饭（大米 75g，高粱米 20g）<br>拌菜（生菜 200g）<br>素炒香菇（香菇【鲜】200g）<br>紫苏鱼（紫苏叶*10g，黑鱼 100g）             |
| 油、盐                                                                                                                     | 全天总用量：植物油 25g，盐<5g                                                                        |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 82g，碳水化合物 215g 及脂肪 48g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 53%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如生姜、紫苏。  |                                                                                           |
| <b>冬季食谱 1（总能量约 1200kcal）</b>                                                                                            |                                                                                           |
| 早餐                                                                                                                      | 荞麦面（荞麦面粉 50g，圆白菜 150g）<br>煮鸡蛋（鸡蛋 50g）<br>无糖豆浆（黄豆【干】20g）                                   |
| 中餐                                                                                                                      | 杂粮饭（大米 50g，玉米糝 15g）<br>蒜蓉金针菇（金针菇 100g）<br>泡椒兔（兔肉 50g，泡椒 10g，黄瓜 100g，花椒*5g）                |
| 晚餐                                                                                                                      | 杂粮饭（大米 50g，玉米糝 15g）<br>上汤娃娃菜（娃娃菜 200g，枸杞子【鲜】*5g）<br>莴笋鸡丁（鸡胸肉【去皮】50g，莴笋 100g）              |
| 油、盐                                                                                                                     | 全天总用量：植物油 25g，盐<5g                                                                        |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 60g，碳水化合物 166g 及脂肪 41g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 51%，脂肪 30%。<br>2. *为食谱中用到的食药物质，如花椒、枸杞子。 |                                                                                           |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                                            |                                                                                           |
| 早餐                                                                                                                      | 杂粮馒头（青稞炒面 10g，面粉 50g）<br>早餐拌菜（菠菜 200g，香菇【鲜】50g）<br>蒸蛋羹（鸡蛋 50g）<br>脱脂牛奶（250mL）             |
| 中餐                                                                                                                      | 杂粮饭（大米 50g，玉米糝 25g）<br>炒西葫芦（西葫芦 200g）<br>萝卜羊肉汤（白萝卜 200g，羊前腿肉【带骨】50g，香菜 10g，小葱 10g，黑胡椒*2g） |
| 晚餐                                                                                                                      | 杂粮饭（大米 50g，玉米糝 15g）<br>蔬菜汤（豌豆苗 150g）<br>青花椒蒸鱼（鲈鱼 50g，花椒【青，湿重】*5g）<br>蒸茄子（茄子 200g）         |
| 油、盐                                                                                                                     | 全天总用量：植物油 25g，盐<5g                                                                        |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 71g，碳水化合物 196g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 20%，碳水化合物 55%，脂肪 25%。                             |                                                                                           |

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| 2.*为食谱中用到的食药物质，如花椒、黑胡椒。                                                                                               |                                                                                  |
| 冬季食谱3（总能量约1600kcal）                                                                                                   |                                                                                  |
| 早餐                                                                                                                    | 燕麦粥（燕麦片 50g，脱脂牛奶 250mL）<br>拌芹菜（芹菜 150g）<br>煮鸡蛋（鸡蛋 50g）                           |
| 中餐                                                                                                                    | 杂粮饭（大米 50g，青稞 15g）<br>水炆炒寒菜（冬寒菜 200g）<br>萝卜半汤鱼（白萝卜 150g，鲫鱼 100g，紫苏叶*10g，生姜*2g）   |
| 加餐                                                                                                                    | 橙子（200g）                                                                         |
| 晚餐                                                                                                                    | 杂粮饭（大米 40g，玉米糝 15g）<br>烩儿菜（儿菜 150g，蘑菇【鲜】50g，冬笋【鲜】100g）<br>肉末豆腐（北豆腐 120g，猪瘦肉 25g） |
| 油、盐                                                                                                                   | 全天总用量：植物油 24g，盐 < 5g                                                             |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 81g，碳水化合物 206g 及脂肪 53g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 52%，脂肪 30%。<br>2.*为食谱中用到的食药物质，如生姜、紫苏。 |                                                                                  |

## 七、华南地区

华南地区居民主食以大米为主，有喝汤的习惯，常吃新鲜蔬菜、水产品，口味偏向于清淡，部分地区嗜好辛辣。本系列食谱遵循成人肥胖患者食养原则，合理搭配华南地区特色食材，尊重本地区传统饮食文化，保留特色饮食，并控制油、盐、糖使用量。华南地区四季食谱示例见表 3.7。

表 3.7 华南地区四季食谱示例

| 春季食谱 1（总能量约 1200kcal）                                                                                                |                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 早餐                                                                                                                   | 菠菜鸡蛋汤面（菠菜 50g，鸡蛋 25g，面条 40g）<br>低脂牛奶（250mL）                                                                                                   |
| 中餐                                                                                                                   | 红薯饭（大米 40g，红薯 100g）<br>胡萝卜炒肉（柿子椒 30g，胡萝卜 50g，猪瘦肉 40g）<br>炒芥兰（芥兰 100g）<br>西红柿豆腐汤（西红柿 50g，豆腐 30g）                                               |
| 加餐                                                                                                                   | 橙子（200g）                                                                                                                                      |
| 晚餐                                                                                                                   | 红白饭（大米 20g，红米 20g）<br>莴苣炒鸡（鸡肉 40g，莴苣 50g）<br>水煮白菜（白菜 100g）<br>枳椇子萝卜鲫鱼汤（枳椇子【干】*20g，白萝卜 80g，鲫鱼 30g）                                             |
| 油、盐                                                                                                                  | 全天总用量：植物油 20g，盐 < 5g                                                                                                                          |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 55g，碳水化合物 170g 及脂肪 36g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 55%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如枳椇子。 |                                                                                                                                               |
| 春季食谱 2（总能量约 1400kcal）                                                                                                |                                                                                                                                               |
| 早餐                                                                                                                   | 鸡蛋肠粉（菠菜 50g，鸡蛋 50g，肠粉【湿】150g）<br>低脂牛奶（250mL）                                                                                                  |
| 中餐                                                                                                                   | 米饭（大米 60g）<br>清蒸鲩鱼（鲩鱼 30g）<br>盐水菜心（菜心 100g）<br>冬瓜豆腐肉丝汤（冬瓜 150g，豆腐 50g，猪瘦肉 20g）                                                                |
| 加餐                                                                                                                   | 苹果（200g）                                                                                                                                      |
| 晚餐                                                                                                                   | 黄白饭（大米 25g，玉米碴【干】20g）<br>水煮油菜（油菜 150g）<br>黑木耳蒸鸡（木耳【干】10g，鸡肉 35g）<br>青椒炒牛肉（柿子椒 100g，牛肉 25g）<br>白扁豆莲子百合汤（莲子【干】*5g，百合【鲜】*15g，白扁豆【干】*8g，山药【干】*5g） |

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|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 油、盐                                                                                                                         | 全天总用量：植物油 19g，盐 < 5g                                                                                    |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 62g，碳水化合物 202g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 56%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如百合、白扁豆、莲子等。 |                                                                                                         |
| <b>春季食谱 3（总能量约 1600kcal）</b>                                                                                                |                                                                                                         |
| 早餐                                                                                                                          | 鸡蛋炒面（香菇【干】3g，鸡蛋 50g，面条【干】70g）<br>低脂牛奶（250mL）                                                            |
| 中餐                                                                                                                          | 米饭（大米 75g）<br>青瓜炒肉（黄瓜 100g，猪瘦肉 30g）<br>绿豆芽炒鸡（绿豆芽 100g，鸡肉 30g）<br>鱼头豆腐汤（豆腐 30g，鱼头 100g）                  |
| 加餐                                                                                                                          | 柑（200g）                                                                                                 |
| 晚餐                                                                                                                          | 粗粮饭（大米 40g，燕麦 30g）<br>蒸排骨（猪排骨 25g，南瓜 150g）<br>韭菜炒牛肉（韭菜 140g，牛肉 25g）<br>郁李仁粥（郁李仁*3g，粳米 20g）              |
| 油、盐                                                                                                                         | 全天总用量：植物油 21g，盐 < 5g                                                                                    |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 69g，碳水化合物 230g 及脂肪 48g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 57%，脂肪 26%。<br>2. *为食谱中用到的食药物质，如郁李仁。        |                                                                                                         |
| <b>夏季食谱 1（总能量约 1200kcal）</b>                                                                                                |                                                                                                         |
| 早餐                                                                                                                          | 鸡蛋炒粿条（鸡蛋 25g，米粉条【湿】90g，芥兰 50g）<br>低脂牛奶（250mL）                                                           |
| 中餐                                                                                                                          | 米饭（大米 50g）<br>炒菜心（菜心 100g）<br>蒸马鲛鱼（马鲛鱼 50g）<br>冬瓜海带汤（冬瓜 150g，海带【鲜】60g，豆腐 40g）                           |
| 加餐                                                                                                                          | 火龙果（200g）                                                                                               |
| 晚餐                                                                                                                          | 杂粮饭（大米 20g，红薯 80g）<br>木耳炒肉（苦瓜 100g，猪瘦肉 30g，木耳【干】5g）<br>白灼青菜（空心菜 150g）<br>薏米粥（薏苡仁*10g，绿豆【干】5g，百合【鲜】*15g） |
| 油、盐                                                                                                                         | 全天总用量：植物油 18g，盐 < 5g                                                                                    |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 54g，碳水化合物 177g 及脂肪 34g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 57%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如薏苡仁、百合。     |                                                                                                         |
| <b>夏季食谱 2（总能量约 1400kcal）</b>                                                                                                |                                                                                                         |
| 早餐                                                                                                                          | 菜包子（面粉 20g，大白菜 20g）<br>牛奶冲麦片（低脂奶粉 25g，燕麦片 30g）<br>煮鸡蛋（鸡蛋 50g）                                           |
| 中餐                                                                                                                          | 米饭（大米 80g）<br>豆角炒鸡丝（长豆角 100g，鸡肉 20g）<br>水煮芥菜（芥菜 150g）                                                   |

|                                                                                                                         |                                                                                                                                     |
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|                                                                                                                         | 豆腐骨头汤（豆腐 30g，猪排骨 20g，枸杞子*3g）                                                                                                        |
| 加餐                                                                                                                      | 橙子（200g）                                                                                                                            |
| 晚餐                                                                                                                      | 二米饭（大米 30g，黑米 30g）<br>青瓜炒肉（黄瓜 100g，猪瘦肉 20g）<br>清蒸桂花鱼（桂花鱼 30g）<br>蒜蓉炒菜心（菜心 100g）<br>荷叶冬瓜汤（荷叶【鲜】*半张，冬瓜【鲜】90g）                         |
| 油、盐                                                                                                                     | 全天总用量：植物油 16g，盐 < 5g                                                                                                                |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 62g，碳水化合物 203g 及脂肪 40g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 57%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如枸杞子、荷叶。 |                                                                                                                                     |
| <b>夏季食谱 3（总能量约 1600kcal）</b>                                                                                            |                                                                                                                                     |
| 早餐                                                                                                                      | 空心菜蒸河粉（牛肉 50g，细米粉 50g，空心菜 50g）<br>低脂牛奶（250mL）                                                                                       |
| 中餐                                                                                                                      | 米饭（大米 80g）<br>炒苋菜（苋菜 150g）<br>佛手瓜炒蛋（鸡蛋 50g，佛手瓜 100g）<br>黄骨鱼豆腐汤（金针菇 50g，黄骨鱼 20g，豆腐 60g）                                              |
| 加餐                                                                                                                      | 杨桃（200g）                                                                                                                            |
| 晚餐                                                                                                                      | 二米饭（大米 30g，小米 25g）<br>瘦肉炒茄子（茄子 120g，猪瘦肉 30g）<br>白菜炒鲜菇（杏鲍菇【鲜】30g，白菜 140g）<br>白斩鸡（鸡肉 20g）<br>决明子昆布绿豆粥（决明子*3g，绿豆【干】5g，昆布【干】*5g，大米 15g） |
| 油、盐                                                                                                                     | 全天总用量：植物油 24g，盐 < 5g                                                                                                                |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 81g，碳水化合物 242g 及脂肪 46g；宏量营养素占总能量比约为：蛋白质 19%，碳水化合物 57%，脂肪 24%。<br>2. *为食谱中用到的食药物质，如决明子、昆布。 |                                                                                                                                     |
| <b>秋季食谱 1（总能量约 1200kcal）</b>                                                                                            |                                                                                                                                     |
| 早餐                                                                                                                      | 蒸肠粉（鸡蛋 25g，肠粉【湿】110g，生菜 50g）<br>低脂牛奶（250mL）                                                                                         |
| 中餐                                                                                                                      | 米饭（大米 60g）<br>胡萝卜莲藕排骨汤（莲藕 30g，胡萝卜 100g，猪排骨 15g）<br>清蒸马鲛鱼（马鲛鱼 40g）<br>水煮大白菜（大白菜 110g）                                                |
| 加餐                                                                                                                      | 雪梨（200g）                                                                                                                            |
| 晚餐                                                                                                                      | 燕麦饭（大米 30g，燕麦 20g）<br>水煮红薯叶（红薯叶 150g）<br>芸豆炒牛肉（芸豆【鲜】80g，牛肉 40g）<br>罗汉果霸王花煲猪肺（罗汉果*0.5 个，猪肺 1 个，干霸王花 1 小捆，橘皮*适量，生姜*2 片）               |
| 油、盐                                                                                                                     | 全天总用量：植物油 19g，盐 < 5g                                                                                                                |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 50g，碳水化合物 175g 及脂肪                                                                        |                                                                                                                                     |

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| 36g; 宏量营养素占总能量比约为: 蛋白质 16%, 碳水化合物 57%, 脂肪 27%。<br>2.*为食谱中用到的食药物质, 如罗汉果、生姜、橘皮。                                                    |                                                                                                                                                         |
| <b>秋季食谱 2 (总能量约 1400kcal)</b>                                                                                                    |                                                                                                                                                         |
| 早餐                                                                                                                               | 白菜肉饺 (面粉 50g, 大白菜 25g, 鲜山药*15g, 玉米【鲜】15g, 香葱 1g, 虾米 4g, 猪瘦肉 15g)<br>低脂牛奶 (250mL)                                                                        |
| 中餐                                                                                                                               | 米饭 (大米 50g)<br>黄豆芽炒瘦肉 (猪瘦肉 15g, 黄豆芽 100g)<br>蒸鹅 (鹅肉 25g)<br>西红柿豆腐汤 (西红柿 150g, 豆腐 50g)                                                                   |
| 加餐                                                                                                                               | 鹰嘴桃 (200g)                                                                                                                                              |
| 晚餐                                                                                                                               | 米饭 (大米 20g)<br>煮玉米 (玉米 55g)<br>百合炒鸡 (西芹 100g, 百合【鲜】*30g, 鸡肉 20g)<br>炒上海青 (上海青 150g)<br>蒸鱼 (黄脚立 30g)<br>山楂苹果雪梨煲猪腱 (猪腱子肉 100g, 苹果 80g, 雪梨 80g, 山楂【鲜】*2 颗) |
| 油、盐                                                                                                                              | 全天总用量: 植物油 21g, 盐 < 5g                                                                                                                                  |
| 注: 1. 本食谱提供能量约为 1400kcal, 其中蛋白质 66g, 碳水化合物 206g 及脂肪 43g; 宏量营养素占总能量比约为: 蛋白质 18%, 碳水化合物 56%, 脂肪 26%。<br>2.*为食谱中用到的食药物质, 如山楂、百合、山药。 |                                                                                                                                                         |
| <b>秋季食谱 3 (总能量约 1600kcal)</b>                                                                                                    |                                                                                                                                                         |
| 早餐                                                                                                                               | 馒头 (面粉 40g)<br>低脂牛奶 (250mL)<br>瘦肉汤粉 (排粉 30g, 大白菜 30g, 猪瘦肉 50g)                                                                                          |
| 中餐                                                                                                                               | 米饭 (大米 70g)<br>丝瓜蛋汤 (丝瓜 120g, 鸡蛋 50g)<br>水煮生菜 (生菜 110g)<br>海带鸡汤 (海带【鲜】50g, 鸡肉 80g)                                                                      |
| 加餐                                                                                                                               | 芭乐 (200g)                                                                                                                                               |
| 晚餐                                                                                                                               | 黑白饭 (大米 30g, 黑米 30g)<br>南瓜蒸牛肉粒 (牛肉 45g, 南瓜 150g)<br>肉丝炒花菜 (西兰花 80g, 猪瘦肉 25g)<br>麻仁紫苏籽粥 (紫苏籽【干】*5g, 火麻仁【干】*5g, 粳米 20g)                                   |
| 油、盐                                                                                                                              | 全天总用量: 植物油 24g, 盐 < 5g                                                                                                                                  |
| 注: 1. 本食谱提供能量约为 1600kcal, 其中蛋白质 75g, 碳水化合物 231g 及脂肪 47g; 宏量营养素占总能量比约为: 蛋白质 18%, 碳水化合物 56%, 脂肪 26%。<br>2.*为食谱中用到的食药物质, 如火麻仁、紫苏籽。  |                                                                                                                                                         |
| <b>冬季食谱 1 (总能量约 1200kcal)</b>                                                                                                    |                                                                                                                                                         |

|                                                                                                                                           |                                                                                                                                |
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| 早餐                                                                                                                                        | 切片面包（35g）<br>燕麦粥（燕麦 15g）<br>低脂牛奶（250mL）<br>煮鸡蛋（鸡蛋 50g）                                                                         |
| 中餐                                                                                                                                        | 米饭（大米 50g）<br>芋头蒸鸡块（芋头 20g，鸡肉 60g）<br>水煮芥菜（芥菜 100g）<br>羊肉萝卜汤（白萝卜 100g，羊肉 15g）                                                  |
| 加餐                                                                                                                                        | 猕猴桃（200g）                                                                                                                      |
| 晚餐                                                                                                                                        | 黄白米饭（大米 25g，玉米糝 25g）<br>炒圆白菜（圆白菜 80g）<br>牛肉煮冬笋（冬笋 100g，牛肉 30g）<br>麻仁当归瘦肉汤（猪瘦肉 15g，火麻仁*8g，郁李仁*3g，当归*2g）                         |
| 油、盐                                                                                                                                       | 全天总用量：植物油 16g，盐 < 5g                                                                                                           |
| 注：1. 本食谱提供能量约为 1200kcal，其中蛋白质 55g，碳水化合物 174g 及脂肪 35g；宏量营养素占总能量比约为：蛋白质 18%，碳水化合物 57%，脂肪 25%。<br>2. *为食谱中用到的食药物质，如火麻仁、郁李仁、当归，当归仅做香辛料和调味品使用。 |                                                                                                                                |
| <b>冬季食谱 2（总能量约 1400kcal）</b>                                                                                                              |                                                                                                                                |
| 早餐                                                                                                                                        | 花卷（面粉 65g）<br>拌菜心（大白菜 20g）<br>低脂牛奶（250mL）<br>煮鸡蛋（鸡蛋 50g）                                                                       |
| 中餐                                                                                                                                        | 米饭（大米 60g）<br>冬菇蒸鸡（香菇【干】10g，鸡肉 30g）<br>水煮西洋菜（西洋菜 125g）<br>萝卜豆腐汤（白萝卜 120g，豆腐 50g）                                               |
| 加餐                                                                                                                                        | 沙田柚（200g）                                                                                                                      |
| 晚餐                                                                                                                                        | 二米饭（大米 30g，小米 25g）<br>荷兰豆炒肉末（荷兰豆 60g，猪瘦肉 15g）<br>甘蓝煮鱼（球茎甘蓝 120g，鲈鱼 20g）<br>莱菔子桃仁杏仁骨头汤（莱菔子【干】*10g，桃仁【干】*10g，甜杏仁*【干】10g，猪排骨 15g） |
| 油、盐                                                                                                                                       | 全天总用量：植物油 21g，盐 < 5g                                                                                                           |
| 注：1. 本食谱提供能量约为 1400kcal，其中蛋白质 62g，碳水化合物 199g 及脂肪 43g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 56%，脂肪 27%。<br>2. *为食谱中用到的食药物质，如莱菔子、桃仁、甜杏仁。               |                                                                                                                                |
| <b>冬季食谱 3（总能量约 1600kcal）</b>                                                                                                              |                                                                                                                                |
| 早餐                                                                                                                                        | 蛋肠（肠粉【湿】250g，鸡蛋 50g）<br>低脂牛奶（250mL）                                                                                            |
| 中餐                                                                                                                                        | 糙米饭（糙米 90g）<br>鲜虾焖冬笋（冬笋 80g，海虾 30g）<br>水煮奶白菜（矮脚白菜 80g）<br>枸杞叶豆腐汤（枸杞叶 50g，豆腐 50g）                                               |

|                                                                                                                      |                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 加餐                                                                                                                   | 苹果（200g）                                                                                        |
| 晚餐                                                                                                                   | 羊肉煲仔饭（大米 65g，羊肉 25g）<br>上汤茼蒿（茼蒿菜 150g）<br>西兰花炒鸡丝（西兰花 100g，鸡肉 40g）<br>白茅根瘦肉汤（猪瘦肉 20g，白茅根【干】*10g） |
| 油、盐                                                                                                                  | 全天总用量：植物油 24g，盐 < 5g                                                                            |
| 注：1. 本食谱提供能量约为 1600kcal，其中蛋白质 70g，碳水化合物 236g 及脂肪 49g；宏量营养素占总能量比约为：蛋白质 17%，碳水化合物 57%，脂肪 26%。<br>2. *为食谱中用到的食药物质，如白茅根。 |                                                                                                 |

## 附录 4

# 成人肥胖患者食养方举例

### 一、胃热火郁证

#### （一）铁皮石斛玉竹煲瘦肉。

主要材料：猪瘦肉 60g，铁皮石斛 10g，玉竹 10g。

制作方法：所有食材洗净放进瓦煲内，加入清水，大火煲沸后，改为小火煲 1 小时，放入精盐适量。

用法用量：可佐餐食用，温服。酌情每日或隔日食用 1 次。

#### （二）三豆饮。

主要材料：赤小豆 15g、黑豆 15g、绿豆 15g、生甘草 5g。

制作方法：所有食材洗净，加水适量，煮至豆熟烂即可。

用法用量：可代替部分主食，温服，吃豆喝汤。每日 2 次，连续食用 5~7 天。

#### （三）芦根汤。

主要材料：鲜芦根 100g 或干品 50g。

制作方法：芦根洗净，煮水 10~15 分钟（干品可煮 20 分钟）。

用法用量：代茶饮，频服，每日 2 次，连续饮用 5~7 天。

### 二、痰湿内盛证

#### （一）柚子皮茯苓炖牛尾骨。

主要材料：牛尾骨（约 100g），柚子皮 50g，白萝卜 100g，茯苓 5g，生姜 1~2 片。

制作方法：所有食材洗净，白萝卜削皮后与柚子皮均切成

小块。牛尾骨切段，放入冷水中浸泡，再放入沸水中焯水，将上述食材放入锅中，加入清水，大火煮沸后改为小火煮 1 小时，放入适量精盐调味。

用法用量：可佐餐食用，温服。每日 1 次。

### （二）薏苡仁冬瓜汤。

主要材料：冬瓜 300g、薏苡仁 20g。

制作方法：将冬瓜去皮去瓤，切 1cm 厚、4cm 长冬瓜片备用。生姜切片，葱切段备用。将薏苡仁洗净，置于炖锅内，加水适量，大火煮开，小火继续煮 30 分钟。加入冬瓜片、葱、姜，转大火煮开，小火继续煮约 15 分钟，加盐少量调味即可（不加盐为宜）。

用法用量：餐前食用或佐餐食用。

注意：建议孕期女性遵医嘱食用。

### （三）橘枣茶。

主要材料：大枣 3 枚、橘皮 3g。

制作方法：大枣去核，炒焦，橘皮洗净，一起用沸水冲泡 10 分钟。

用法用量：代茶饮，温热频服，枣可食用。

## 三、气郁血瘀证

### （一）佛手橘皮山楂粥。

主要材料：佛手 10g、橘皮 5g、山楂 5g、粳米 50g。

制作方法：所有食材洗净，将佛手、橘皮、山楂用纱布包起，与粳米一起放入锅中，加适量清水，大火煮沸后改为小火煲 30 分钟。

用法用量：可做为主食食用。每周 3~5 次。

注意：建议孕期女性遵医嘱食用。

## （二）山楂内金粥。

主要材料：粳米 50g、山楂 10g、炒鸡内金粉 10g。

制作方法：粳米淘洗干净，山楂洗净，备用。将粳米和山楂置于砂锅内，加清水，煮粥。待粳米煮至熟烂，加入鸡内金粉，熬煮片刻即可。

用法用量：可做为主食食用。每周 3~5 次。

注意：建议孕期女性遵医嘱食用。

## （三）山楂橘皮茶。

主要材料：山楂 10g，橘皮 3g。

制作方法：将山楂、橘皮洗净，置于杯中，沸水冲泡 10 分钟。

用法用量：代茶饮，温热频服。

注意：建议孕期女性遵医嘱食用。

# 四、脾虚不运证

## （一）黄芪橘皮饮。

主要材料：黄芪 10g，橘皮 5g

制作方法：将黄芪、橘皮洗净，一起放入炖盅中，加入清水，大火烧开后转小火 30 分钟左右。

用法用量：代茶饮，温热频服。

## （二）扁豆山药粥。

主要材料：白扁豆 30g、鲜山药 100g、粳米 30g。

制作方法：将鲜山药去皮、洗净，切片备用。将白扁豆洗

净，清水浸泡 2 小时。将粳米洗净，加入鲜山药、白扁豆，一同煮粥，煮至米、豆熟烂即可。

用法用量：做为主食食用。每周食用 3~5 次。

### （三）荷叶减肥茶。

主要材料：山楂 6g、薏苡仁 6g、橘皮 3g、荷叶 9g。

制作方法：将材料放到纱布包或药袋内，扎紧，沸水冲泡 10 分钟，煮开效果更佳。

用法用量：代茶饮，温热频服。

注意：孕期女性遵医嘱食用。

## 五、脾肾阳虚证

### （一）山药黄芪炖鸭肉汤。

主要材料：鲜山药 100g，黄芪 10g，生姜 3~4 片，鸭肉 300g，板栗 100g。

制作方法：鸭肉切成小块，放入沸水中焯水；板栗加适量清水煮熟凉后剥皮壳备用；将鲜山药去皮、洗净，切厚片备用。上述食材一同放入瓦煲内，加入清水，大火烧沸后，再用小火煲 1 小时，放入少许精盐调味后即可。

用法用量：可佐餐食用，温服。每周食用 3~5 次。

### （二）人参核桃汤。

主要材料：核桃仁 3 个、人参（人工种植≤5 年）3g，生姜 5 片。

制作方法：将核桃仁捣碎备用。将人参放入砂锅中，加水煮 20 分钟后，加入核桃仁、生姜，继续煮 20 分钟即可。

用法用量：喝汤吃核桃仁。每日 1 次，连续食用 7~10 天，

之后可每周 3~5 次。

注意：孕期女性遵医嘱食用。

### （三）姜桂茶。

主要材料：干姜 3g、肉桂 3g。

制作方法：将干姜、肉桂沸水冲泡 10 分钟。

用法用量：代茶饮，温热频服。

附录 5

成人肥胖判定标准

成人肥胖及中心型肥胖分别以 BMI 和腰围进行判定，详见表 5.1～5.2。

表 5.1 成人体重分类

| 分类   | BMI 值/ ( kg/m² )    |
|------|---------------------|
| 肥胖   | BMI ≥ 28. 0         |
| 超重   | 24. 0 ≤ BMI < 28. 0 |
| 体重正常 | 18. 5 ≤ BMI < 24. 0 |
| 体重过低 | BMI < 18. 5         |

表 5.2 成人中心型肥胖分类

| 分类      | 腰围值/cm         |
|---------|----------------|
| 中心型肥胖前期 | 85 ≤ 男性腰围 < 90 |
|         | 80 ≤ 女性腰围 < 85 |
| 中心型肥胖   | 男性腰围 ≥ 90      |
|         | 女性腰围 ≥ 85      |

注：1. 引自：《成人体重判定》（WS/T 428-2013）

2. BMI 的计算公式：
$$BMI = \frac{\text{体重(kg)}}{[\text{身高(m)}]^2}$$

3. 腰围：腋中线肋弓下缘和髂嵴连线中点的水平位置处体围的周径长度。

## 附录 6

### 常见身体活动强度系数

活动强度以代谢当量 (MET) 表示, 其数值代表活动时能量消耗相当于安静时能量消耗的倍数。1MET 是休息静坐时的能量消耗速度, 对大多数人来说, 相当于每分钟每千克体重消耗 3.5mL 氧气。中国 18~64 岁健康成年人常见身体活动强度系数及强度分类见表 6.1。

表 6.1 中国 18~64 岁健康成年人常见身体活动强度系数

| 活动类别   | 具体活动                 | METS | 强度   |
|--------|----------------------|------|------|
| 不活动/休息 | 安静地躺着                | 1.2  | 静态行为 |
|        | 安静地坐着                | 1.3  | 静态行为 |
|        | 安静地站着                | 1.6  | 低    |
|        | 坐姿: 读书               | 1.4  | 静态行为 |
|        | 坐姿: 打字               | 1.7  | 低    |
| 家务性劳动  | 洗涤衣物: 叠、挂、熨烫、洗衣服     | 2.2  | 低    |
|        | 拖地                   | 2.6  | 低    |
|        | 铺床: 换床上用品            | 2.7  | 低    |
|        | 整理房间: 书桌、物品          | 2.7  | 低    |
|        | 清洁: 擦地板、打扫、清垃圾等      | 2.8  | 低    |
|        | 购物: 手推车              | 3.8  | 中    |
| 交通性活动  | 购物: 手提篮子             | 4.3  | 中    |
|        | 步行: 3km/h            | 2.9  | 低    |
|        | 步行: 4km/h            | 3.3  | 中    |
|        | 步行: 5km/h            | 3.8  | 中    |
|        | 步行: 6km/h            | 5.2  | 中    |
|        | 负重走: 背部负重 4kg, 5km/h | 4.5  | 中    |
|        | 户外骑行: 10km/h         | 3.6  | 中    |
|        | 户外骑行: 12km/h         | 3.9  | 中    |
|        | 户外骑行: 13km/h         | 4.4  | 中    |
| 休闲性活动  | 户外骑行: 15km/h         | 5.5  | 中    |
|        | 跑步: 5km/h            | 4.8  | 中    |
|        | 跑步: 6km/h            | 6.5  | 高    |
|        | 跑步: 7km/h            | 7.8  | 高    |
|        | 跑步: 8km/h            | 8.2  | 高    |
|        | 跑步: 9km/h            | 9.1  | 高    |
|        | 登山: 慢速, 感觉有点累        | 6.1  | 高    |
|        | 登山: 中速, 感觉稍累         | 8.7  | 高    |
|        | 登山: 快速, 感觉为累或很累      | 17.2 | 高    |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                          |                                                                                                                                     |                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 平板支撑<br>瑜伽<br>广播体操：第九套<br>广场舞：民族舞风格<br>有氧健身操<br>舞蹈：拉丁舞<br>舞蹈：芭蕾舞<br>排球<br>足球：颠球、双人传球、运球过人<br>乒乓球<br>篮球<br>羽毛球<br>网球<br>跳绳：单摇并步，100 次/min-130 次/min<br>八段锦<br>五禽戏<br>太极柔力球<br>太极拳：24 式简化，自由架势<br>太极剑：32 式 | 2.8<br>3.1<br>5.1<br>5.5<br>7.3<br>7.0<br>9.8<br>4.1<br>4.7<br>5.7<br>6.1<br>9.8<br>10.1<br>10.2<br>3.2<br>3.5<br>3.5<br>3.7<br>4.5 | 低<br>中<br>中<br>中<br>高<br>高<br>高<br>中<br>中<br>中<br>高<br>高<br>高<br>高<br>中<br>中<br>中<br>中<br>中 |
| 职业性活动                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 农业劳动：推车、施肥、插秧、锄地、浇水等<br>消防工作：水带操、负重跑、负重登楼等<br>造船厂工作：木工<br>造船厂工作：批铲、上下船舱<br>造船厂工作：捶打工<br>矿山工作：走路、风钻、把钎等<br>矿山工作：推空车<br>矿山工作：选矿<br>矿山工作：推重车                                                                | 3.9<br>3.8<br>4.2<br>4.5<br>5.6<br>2.7<br>3.9<br>6.4<br>8.4                                                                         | 中<br>中<br>中<br>中<br>中<br>低<br>中<br>高<br>高                                                   |
| <b>强度分类：</b><br>静态行为 $\leq 1.5\text{MET}$ ；低强度 $1.6\text{MET} \sim 2.9\text{MET}$ ；中等强度 $3.0\text{MET} \sim 5.9\text{MET}$ ；<br>高强度 $\geq 6.0\text{MET}$ 。<br><b>基础代谢率预测公式：</b><br>女性基础代谢率 $= 655 + 9.5 \times \text{体重 (kg)} + 1.8 \times \text{身高 (cm)} - 4.7 \times \text{年龄 (岁)}$<br>男性基础代谢率 $= 66 + 13.7 \times \text{体重 (kg)} + 5.0 \times \text{身高 (cm)} - 6.8 \times \text{年龄 (岁)}$<br><b>身体活动能量消耗（包含基础代谢）计算公式：</b><br>$\text{MET 值 (kcal/(kg} \cdot \text{h))} \times \text{体重 (kg)} \times \text{活动时长 (h)}$<br><b>总能量消耗预测公式：</b><br>$\text{基础代谢率} \times \text{全天中非身体活动时间占比} + \text{身体活动能量消耗} + \text{食物热效应}$<br>注：食物热效应约占每日总能量消耗的 10% |                                                                                                                                                                                                          |                                                                                                                                     |                                                                                             |

注：引自《健康成年人身体活动能量消耗参考值》(T/CSSS 002—2023)

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· 专家共识 ·

## 中国居民健康体重管理之减重行动 20 条： 基于科学循证的专家建议共识

中国营养学会肥胖防控分会专家组

**摘要：**过去 30 年间，我国居民超重/肥胖患病率快速增长。目前，我国成年人超重/肥胖患病率已经超过 50%，学龄儿童接近 20%，超重/肥胖会增加高血压、2 型糖尿病、心脑血管疾病等多种慢性病的患病风险，肥胖防治已经刻不容缓。践行健康生活方式，做好健康体重管理，有助于防治慢性疾病，推进健康中国建设。中国营养学会肥胖防控分会和西安交通大学全球健康研究院组织跨学科专家，根据全球相关领域最新研究证据、临床指南和专家共识，编写减重行动 20 条，旨在以高级别科学证据为基础，向公众及相关卫生工作者推荐减重原则和实用方法。内容涵盖膳食、运动等生活方式管理和临床治疗措施建议，帮助超重/肥胖患者科学减重。坚持健康的生活方式是健康减重的基础，主要方法包括：控制总热量摄入、坚持平衡膳食、适量运动及作息规律等。通过健康生活方式干预不能有效减重者，可考虑采用药物或手术等方式治疗。

**关键词：**体重管理；减重；肥胖；超重；健康生活方式

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### The 20 actions for weight loss and healthy weight management among Chinese residents: evidence-based expert recommendations and consensus

The Obesity Prevention and Control Section Expert Group of the Chinese Nutrition Society

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**Abstract:** China has witnessed a rapid increase in the prevalence of overweight and obesity in the past three decades. At present, the overweight and obesity rate among Chinese adults has exceeded 50%, while that among school-aged children is approximately 20%. Overweight/obesity increases the risks of various chronic diseases, such as hypertension, type 2 diabetes mellitus, and cardio-cerebro-vascular diseases. There is an urgent need for obesity prevention and treatment. Promoting healthy lifestyle and healthy weight management plays a vital role in the prevention and control of chronic diseases, and ultimately helps achieve the Healthy China goals. The Obesity Prevention and Control Society of the Chinese Nutrition Society and the Xi'an Jiaotong University Global Health Institute organized experts from multiple disciplines to compile 20 actions for weight loss and healthy body weight management based on the latest research evidence, clinical guidelines, and expert consensus worldwide. The report aims to provide recommendations on weight loss principles and practical methods for the general public and healthcare professionals. It covers lifestyle modification, such as diet and physical exercise, as well as clinical treatment strategies to facilitate healthy weight loss among overweight/obese patients. Maintaining a healthy lifestyle is the foundation for healthy weight loss, focusing on calorie intake control, a balanced diet, moderate physical activities, and a consistent daily routine. Medication or surgery may be considered for those who fail to lose weight effectively through lifestyle modifications.

**Keywords:** Body weight management; Weight loss; Obesity; Overweight; Healthy lifestyle

## 1 背景

当前,肥胖已成为影响我国居民健康的严重公共卫生问题。过去30年间,我国居民超重/肥胖快速增长,成年人超重/肥胖率超过50%,学龄儿童青少年超重/肥胖率接近20%,约有(5~6)亿成年人和5 000万儿童青少年超重/肥胖。超重/肥胖会增加高血压、2型糖尿病(type 2 diabetes mellitus, T2DM)、心脑血管疾病、特定癌症等多种慢性病的患病风险<sup>[1]</sup>。全球疾病负担研究表明,44%的T2DM、23%的冠心病和7%~41%特定癌症的负担可归因于超重/肥胖<sup>[2]</sup>。肥胖还对个体产生不良心理和社会影响,并造成巨大社会和家庭经济负担<sup>[3]</sup>。有研究预测到2030年,我国成年人肥胖超重率可达70%,儿童可达30%;归因于超重/肥胖的医疗费用约为4 180亿元人民币,约占全国医疗费用总额的22%;未来中国城乡居民超重/肥胖率及其所造成的经济负担将呈上升趋势,肥胖预防及治疗已经刻不容缓<sup>[4]</sup>。

我国政府高度重视肥胖防控工作,《健康中国行动(2019—2030年)》“合理膳食行动”将“成人肥胖增长率”控制作为重要预期性指标,将成年人“维持健康体重”作为主要倡导性指标,将肥胖控制作为“中小学健康促进行动”“心脑血管疾病防治行动”的主要可改变危险因素干预指标,“全民健身行动”将“经常参加体育锻炼人数比例”作为预期性指标,并把“城市慢跑/步行道、绿道的人均长度”作为预期性政府工作指标<sup>[5]</sup>。近年来,我国大力实施“全民健康生活方式行动”“三减三健专项行动”“全民健康素养促进行动”“全民健身计划”和“全国亿万学生阳光体育运动”。2019年发布的《中国肥胖预防和控制蓝皮书》<sup>[6]</sup>和2022年发布的《中国居民肥胖防治专家共识》<sup>[7]</sup>系统提出了我国肥胖防控策略。

为了助力“健康中国(2019—2030年)”行动,推进2023年3月4日“世界肥胖日”中国行动,调动居民自身积极性,做好“自己健康第一责任人”,践行健康生活方式,加强健康体重管理和疾病预防,中国营养学会肥胖分会和西安交通大学全球健康研究院组织来自多所大学、研究机构 and 医院的跨学科专家,根据全球相关领域最新研究证据、临床指南和专家共识,编写了《中国居民健康体重管理之减重行动20条:基于科学循证的专家建议共识》,以下简称《共识》。本共识旨在系统梳理相关科学研究最新进展,向公众及

相关卫生工作者等推荐基于高级别科学证据的减重原则和实用方法,内容涵盖膳食、运动等生活方式管理和临床治疗措施建议,帮助肥胖/超重患者科学减重。

## 2 方法

共识的制定采用专家综览和意见集中法,检索并汇总高级别证据,经过多轮专家讨论,在2022年12月至2023年8月完成。

**2.1 专家综览** 根据专家综览法的步骤和流程要求,首先确定编制共识的目的,系统梳理和归纳肥胖相关科学研究最新进展,总结有高级别科学证据的减重原则和实用方法;其次明确目标,确定肥胖管理和减重相关研究的最新研究证据,进行比较和归纳,提出循证减重建议。根据研究目的和目标,本共识旨在明确回答减重过程中的一些常见问题,例如:怎样调整膳食达到长期维持健康体重而不影响人体正常热量和营养需要?怎样通过改善运动行为达到长期维持健康体重而不影响人体正常功能/身体损伤?是否可以通过服药以达到长期维持健康体重而不影响整体健康?是否可以通过服用保健食品达到长期维持健康体重而不影响整体健康?有什么其他有效措施可以减重并长期维持健康体重?儿童减重应遵循哪些原则?

根据研究需回答的问题,邀请从事肥胖研究、临床治疗、临床营养、运动干预、健康教育等领域的15名资深专家,组成专家综览小组,每1~2名专家负责一个问题,最终提出该领域的研究结论。

文献的纳入:(1)2020年以来,肥胖和减重相关高质量文献,包括系统综述、Meta分析、指南、共识和蓝皮书(如该领域2020年后无进展,文献发表时限可放宽至2015年)。(2)文献检索数据库:检索的英文数据库包括Pubmed、Scienccdirect、Cochrane;检索的中文数据库包括中国知网(CNKI)、万方数据知识服务平台。(3)检索方法:首先采用关键词检索法,找出有关文献,仔细阅读全文,重点查看其研究方法和结论。

**2.2 意见集中及讨论** 在专家综览提出研究结论的基础上,进行意见集中讨论,达成共识,仅保留专家一致同意的结论。

**2.3 延伸咨询** 在专家小组意见集中达成共识的基础上,通过函询,就研究结论(包括内容和文字表述的准确性等)分别征求多位肥胖相关领域的资深专家的意见,形成终稿。

### 3 结 果

共产出与减重相关行动的专家建议共识 20 条，涵盖减重的 6 个要点，见表 1。

表 1 中国居民健康体重管理之减重行动 20 条要点

| 序号 | 减重的要点               | 包含条目  |
|----|---------------------|-------|
| 一  | 生活方式干预是科学减重的首选和基础措施 | 1~2   |
| 二  | 合理膳食是科学减重的基础        | 3~9   |
| 三  | 运动干预是科学减重的核心        | 10~11 |
| 四  | 良好的睡眠和健康积极的心态有助于减重  | 12~14 |
| 五  | 药物和手术治疗是临床减重的重要手段   | 15~17 |
| 六  | 肥胖的全生命周期防治,关注儿童肥胖问题 | 18~20 |

#### 3.1 生活方式干预是科学减重的首选和基础措施

第一条 超重/肥胖是热量摄入多于消耗造成的机体总脂肪含量过多，或局部脂肪含量增多及分布异常，减重需要控制饮食，增加身体活动。

释义：超重/肥胖是摄入热量多于消耗，使热量以脂肪的形式积聚在体内，造成机体总脂肪含量过多或局部脂肪含量增多及分布异常<sup>[7]</sup>。我国目前使用体质质量指数（body mass index, BMI） $\geq 24.0 \text{ kg/m}^2$ 和 BMI $\geq 28.0 \text{ kg/m}^2$ 作为成年人超重和肥胖的诊断标准；以男性腰围 $\geq 90.0 \text{ cm}$ 、女性腰围 $\geq 85.0 \text{ cm}$ 作为诊断成人中心性肥胖的标准（附件 1）。中心性肥胖的健康危害比全身性肥胖更大<sup>[8]</sup>。儿童青少年超重/肥胖的定义与成年人不同，我国制定了年龄-性别 BMI 参考界值<sup>[9]</sup>（附件 2）。

第二条 不健康生活方式是超重/肥胖的主要危险因素，全生活方式管理可帮助有效减重。

释义：超重/肥胖主要是由高脂、高糖等高热量膳食和低纤维膳食习惯、饮食不规律、缺乏身体活动等生活方式造成的，其他致病因素还有遗传、心理、经济、文化等因素<sup>[10]</sup>。全生活方式管理是指对超重/肥胖者同时实施多维度的生活方式干预，主要包括饮食、运动和行为干预三个要素。全生活方式管理优于单纯的饮食干预或运动干预，并可带来多重健康效应<sup>[11]</sup>。超重/肥胖者可通过加强体重监测，设定生活方式改善目标，坚持健康的生活方式，获取社会支持等措施，达到有效减重和长期体重控制的目的<sup>[12]</sup>。

#### 3.2 合理膳食是科学减重的基础

第三条 在控制总热量的基础上，坚持谷类为主的平衡膳食模式有利于减重；每日膳食应包括谷薯类、蔬菜水果、畜禽鱼蛋奶和豆类食物，减少

油、盐、糖摄入。

释义：控制总热量的平衡膳食模式是减重的基础<sup>[7]</sup>。以蔬菜水果、鱼类、五谷杂粮、豆类和橄榄油为主的饮食模式，也被称为地中海饮食<sup>[13]</sup>。地中海饮食常被代指为有利于健康的、多样化的、富含营养的饮食模式。地中海饮食与体重改善、心血管疾病（cardio-vascular diseases, CVD）和代谢性疾病风险下降相关<sup>[14]</sup>。全球范围内，还有得舒饮食、北欧饮食、中国江南饮食（东方健康饮食）等不同的饮食模式<sup>[15]</sup>。江南饮食是我国长江中下游居民长期形成的一种饮食习惯，可作为我国健康膳食模式的一个代表，特点是食材种类丰富；蔬菜水果摄入量；水产品与禽类等白肉摄入多于猪牛羊等红肉；油和盐量摄入较少；口味较清淡；烹调用油少，以植物油为主；烹饪方式以清蒸、煮等为主。这种膳食可能有利于控制体重、降低慢性病风险<sup>[16]</sup>。选择适合自己的科学膳食模式并长期坚持是减重成功并维持健康体重的关键措施。

第四条 膳食中适当增加奶类及其制品有助于减重。

释义：研究表明牛奶对超重、肥胖、T2DM 病和 CVD 可能具有潜在的改善作用。奶及奶制品可提供优质蛋白质，是膳食钙的最佳来源，同时还可以提供人体必需的多种营养素<sup>[17]</sup>。《中国居民膳食指南（2022）》<sup>[18]</sup>推荐，每人每天摄入 300~500 g 液态奶或等量奶制品。适当食用牛奶及奶制品可能对所有年龄段的人都有益，但乳糖不耐受或牛奶蛋白过敏等特殊群体除外<sup>[17]</sup>。

第五条 控制总热量、改变三大供能营养素配比和间歇性断食有助于短期减重，但长期效果缺乏证据支持。

释义：研究表明控制总热量、改变三大供能营养素配比（低碳水、低脂肪、高蛋白等）的饮食模式有短期减重效果，但长期效果不明显，不推荐长期使用<sup>[19]</sup>。如极低和低热量饮食可在短期内减重 2%~15%，且可控制血糖和改善脂质代谢，但其长期效果尚无证据<sup>[20]</sup>。间歇性断食又称“轻断食”，是一种正常热量与热量限制（或完全禁食）交替进行的膳食模式，有一定减重作用，但长期效果亦尚无证据<sup>[21]</sup>。

第六条 低碳水化合物饮食有利于中短期体重控制，但其长期安全性和有效性证据不足。应用生酮饮食减重需在医生指导下进行。

释义：低碳水化合物饮食一般是指膳食中碳水化合物供能比从 55%~65% 减少到 $\leq 40\%$ ，脂肪供能占比 $\geq 30\%$ ，蛋白质摄入量相对增加的一类饮食

模式<sup>[22]</sup>。极低碳水化合物饮食（碳水化合物供能比 $<10\%$ ），即摄入 $30\sim 50\text{ g/d}$ 碳水化合物，相应提高脂肪和蛋白质与碳水的供能比 $3:1\sim 4:1$ ，也称为生酮饮食，对超重/肥胖有改善作用<sup>[23]</sup>。生酮饮食产生减重效应的机制可能包括：饮食中缺乏碳水化合物可导致胰岛素分泌降低，抑制脂肪生成和积累，并促进脂肪分解；高蛋白质饮食会产生饱腹感，并影响食欲控制激素（如瘦素和食欲刺激素）、胰岛素分泌和酮体产生<sup>[24]</sup>。有研究显示，短期应用低碳水化合物饮食的减重效果显著，但长期应用的安全性和益处尚不明确<sup>[25]</sup>。应用生酮饮食模式减重需要在专业人员的科学指导下进行。

**第七条** 夜间饮食和不吃早餐增加肥胖风险，不利于减重。

释义：进食时间在导致肥胖和影响减重效果中的作用日益受到重视。不吃早餐和夜间饮食与体重增加有关，甚至会导致肥胖。研究表明，不吃早餐会增加饥饿感，增加午餐与晚餐的进食量，并加重胰岛素抵抗。吃早餐有利于维持血糖稳定，增加机体胰岛素敏感性，避免了由于禁食时间过长所引起的胃饥饿素浓度增大所引起的食欲亢进<sup>[26]</sup>。夜间摄入食物的质量和营养特征可能会对最佳健康所需的代谢和昼夜节律产生负面影响<sup>[27]</sup>。

**第八条** 降低进食速度有利于恢复和保持健康体重。

释义：研究显示，进食速度过快与肥胖有关，特别是腹型和内脏型肥胖<sup>[28]</sup>。降低进食速度有利于减重的可能机制是：减少热量摄入，降低饥饿素分泌，减轻饥饿感；升高饱食激素如神经肽 Y 和胰高糖素样肽-1（glycagon-like peptide-1, GLP-1）的分泌，增加饱腹感<sup>[29]</sup>。建议成年人每餐进食时间 $>20\text{ min}$ 。

**第九条** 尚无明确科学证据证实天然膳食补充剂的减重效果，需谨慎使用。

释义：天然膳食补充剂包括肉碱、白芸豆提取物、壳聚糖、羟基柠檬酸、辣椒素、吡啶甲酸铬、共轭亚油酸、葡甘露聚糖、铬、瓜尔胶、丙酮酸盐、咖啡因等。在肥胖人群中天然膳食补充剂的减重效果缺乏足够的证据。截至目前，大多数研究存在方法学缺陷、样本量不足、缺乏长期的随访数据等问题，不同研究甚至得出相反的结论。因此，当前还缺乏足够的证据证明上述膳食补充剂的有效性和安全性<sup>[30]</sup>。有部分研究表明，个别膳食补充剂可能存在肠道不良反应，甚至会引起肝肾功能损害，建议谨慎使用<sup>[31]</sup>。

### 3.3 运动干预是科学减重的核心

**第十条** 有氧、抗阻、高强度间歇运动均可有效减重。

释义：有氧运动是指以有氧代谢供能为主的运动，特点是运动强度较低，如：快走、长跑、广场舞、长距离骑行等。有氧运动可持续较长时间，热量和脂肪消耗总量较大；长期规律的有氧运动有利于减脂<sup>[32]</sup>。抗阻运动是通过对抗阻力，使肌肉收缩以得到锻炼的一种运动方式。抗阻运动可预防/减少通过限制热量减重过程中的肌肉量下降<sup>[33]</sup>。高强度间歇运动是指进行多次、短时间、高强度的运动，且两次高强度运动间采用几秒到几分钟不等的低强度运动或休息，并循环进行的一种运动方式。高强度间歇运动可增加运动后过量氧耗，增强减脂效率。

**第十一条** 维持中等强度运动 $>250\text{ min/周}$ 可帮助减重，较高强度运动减重效果更明显。

释义：维持中等强度的运动（ $150\sim 250\text{ min/周}$ ）即可达到适度减重目的； $>250\text{ min/周}$ ，可达到明显减重并维持的效果<sup>[34-37]</sup>。按储备心率百分比法，中等强度运动建议达到 $40\%\sim 60\%$ ，高强度运动达到 $60\%\sim 80\%$ 。运动强度推算方法：靶心率=安静心率+（最大心率-安静心率） $\times$ 运动强度百分比，最大心率=220-年龄。有基础疾病，如T2DM、高血压、心脑血管疾病的超重/肥胖患者应该在得到专业评估确认安全后，才可进行较高强度的运动。在运动中和运动后应注意监测疾病相关生物标志物、症状和体征的变化。

### 3.4 良好的睡眠和健康积极的心态有助于减重

**第十二条** 每天睡眠时间 $<6\text{ h}$ 增加肥胖风险， $>7\text{ h}$ 有利于减重，特别是有利于预防腹型肥胖。

释义：流行病学研究显示，每天睡眠时间 $<6\text{ h}$ 与肥胖、T2DM、CVD、代谢性疾病发生风险和事故发生风险增加相关<sup>[38]</sup>。长期睡眠障碍可导致慢性压力，使人体“下丘脑-垂体-肾上腺轴”长时间处于功能活跃状态，糖皮质激素分泌增加，并进而导致胰岛素抵抗和体重增加<sup>[39]</sup>。同时，睡眠障碍还可通过增加焦虑和抑郁情绪，减少身体活动，影响热量消耗<sup>[40]</sup>。

**第十三条** 长期持续的心理压力可增加肥胖风险，保持良好的心理和情绪有助于保持健康体重。

释义：长期持续的心理压力会干扰人的认知功能，如执行功能和自我调控能力<sup>[41]</sup>。慢性压力可通过诱导暴饮暴食和摄入高脂肪或高糖等高热量食物，增加额外热量摄入，同时减少身体活动和睡眠时间使体内脂肪积聚。慢性压力还可能通过影响人体“下丘脑-垂体-肾上腺轴”促进“自我奖励性”

高热量食物（油脂类、甜食）的摄入，影响肠道微生态环境和肽类激素的分泌（如瘦素、食欲刺激素和神经肽 Y 等），导致肥胖<sup>[42]</sup>。

第十四条 正念及照镜子有利于恢复健康体重。

释义：体重管理的心理学方法有助于提高肥胖患者的减重动机和自我控制能力，限制进食冲动和不适当的食物摄入。作为辅助性和自我导向的心理干预，正念可以通过改善饮食行为失调、强化自我激励和自我控制进而提高减肥计划的有效性，与其他心理方法联合应用效果会更好<sup>[43]</sup>。另外，有研究显示，经常照镜子可改变认知，影响膳食行为，对减重有作用<sup>[44]</sup>。但这些方法的长期效果有待进一步研究。

### 3.5 药物和手术治疗是临床减重的重要手段

第十五条 针灸疗法辅以生活方式管理有助于减重。

释义：针灸会影响食欲、肠动力和新陈代谢，减轻压力、调节情绪等<sup>[30]</sup>。针灸通过改变中枢神经递质，调节饥饿感和饱腹感，增加血浆和脑组织中的脑啡肽、 $\beta$ -内啡肽和血清素水平，降低食欲，而起到减重的效果<sup>[45]</sup>。耳针、针刺、穴位埋线等方法可能有助于超重/肥胖患者减重，但其长期效果尚需更多证据<sup>[46]</sup>。

第十六条 超重/肥胖合并“三高”并发症的患者，经 3~6 个月的生活方式干预仍不能有效减重的，可考虑药物治疗。

释义：生活方式干预是超重/肥胖治疗的基础。当超重/肥胖合并“三高”（即高血压、高血糖和高血脂），改变生活方式无效时，可以考虑使用适宜的减肥药物<sup>[6, 47]</sup>。药物治疗有助于增加患者对行为治疗的依从性，有更显著的减重作用。我国目前批准应用的非处方减重药物仅有奥利司他，该药是一种肠道胰脂肪酶抑制剂，可减少膳食脂肪的吸收率，但不影响蛋白质和碳水化合物的吸收。用药常见不良反应有：皮肤油性斑点、胃肠排气增多，大便紧急感、油性大便和大便失禁等；同时也会导致脂溶性维生素的吸收减少（特别是维生素 D），用药期间应注意补充。T2DM 合并肥胖患者可在医生指导下选择更有利于体重控制的二甲双胍、GLP-1 受体激动剂、钠-葡萄糖协同转运蛋白 2（sodium-glucose linked transporter 2, SGLT-2）抑制剂等降糖药物<sup>[7-8]</sup>。这类药物具有抑制食欲、延缓胃排空速度和增加体内葡萄糖排出的作用。二甲双胍、GLP-1 受体激动剂的常见不良反应为胃肠道事件。药物治疗后应定期进行有效性和安全性评估并及时调整治疗。

第十七条 手术治疗肥胖有效，适用于重度肥

胖且生活方式干预无效者。

释义：重度肥胖（ $BMI \geq 37.5 \text{ kg/m}^2$  或  $BMI \geq 32.5 \text{ kg/m}^2$  且有并发症）患者可以考虑包括强化的全生活方式干预、药物治疗和减重手术在内的积极治疗手段。尽管进行减重手术是减重和维持减重效果，改善合并症和死亡风险的最有效方法，但仍建议将改善生活方式作为减重和防控相关合并症的基础措施。最常见的肥胖手术类型为胃袖状切除术和 Roux-en-Y 胃旁路手术，术后 10 年体重减轻可达 27%~69%。在患有 T2DM 的肥胖患者中，术后 10 年 T2DM 缓解率为 25%~62%。但手术可能导致维生素缺乏、胃食管反流和倾倒综合征等并发症<sup>[48-49]</sup>。肥胖患者应该在具有丰富经验的手术减重医学中心接受减重手术治疗。术前应对手术的适应证和安全性进行全面的内科评估。术后应接受长期的随访和营养管理。

### 3.6 肥胖的全生命周期防治，关注儿童肥胖问题

第十八条 超重/肥胖儿童的体重干预目标是维持体重不增或增长速度减缓，最终达到健康体重，而非必须降低绝对体重。方法首推生活方式干预，父母和家庭的参与至关重要。

释义：超重/肥胖儿童体重干预目标是在保证身高稳定增长的同时，体重不增或增长速度减缓，最终达到健康体重，而非必须降低绝对体重<sup>[50]</sup>。生活方式干预是指对超重/肥胖儿童实施多种生活方式策略，主要包括饮食、运动和行为方式干预等。肥胖儿童的生活方式干预应针对整个家庭，促进以家庭为中心的生活方式改变（饮食、身体活动等），以达到促进肥胖儿童 BMI 合理降低的目的。确定生活方式干预无效后，才可以药物作为儿童肥胖治疗的辅助手段，且需在专业医生指导下使用<sup>[51-52]</sup>。

第十九条 超重/肥胖儿童减重应注重膳食结构调整，减少外出就餐，控制进食速度、零食和含糖饮料。

释义：超重/肥胖儿童减重饮食应坚持控制食物总量、调整饮食结构和饮食行为的原则，减少食用快餐食品、零食，并避免含糖饮料的摄入，多吃水果和蔬菜；保证每天至少饮奶 300 ml 或相当量的奶制品；减少在外就餐频率，进食速度不宜过快，每餐时间控制在 20~30 min<sup>[53-56]</sup>。

第二十条 超重/肥胖儿童每周至少应进行 150 min 中高强度有氧运动和抗阻训练，减少久坐，每天电子设备使用不超过 2 h。

释义：对于超重/肥胖儿童，建议每天进行中高强度、全身性有氧运动 30~60 min（如慢跑、滑冰、游泳等），每周  $\geq 4 \text{ d}$ ，时长  $\geq 150 \text{ min}$ ；每周进行 3~4 次抗阻训练（如引体向上、仰卧起坐、高

抬腿运动等),建议隔天进行。运动需要长期坚持,同时减少久坐行为<sup>[7, 57-59]</sup>。

#### 4 结 论

过去 30 年间,我国居民超重/肥胖患病率快速增长,当前,在我国成年人超重/肥胖率已经超过 50%,学龄儿童青少年约为 20%,超重/肥胖会增加高血压、T2DM、心脑血管疾病、癌症等多种慢性病的患病风险,预防和控制肥胖已经刻不容缓。本共识以高级别科学证据为基础,旨在指导超重/肥胖者和相关卫生工作者开展科学减重。坚持健康的生活方式是健康减重的基础。控制总热量的摄入,坚持平衡膳食、适当增加高蛋白食物、奶类、蔬菜水果、降低进食速度、坚持中等强度有氧运动、作息规律、保持良好的心理状态等有利于减重。低热量饮食、低碳饮食、间歇性断食、膳食补充剂尚无长期有效减重效果的证据。儿童体重管理的关键是坚持健康生活方式,家庭的参与至关重要。如果生活方式的改变不能有效获得健康体重,可以在医生的指导下,采取药物及手术等临床治疗措施。

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#### 附件 1 中国成人超重或肥胖诊断标准临界值

| 分类    | 体质量指数(kg/m <sup>2</sup> ) |           | 腰围(cm)               |                      |
|-------|---------------------------|-----------|----------------------|----------------------|
|       | 世界卫生组织                    | 中国        | 国际糖尿病联合会             | 中国糖尿病学会              |
| 超重    | 25.0~29.9                 | 24.0~27.9 | -                    | -                    |
| 肥胖    | ≥30.0                     | ≥28.0     | -                    | -                    |
| 中心性肥胖 | -                         | -         | 男性:≥90.0<br>女性:≥80.0 | 男性:≥90.0<br>女性:≥85.0 |

#### 附件 2 中国 6~17 岁学龄儿童青少年性别年龄别 BMI 超重与肥胖界值(kg/m<sup>2</sup>)

| 年龄(岁) | 男生   |      | 女生   |      |
|-------|------|------|------|------|
|       | 超重   | 肥胖   | 超重   | 肥胖   |
| 6.0~  | 16.4 | 17.7 | 16.2 | 17.5 |
| 6.5~  | 16.7 | 18.1 | 16.5 | 18.0 |
| 7.0~  | 17.0 | 18.7 | 16.8 | 18.5 |
| 7.5~  | 17.4 | 19.2 | 17.2 | 19.0 |
| 8.0~  | 17.8 | 19.7 | 17.6 | 19.4 |
| 8.5~  | 18.1 | 20.3 | 18.1 | 19.9 |
| 9.0~  | 18.5 | 20.8 | 18.5 | 20.4 |
| 9.5~  | 18.9 | 21.4 | 19.0 | 21.0 |
| 10.0~ | 19.2 | 21.9 | 19.5 | 21.5 |
| 10.5~ | 19.6 | 22.5 | 20.0 | 22.1 |
| 11.0~ | 19.9 | 23.0 | 20.5 | 22.7 |
| 11.5~ | 20.3 | 23.6 | 21.1 | 23.3 |
| 12.0~ | 20.7 | 24.1 | 21.5 | 23.9 |
| 12.5~ | 21.0 | 24.7 | 21.9 | 24.5 |
| 13.0~ | 21.4 | 25.2 | 22.2 | 25.0 |
| 13.5~ | 21.9 | 25.7 | 22.6 | 25.6 |
| 14.0~ | 22.3 | 26.1 | 22.8 | 25.9 |
| 14.5~ | 22.6 | 26.4 | 23.0 | 26.3 |
| 15.0~ | 22.9 | 26.6 | 23.2 | 26.6 |
| 15.5~ | 23.1 | 26.9 | 23.4 | 26.9 |
| 16.0~ | 23.3 | 27.1 | 23.6 | 27.1 |
| 16.5~ | 23.5 | 27.4 | 23.7 | 27.4 |
| 17.0~ | 23.7 | 27.6 | 23.8 | 27.6 |
| 17.5~ | 23.8 | 27.8 | 23.9 | 27.8 |
| 18.0~ | 24.0 | 28.0 | 24.0 | 28.0 |

注:来源于中华人民共和国国家卫生和计划生育委员会 2018 年制定发布的《学龄儿童青少年超重与肥胖筛查》,将 6~17 岁的儿童青少年超重/肥胖定义为 BMI 分别大于相应性别和年龄别 BMI 值的参考标准,是与成年人(>18 岁)超重/肥胖年龄-BMI 曲线相对应的临界值。

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# 中国超重/肥胖医学营养治疗指南（2021）

中国医疗保健国际交流促进会营养与代谢管理分会，中国营养学会临床营养分会，中华医学会糖尿病学分会，中华医学会肠外肠内营养学分会，中国医师协会营养医师专业委员会

近十几年来，全球超重/肥胖的患病率以惊人的速度增长，并呈现快速蔓延趋势。随着人们生活水平的提高和膳食结构的不断改变，超重/肥胖人口占比不断增加，并且逐渐向年轻化发展，现阶段超重/肥胖已成为严重影响国人身心健康的主要公共卫生问题。医学营养治疗是肥胖症治疗的基础，是在肥胖自然病程中任何阶段预防和控制必不可少的措施。2015年，中国超重/肥胖医学营养治疗专家共识编写委员会参考世界卫生组织（World Health Organization, WHO）出版的《WHO指南编写手册》结合医学营养减重治疗实践，制定并发布了《中国超重/肥胖医学营养治疗专家共识（2016年版）》（以下简称2016年版共识），受到内分泌、营养与代谢领域及相关专业领域人员的欢迎<sup>[1-3]</sup>。鉴于近5年医学减重领域发表了大量的临床证据，且循证指南/共识的方法学也有更新<sup>[4,5]</sup>，中国医疗保健国际交流促进会营养与代谢管理分会、中国营养学会临床营养分会、中华医学会糖尿病学分会、中华医学会肠外肠内营养学分会、中国医师协会营养医师专业委员会组织循证医学、公共卫生、营养与代谢领域的多名学者以及涵盖外科、内分泌等多学科专家共同协作，对2016年版共识进行全面更新，形成《中国超重/肥胖医学营养治疗指南（2021）》（以下简称本指南）。

本指南在制定过程中，首先设立文献支持小组并确定检索近20年发表的文献，确定二级和一级数据库并以GRADE（Grading of Recommendations Assessment, Development and Evaluation）协作网的指南分级标准进行分级推荐强度分类，具有较好的可操作性（表1、表2）。

表1 GRADE分级系统

| 证据强度分级 | 具体描述                                                           |
|--------|----------------------------------------------------------------|
| 高（A）   | 非常确信估计效应值接近真实效应值，进一步研究也不可能改变该估计效应值的可信度                         |
| 中（B）   | 对估计效应值确信程度中等，估计效应值可能接近真实效应值，但仍存在二者不相同的可能性，进一步研究有可能改变该估计效应值的可信度 |
| 低（C）   | 对估计效应值确信程度有限，估计效应值与真实效应值可能大不相同，进一步研究极有可能改变该估计效应值的可信度           |
| 极低（D）  | 对估计效应值几乎没有信心：估计效应值与真实效应值很可能完全不同。对效应值的任何估计都很不确定                 |

表2 GRADE推荐强度分级

| 推荐强度分级 | 具体描述                   |
|--------|------------------------|
| 强推荐    | 明确显示干预措施利大于弊或弊大于利      |
| 弱推荐    | 利弊不确定或无论质量高低的证据均显示利弊相当 |

除方法学和“1 肥胖的流行与危害”外，本指南各章节均按照“背景-推荐意见（证据等级，推荐级别；同意比例）-证据简述”的基本框架分别阐述。关键性临床问题按照PICO格式，即患者类型（patient）、干预措施或诊断试验（intervention）、对照/替代措施（comparison）、结局（outcome）进行描述和评价。根据临床问题检索、汇总并分析证据，形成推荐意见。再总结关键性临床问题的证据，充分考虑卫生经济学效应后作出结论。对于有分歧的推荐意见，采用“德尔斐法则”，通过编写支持小组与各专业领域的专家讨论，达成“循证共识”并以同意比例描述共识的程度。

## 1 肥胖的流行与危害

肥胖是指机体总脂肪含量过多和/或局部脂肪含量增多及分布异常，是由遗传和环境等因素共同作用而导致的慢性代谢性疾病。肥胖已成为一种全

球性“流行病”，全球人口的平均体质量指数(body mass index, BMI)正逐渐增加。2016年，全球超过19亿18岁以上的成人超重，其中超过6.5亿人肥胖，18岁及以上的成人中有39%超重、13%肥胖<sup>[6]</sup>。《中国居民营养与慢性病状况报告(2020年)》显示，我国超过一半成人超重/肥胖，6~17岁、6岁以下儿童和青少年超重/肥胖率分别达到19.0%和10.4%<sup>[7]</sup>。超重/肥胖造成的并发症与死亡风险密切相关，成为可预防疾病及失能的首要原因。

肥胖可导致较高的早期死亡风险，并增加总体死亡率。由于过多脂肪组织的质量效应或其直接的代谢效应，还与各种慢性病发生相关，包括糖尿病、脑卒中、冠状动脉疾病、高血压、呼吸系统疾病、阻塞性睡眠呼吸暂停、骨关节炎和胆结石等。肥胖甚至还与多种肿瘤的发生相关。此外，已知肥胖对个体可能产生不良心理和社会后果。多项调查研究显示有超过200种与肥胖相关的共存疾病，同时，即使小幅度减重也能改善这些共存疾病。《中国居民营养与慢性病状况报告(2020年)》显示，我国慢性病人群仍将不断扩大，因慢性病死亡的比例也会持续增加<sup>[7]</sup>。2019年我国因慢性病导致的死亡人数占总死亡人数的88.5%，其中心脑血管疾病、肿瘤、慢性呼吸系统疾病死亡比例为80.7%。肥胖与新型冠状病毒肺炎的不良结局(包括死亡)密切相关且是其独立危险因素，较高的BMI与新型冠状病毒肺炎较差的结局成正比<sup>[8]</sup>。

肥胖的流行以其高昂的医疗费用为国民经济带来了沉重的负担。临床数据表明肥胖与个人年医疗支出呈显著正相关，除增加31.8%的直接医疗成本外，还增加61.8%的间接负担，特指因肥胖引起的机会成本损失，包括日常活动能力下降、工作生产力丧失、劳动时间减少和家庭收入降低<sup>[9]</sup>。

全生活方式管理是指对超重/肥胖者同时实施多种生活方式干预策略，主要包含饮食管理、体育锻炼和行为干预3个要素。超重/肥胖者可采用自身能坚持的饮食方式配合体力活动，每周进行不少于150 min的运动，并通过适当的行为干预，如自我检测、目标设定等方式，以个人或小组面对面对谈的形式开展干预，是减重综合管理的有效方式。保持6个月内不少于14次随诊并持续1年，可使超重/

肥胖者平均减重8 kg<sup>[4]</sup>。全生活方式管理优于单纯的饮食干预或运动干预，发挥良好的减重作用。一项为期8年的大型随机对照试验(randomized controlled trial, RCT)招募了5145例患有糖尿病的超重/肥胖者，随机进行长期常规管理(对照组)或强化生活方式干预(干预组)，结果显示干预组中有4.6%的患者达到>5%的减重目标，而对照组中这一比例仅为2.1%<sup>[10]</sup>。糖尿病预防计划(Diabetes Prevention Program, DPP)研究也得出这一结论<sup>[11]</sup>。除减重作用外，全生活方式管理还能为超重/肥胖者带来多重健康效应<sup>[12]</sup>。

## 2 医学减重干预方法

**2.1 限能量膳食** 限能量膳食(calorie restrict diet, CRD)是指在目标能量摄入基础上每日减少能量摄入500~1000 kcal(男性为1200~1400 kcal/d, 女性为1000~1200 kcal/d)，或较推荐摄入量减少1/3总能量，其中碳水化合物占每日总能量的55%~60%，脂肪占每日总能量的25%~30%<sup>[13,14]</sup>。越来越多的研究表明，CRD是有效的体重管理方法，能够减轻肥胖者体重、减少体脂含量，进而减轻机体炎症反应、降低代谢综合征组分、减少心血管疾病危险因素<sup>[15-19]</sup>，改善睡眠质量<sup>[20]</sup>并缓解焦虑症状<sup>[21]</sup>。

问题1：蛋白质来源对CRD干预的作用有何影响？

提高大豆蛋白摄入比例的CRD可降低体脂率、血清总胆固醇(total cholesterol, TC)和低密度脂蛋白胆固醇(low density lipoprotein-cholesterol, LDL-C)水平。(证据等级C，弱推荐；同意比例94.9%)

Lopez-Legarrea等<sup>[22]</sup>研究蛋白质类型与肥胖相关炎症的关系，线性回归分析结果显示，总蛋白质摄入量( $P=0.007$ )、动物蛋白( $P=0.025$ )和肉类蛋白( $P=0.015$ )均与炎症呈正相关，但未发现植物或鱼类来源的蛋白质影响炎症状态。Liao等<sup>[23]</sup>在30例小样本研究中证实，与传统CRD相比，以大豆蛋白为基础的CRD能显著降低超重成人血清TC、LDL-C水平和体脂含量。

问题2：增加乳制品摄入量对CRD的减重干预有何影响？

增加乳制品摄入量可降低超重/肥胖者的体重

和体脂含量,而单纯增加钙补充剂并不能增强减重效果。(证据等级B,弱推荐;同意比例92.4%)

Jones等<sup>[24]</sup>研究补充乳制品和高钙饮食模式能否在超重/肥胖成人CRD干预期间增强减重效果和改善食欲调节,结果显示CRD干预期间增加钙摄入量并不能进一步增强减重效果。随着乳制品/钙摄入量的增加,血浆酪酪肽(peptide YY, PYY)浓度增加可能有助于增强饱腹感,并减少CRD干预期间脂肪摄入量。其他乳制品的研究也显示,CRD干预的同时增加乳制品摄入量能够减少更多的体重和体脂含量<sup>[25]</sup>,尤其增加低脂奶摄入可显著减少向心性肥胖<sup>[26]</sup>。

**2.2 高蛋白膳食** 高蛋白膳食(high protein diet, HPD)包括相对数量(蛋白质供能比)和绝对数量(蛋白质摄入量)的界定,多数HPD指每日蛋白质摄入量超过每日总能量的20%或1.5 g/(kg·d),但一般不超过每日总能量的30%或> 2.0 g/(kg·d)的膳食模式。多项研究证实,HPD能减轻饥饿感,增加饱腹感和静息能量消耗。由于摄入的蛋白质不能被人体储存而需立即进行代谢和利用(包括肽合成、新蛋白质合成、尿素生成和糖异生),代谢过程需要消耗大量三磷酸腺苷(adenosine triphosphate, ATP)。多项研究显示,HPD能减轻体重,改善一系列心血管疾病的危险因素,包括葡萄糖稳态和血脂改善等。Santesso等<sup>[27]</sup>报道基于74项RCT的系统评价,与常规蛋白质膳食相比,HPD更能显著减轻体重、缩小腰围。

**问题3: HPD能否改善超重/肥胖2型糖尿病(type 2 diabetes mellitus, T2DM)患者的体重和血糖?**

HPD有助于超重/肥胖T2DM患者减轻体重,并有利于血糖控制。长期应用时应加强包括肾功能在内的临床监测与营养咨询。(证据等级B,弱推荐;同意比例91.6%)

Larsen等<sup>[28]</sup>针对超重/肥胖T2DM患者进行12个月的RCT干预研究,结果显示与常规蛋白质膳食相比,HPD(30%供能比)能更显著地减轻体重,降低血甘油三酯(triacylglycerol, TG)和TC水平,两组患者糖化血红蛋白(glycosylated hemoglobin A<sub>1c</sub>, HbA<sub>1c</sub>)水平随时间推移均呈下降趋势,组间比较差异尚无统计学意义。一项开放、群体随机的

DiRECT研究证实,超重/肥胖T2DM患者采取限能量HPD并停用所有抗糖尿病和抗高血压药物3~5个月,再恢复CRD(15%蛋白质供能比),随访12个月,干预组24%的患者体重下降15 kg以上;对照组患者平均体重下降1 kg,两组比较差异有统计学意义;干预组46%的随访者糖尿病缓解,且体重降幅越大,糖尿病缓解率越高<sup>[29]</sup>。

迄今为止,HPD减重研究尚未发现对正常肾功能的不良影响。一项纳入44例接受胰岛素治疗的T2DM患者进行为期12周的RCT研究发现,HPD组受试者干预12周后估算肾小球滤过率(estimated glomerular filtration rate, eGFR)和尿微量白蛋白排泄量与均衡饮食组比较差异均无统计学意义<sup>[30]</sup>。另一项针对115例T2DM患者为期52周的RCT研究,结果显示,HPD与传统的高碳水化合物饮食干预在血肌酐、eGFR和蛋白尿指标方面比较差异均无统计学意义<sup>[31]</sup>。一项纳入419例T2DM患者的多中心平行、盲法、RCT研究分别实施HPD和高碳水化合物低脂饮食干预,随访2年,两组患者体重均有所减轻,腰围均显著缩小<sup>[32]</sup>。表明T2DM伴超重/肥胖患者可接受HPD减重干预,但应加强包括肾功能在内的临床监测与营养咨询。

**问题4: HPD对减重依从性和维持减重效果的影响?**

HPD可增加饱腹感、减轻饥饿感,有助于增强重度肥胖者的减重依从性并维持减重效果。(证据等级C,弱推荐;同意比例93.3%)

Johnston等<sup>[33]</sup>的Meta分析比较多种膳食模式对超重/肥胖成人的减重作用,发现不同膳食模式减重效果差异很小,而HPD的饱腹感和依从性更好。研究发现HPD可促进多种胃肠道激素分泌,包括胰高血糖素样肽-1(glucagon-like peptide-1, GLP-1)、胆囊收缩素和PYY等,并将神经刺激传递至中枢神经系统形成“饱腹感”信号,同时对饥饿有显著和持久的抑制作用<sup>[34,35]</sup>。

**问题5: HPD减重会引起骨质丢失吗?**

HPD保持以乳制品为主的优质蛋白来源更有助于维持骨量。(证据等级B,弱推荐;同意比例92.0%)

既往发表的系统评价支持蛋白质摄入量与体重

稳定的成人骨骼健康呈正相关<sup>[36]</sup>。一篇系统评价纳入16项RCT和20项前瞻性队列研究,结果表明增加蛋白质摄入量对骨骼并无不良作用<sup>[37]</sup>。一项为期1年的RCT研究中绝经后肥胖女性采用HPD干预,其桡骨远端、腰椎、全髋关节和胫骨骨小梁骨密度和骨矿物含量损失更少<sup>[38]</sup>。Josse等<sup>[39]</sup>研究显示,增加以乳制品为主的高蛋白饮食组受试者骨钙素、I型前胶原氨基端原肽(procollagen 1 amino-terminal propeptide, P1NP)、P1NP/I型胶原C末端肽(C-terminal telopeptide of type I collagen, CTX)比值和骨保护素(osteoprotegerin, OPG)/核因子κB受体活化因子配体(receptor activator of nuclear factor-κB ligand, RANKL)比值均增加,而骨吸收标记保持不变。提示增加乳制品来源的蛋白质对维持骨量有一定的积极作用。

问题6:不同蛋白来源的HPD补充剂对减重的影响?

以酪蛋白水解物、乳清蛋白水解物或大豆蛋白为蛋白来源的HPD补充剂,均有助于减重。(证据等级B,弱推荐;同意比例95.4%)

相较于大豆蛋白和酪蛋白,服用乳清蛋白30 min后血中总必需氨基酸和亮氨酸的浓度达到峰值,达峰速度快且曲线下面积大<sup>[40,41]</sup>。Denyschen等<sup>[42]</sup>评估分别补充大豆蛋白和乳清蛋白并结合抗阻训练对超重合并高脂血症男性患者力量增加、身体成分和血脂变化的影响,结果显示,各组患者体脂含量、腰臀比和血清TC水平均显著降低,但组间比较差异均无统计学意义。Speaker等<sup>[43]</sup>研究显示,以大豆蛋白为基础的HPD接受程度更高,可改善减重效果、身体成分和心脏代谢健康指标。一项包含9项RCT的系统评价显示,补充乳清蛋白可改善超重/肥胖者体重、总脂肪含量和部分心血管疾病危险因素<sup>[44]</sup>。

2.3 低碳水化合物饮食 低碳水化合物饮食(low carbohydrate diets, LCDs)通常指膳食中碳水化合物供能比 $\leq 40\%$ ,脂肪供能比 $\geq 30\%$ ,蛋白质摄入量相对增加,限制或不限制总能量摄入的一类饮食<sup>[45,46]</sup>。极低碳水化合物饮食(very low carbohydrate diets, VLCDs)以膳食中碳水化合物供能比 $\leq 20\%$ 为目标。生酮饮食是VLCDs的极特殊类型。近年来,越来越多的RCT研究和Meta分析报道短期应用

LCDs的减重效果显著,却较少评估长期应用的不良后果是否会引起微量营养素缺乏。一项纳入10项RCT的系统评价结果显示,任何类型的LCDs,其维生素A、维生素E、维生素B<sub>1</sub>、叶酸、镁、钙、铁和碘的摄入量均减少,故应额外增加摄入<sup>[47]</sup>。

问题7:LCDs是否有益于减轻体重?

短期LCDs干预有益于控制体重、改善代谢。(证据等级A,强推荐;同意比例94.5%)

Sun等<sup>[48]</sup>研究将不限能量的LCDs结合运动对58名中国超重女性干预4周,发现受试者体重显著降低,腰围与臀围均显著缩小。Liu等<sup>[49]</sup>将50名超重/肥胖女性随机分为不限能量的LCDs组与能量限制组,12周后两组受试者体重减少量比较差异无统计学意义,LCDs组受试者TC/高密度脂蛋白胆固醇(high density lipoprotein-cholesterol, HDL-C)比值和TG/HDL-C比值的降低幅度更大,且两种饮食在减轻体重和减少体脂含量方面同样有效。2016年一项基于78例超重/肥胖合并T2DM患者的研究显示,干预12个月后,限能量LCDs与正常碳水化合物饮食相比同样可以减轻体重,改善HbA<sub>1c</sub>水平,未对内皮功能产生不良影响<sup>[50]</sup>。Ebbeling等<sup>[51]</sup>纳入了164名成人进行3种不同含量碳水化合物(60%、40%、20%)饮食干预5个月,发现碳水化合物含量每降低10%,总能量消耗增加52 kcal/d,20%供能比组受试者生长激素释放肽和瘦素水平较60%供能比组均显著降低。

问题8:LCDs是否适合长期使用?

LCDs多用于短中期体重控制,其长期的安全性和有效性仍待进一步研究。(证据等级C,弱推荐;同意比例92.0%)

Gardner等<sup>[52]</sup>将609例肥胖受试者随机分为不限能量的LCDs组与低脂饮食组,12个月后两组受试者减重效果相当。一项为期2年的RCT研究比较不限能量的LCDs与健康对照饮食对绝经后肥胖女性的减重效果,结果显示LCDs组受试者体重和体脂含量减少更显著<sup>[53]</sup>。但其更长期的安全性和有效性有待进一步研究。

问题9:超重/肥胖的T2DM患者是否可以采用LCDs改善血糖控制?

超重/肥胖的T2DM患者在短中期采用LCDs有

利于改善血糖控制。(证据等级A, 强推荐; 同意比例93.7%)

Tay等<sup>[54]</sup>将115例超重/肥胖合并T2DM患者随机分为限能量LCDs组与正常碳水化合物组, 经52周干预发现两组患者体重、HbA<sub>1c</sub>和空腹血糖水平均有效降低, 限能量LCDs组患者在血糖稳定性和降糖药物使用需求方面改善更大。Saslow等<sup>[55]</sup>研究显示LCDs干预12个月, 合并T2DM的受试者平均体重减轻, LCDs组受试者上午HbA<sub>1c</sub>水平较限能量/适中碳水/低脂饮食组显著降低。2018年一项合并33项RCT和3项临床对照试验(controlled clinical trial, CCT)的Meta分析纳入2161例受试者, 发现相对于低脂饮食, 短期LCDs对T2DM患者HbA<sub>1c</sub>水平改善更佳<sup>[46]</sup>。

问题10: LCDs是否适用于儿童和青少年超重/肥胖者减重?

不推荐儿童和青少年以减重为目的执行长期LCDs。可在临床营养师严格指导下短期进行, 应定期检测血清微量营养素水平, 适当补充膳食纤维和微量营养素。(证据等级C, 弱推荐; 同意比例92.0%)

Ornstein等<sup>[56]</sup>使用不限能量LCDs对12~22岁青春期多囊卵巢综合征(polycystic ovary syndrome, PCOS)女性进行干预, 发现干预12周后受试者体重和BMI均显著降低, 腰围显著缩小。Goss等<sup>[57]</sup>对32例9~17岁患有肥胖症和非酒精性脂肪性肝病(non-alcoholic fatty liver disease, NAFLD)的儿童和青少年进行为期8周的LCDs干预, 发现胰岛素抵抗指数、内脏脂肪含量、体脂含量较干预前均显著降低。仅有极少数研究关注儿童和青少年LCDs干预期间是否存在微量元素缺乏以及是否会影响生长发育<sup>[56,57]</sup>。由于LCDs对食物选择具有局限性, 水果和蔬菜的摄入量远低于肉类和脂肪的摄入量, 膳食纤维、钙、碘、镁、锌、铁的摄入量可能低于推荐摄入量<sup>[58]</sup>。允许适当增加膳食补充剂以满足需求, 尽可能避免微量营养素摄入不足<sup>[59]</sup>。

问题11: 生酮饮食是否可用于医学减重?

在充分考虑安全性的情况下, 尝试其他减重饮食模式干预无效后, 在临床营养师指导下可进行短期生酮饮食管理, 除监测血酮体外, 还应监测肝肾功能、体成分的变化, 并密切关注血脂水平。(证据等级B, 强推荐; 同意比例92.4%)

在与生活方式改变和心理咨询有关的多学科干预下, 可连续或间歇性地将短期生酮饮食应用于体重管理, 但是长期应用的安全性尚未得到证实<sup>[60]</sup>。一项开放、多中心、前瞻性研究纳入89例BMI为30~35 kg/m<sup>2</sup>肥胖合并T2DM患者, 分组接受生酮饮食和常规LCDs干预, 干预4个月显示生酮饮食干预组患者体重和HbA<sub>1c</sub>水平均显著降低, 腰围显著缩小<sup>[61]</sup>。一项纳入13项RCT的Meta分析, 比较干预12个月的生酮饮食和低脂饮食对体重的影响, 结果显示生酮饮食干预者的体重减轻更显著, 血压和TG水平均显著下降, 但LDL-C和HDL-C水平均显著升高<sup>[62]</sup>。Brinkworth等<sup>[63]</sup>开展一项RCT将68例腹型肥胖者随机分为限能量生酮LCDs组和正常碳水化合物组, 随访52周后, 两组受试者的体重减轻相似, 血肌酐水平、eGFR比较差异均无统计学意义, 限能量生酮LCDs未显示对肾功能产生不利影响。

2.4 间歇性能量限制 间歇性能量限制(intermittent energy restriction, IER)是按照一定规律在规定时期内禁食或给予有限能量摄入的饮食模式。多项研究发现IER不仅对于减重有效, 且对代谢性疾病也具有重要作用。目前常用的IER方式包括: 隔日禁食法(每24小时轮流禁食)、4:3或5:2 IER(在连续/非连续日每周禁食2~3 d)等。在IER的禁食期, 能量供给通常在正常需求的0~25%<sup>[64]</sup>。Yan等<sup>[65]</sup>在汇总25项RCT的Meta分析中发现, IER组受试者体重、BMI、瘦体重、体脂含量均显著降低, 腰围显著缩小。但Schwingshackl等<sup>[66]</sup>研究发现, 与持续能量限制(continuous energy restriction, CER)相比, IER的优势并不明显。而不同类型的IER模式的减重效果也并无显著差异。Davis等<sup>[67]</sup>的系统评价发现当IER与CER的总能量限制保持相似时, IER的减重效果与CER相当。

问题12: 超重/肥胖者采用IER干预对减重和脂代谢有何影响?

与常规饮食相比, IER干预可以减轻超重/肥胖者的体重, 改善脂代谢指标。(证据等级A, 强推荐; 同意比例96.6%)

Schwingshackl等<sup>[66]</sup>的系统评价与Meta分析纳入17项RCT共1328名参与者, 观察时长≥12周, 结果显示与常规饮食相比, IER组参与者体重、脂肪

组织含量、TG水平降低更显著,二者对LDL-C、TG水平的改善有相似影响。Meng等<sup>[68]</sup>的系统评价发现与非饮食控制组相比,IER显著降低TC、LDL-C和TG水平,对脂代谢产生有益影响;CER在降低TC、TG水平方面较IER更有效,两种饮食方式可降低LDL-C至相似范围;亚组分析结果显示,摄入能量>50%每日能量所需的参与者TC、LDL-C水平均显著降低,而更严格的能量限制(即≤摄入所需能量的50%)却并未进一步降低上述指标水平。一项研究纳入107例超重/肥胖绝经前女性进行为期6个月的IER和CER干预,两组受试者瘦素、TC、LDL-C和TG水平均相应降低,IER和CER均具有促进脂代谢的效果,两种饮食方式可相互替代<sup>[69]</sup>。Pinto等<sup>[70]</sup>通过比较4周IER和CER对肥胖者心脏代谢健康指标的影响,发现IER组受试者游离脂肪酸浓度低于CER组,但两组受试者脂肪因子/炎症标志物、动脉血压或心率变化比较差异均无统计学意义。Antoni等<sup>[71]</sup>的研究最终纳入23名肥胖者,IER和CER参与者分别需要59 d和73 d达到5%的减重目标,与CER相比,在IER组观察到全身脂肪氧化增加,餐后血脂水平下降更显著。

#### 问题13: IER对超重/肥胖者的糖代谢有何影响?

在非糖尿病的超重/肥胖者中,IER可改善其胰岛素抵抗水平,提高胰岛素敏感性,但对血糖的影响尚不确切。(证据等级B,强推荐;同意比例97.5%)

Cho等<sup>[72]</sup>的一项评估IER在非糖尿病人群中降低BMI和影响糖代谢的系统性综述显示,IER组受试者空腹血糖和胰岛素抵抗水平较基础值均有所改善。Yan等<sup>[65]</sup>的一项评估IER对超重/肥胖者的人体测量和代谢参数调节作用的Meta分析显示,IER组受试者空腹血糖和胰岛素均无显著改善。Barnosky等<sup>[73]</sup>比较间歇性禁食(intermittent fasting, IF)与CER对超重/肥胖成人影响的系统评价显示,IF组受试者空腹胰岛素和胰岛素抵抗水平均下降,但与CER组相当,对于血糖的影响尚无统一结果。

Carter等<sup>[74]</sup>的一项比较IER与CER对T2DM患者血糖控制的RCT研究显示,干预12周两组患者HbA<sub>1c</sub>水平均显著降低,但组间比较差异无统计学意义。该团队另一项研究显示,干预12个月,两组患者HbA<sub>1c</sub>水平较基线均下降,但降低幅度比较差异无

统计学意义<sup>[75]</sup>。Welton等<sup>[64]</sup>的系统评价显示,在5项T2DM患者执行IER的研究中,有4项研究显示HbA<sub>1c</sub>水平改善,1项研究显示胰岛素水平下降。但Overland等<sup>[76]</sup>对1型糖尿病伴超重/肥胖者IER干预减重的安全性和有效性研究显示,两组患者HbA<sub>1c</sub>水平与基线相比均无变化。张明国等<sup>[77]</sup>观察IER治疗糖耐量异常者的临床效果,结果显示接受IER+药物治疗后,糖耐量异常者的空腹血糖和餐后2 h血糖水平较治疗前均显著降低。

#### 问题14: 如何评价IER的安全性与依从性?

与常规饮食相比,IER对健康人群减重是安全的。与CER相比,IER对糖尿病患者也是相对安全的,但需关注降糖药物的调整(证据等级C,弱推荐;同意比例93.7%)。应加强对应用IER干预人群的管理以提高依从性。(证据等级C,强推荐;同意比例95.4%)

Kessler等<sup>[78]</sup>评估IF对健康志愿者的研究显示,与健康饮食相比,IF组志愿者未发现严重不良事件,76%的不良事件与空腹有关或可能有关,包括头痛、恶心、烦躁、循环系统紊乱、无力、疲倦、胃痛、胃灼热。Gabel等<sup>[79]</sup>的一项前瞻性队列研究结果显示,自我报告的不良事件(胃肠道或神经系统)未随时间变化,认知抑制、不受控制的饮食和情绪化进食也未随时间而改变。关于老年人群的研究显示,IF不良事件发生率很低,大多数老年人均可耐受<sup>[80,81]</sup>。Jebeile等<sup>[82]</sup>的一项关于肥胖青少年(12~17岁)IER干预26周的研究显示,与基线数据相比,干预后TG水平和脂肪组织含量均明显下降,颈动脉内膜中层厚度和血管扩张也较基线改善,说明IER在青少年中是可行且有效的干预措施。但关于IER在儿童中的有效性尚缺乏证据等级较高的RCT研究。

Rajpal等<sup>[83]</sup>的系统综述研究了IF方案对代谢综合征、糖尿病前期和T2DM患者的有效性和安全性,结果显示,IF总体上是有效且相对安全的,但增加了低血糖发生风险,特别是使用胰岛素或磺脲类药物治疗的T2DM患者,与使用这些药物相关的不良反应可能会限制这些方案在此类患者中的效用。Corley等<sup>[84]</sup>的研究比较IER对糖尿病患者低血糖的发生风险,结果显示,12周内平均低血糖发生率为1.4次事件,尽管断食日会增加低血糖发生风险,

但总体发生率仍较低，并会随着药物调整而改善。

Jospe等<sup>[85]</sup>开展了一项关于饮食选择、依从性及减重效果的观察性研究，共纳入250名受试者，54.4%的受试者选择IF，27.2%的受试者选择地中海饮食，18.4%的受试者选择旧石器时代饮食，在12个月时仅有54%（IF）、57%（地中海饮食）、35%（旧石器时代饮食）的受试者仍在遵循选择的饮食。Roman等<sup>[86]</sup>的一项针对多发性硬化患者不同饮食模式的安全性和可行性的研究发现，此类患者对CRD的依从性较差。

**2.5 低血糖指数饮食** 低血糖指数（glycemic index, GI）食物具有低能量、高膳食纤维的特性，可使胃肠道容受性舒张，增加饱腹感，有利于降低总能量摄入。低GI饮食可降低餐后血糖峰值，减少血糖波动、胰岛素分泌的速度和数量，从而降低餐后血糖和胰岛素应答，促进脂肪酸合成和储存，阻止脂肪动员和分解，降低游离脂肪酸水平和拮抗激素的反应，增加胰岛素敏感性。一项纳入6项RCT的系统评价显示，与高GI或低脂饮食相比，接受低GI饮食者的体重、BMI、总脂肪含量下降更显著<sup>[87]</sup>。另一项纳入101项研究共8527名参与者的系统评价显示，低GI饮食对减重有良好效果<sup>[88]</sup>。一项纳入14项RCT的系统评价也证实低GI饮食可改善胰岛素抵抗<sup>[89]</sup>。研究显示，高GI饮食可能触发成瘾症状的神经化学和行为反应，引起血糖和胰岛素水平快速变化，类似于成瘾物质的药代动力学<sup>[90]</sup>。葡萄糖和胰岛素会向中脑边缘系统发送信号，改变多巴胺浓度，可能是肥胖的病因之一。肥胖者的脂肪组织增大可伴随炎症反应，如吞噬细胞和其他免疫细胞浸润，脂肪因子分泌增多，出现胰岛素抵抗和系统炎症反应<sup>[91]</sup>。一项针对青少年超重/肥胖的研究显示，低GI饮食者的高敏C反应蛋白、白介素-6（interleukin-6, IL-6）水平均显著降低<sup>[92]</sup>。

**问题15：低GI饮食是否有助于减重？**

限制总能量的低GI饮食可减轻肥胖者体重，且短期应用的减重效果优于高GI饮食。（证据等级B，弱推荐；同意比例96.6%）

一项包括6项RCT的系统评价，持续干预5周至6个月，并进行6个月随访，结果显示与高GI或低脂饮食相比，接受低GI饮食的参与者体重、总脂

肪含量和BMI均显著降低<sup>[87]</sup>。超重/肥胖者采用低GI饮食较接受其他干预可减轻更多的体重，且在脂质方面改善更多。另一项系统评价发现，在为期1~6个月的研究中，低GI饮食优于其他控制能量饮食，应至少需要4周时间来获得饮食干预对体重的影响<sup>[88]</sup>。Abete等<sup>[94]</sup>研究两种不同食物分配和GI值的能量限制饮食对减重和能量代谢的影响，两组试验饮食的三大产能营养素占总能量比例相同，但低GI组提供的膳食纤维含量更高，干预8周发现，低GI组受试者体重减轻明显多于高GI组，但两组受试者腰围、脂肪含量、瘦体重和静息能量消耗等相似。

**问题16：低GI饮食是否有助于增加饱腹感，改善胰岛素抵抗？**

短期应用低GI饮食可增加饱腹感，改善胰岛素抵抗。（证据等级C，弱推荐；同意比例95.8%）

一项纳入32项RCT的系统评价发现，短期研究中，低GI饮食较高GI饮食具有更强的饱腹效果，其机制可能是因为血糖水平对饱腹感产生的特定影响（血糖抑制）和其他参与控制食欲的因素<sup>[93]</sup>。Pittas等<sup>[91]</sup>比较不同血糖负荷（glycemic load, GL）的两种CRD对健康超重成人葡萄糖耐量和炎症的影响，两组的能量密度和膳食纤维相同，但三大产能营养素比例不同，最终两组间体重减轻的效果相当，胰岛素或稳态模型评估的胰岛素抵抗（homeostasis model assessment of insulin resistance, HOMA-IR）指数比较差异均无统计学意义。

## 2.6 多种饮食模式

**2.6.1 终止高血压饮食** 终止高血压饮食（dietary approaches to stop hypertension, DASH）（即DASH饮食）是从美国大型高血压防治计划发展而来的膳食模式，强调增加蔬菜、水果、低脂（或脱脂）奶、全谷类食物摄入，减少红肉、油脂、精制糖及含糖饮料摄入，进食适当的坚果、豆类，从而提供丰富的钾、镁、钙等矿物质和膳食纤维，增加优质蛋白质和不饱和脂肪酸摄入，减少脂肪尤其是饱和脂肪酸和胆固醇摄入<sup>[95]</sup>。

**问题17：与常规饮食相比，DASH饮食是否有助于超重/肥胖者减重？**

与常规饮食相比，DASH饮食可有效降低超重/

肥胖者的体重、BMI和体脂含量。(证据等级B, 强推荐; 同意比例96.2%)

Kucharska等<sup>[96]</sup>对126例超重/肥胖的原发性高血压患者的RCT研究显示, 与无营养干预对照相比, 3个月DASH饮食组患者的体重、血压、体脂含量、空腹血糖、胰岛素、瘦素水平均显著下降。Razavi等<sup>[97]</sup>对60例超重/肥胖的NAFLD患者进行为期8周的RCT研究, 结果显示坚持DASH饮食可显著降低患者体重、BMI、谷丙转氨酶(alanine transaminase, ALT)、碱性磷酸酶(alkaline phosphatase, ALP)、TG、胰岛素水平和HOMA-IR指数。Shenoy等<sup>[98]</sup>对81例代谢综合征患者进行为期12周的RCT研究, 结果显示与对照饮食相比, DASH饮食可显著降低患者的体重。Barak等<sup>[99]</sup>对伊朗293名30岁以上的女护士进行横断面研究, 结果显示DASH饮食与向心性肥胖的发生率呈负相关。

**2.6.2 地中海饮食** Keys等<sup>[100]</sup>于20世纪60年代首次确定并提出地中海饮食模式, 基于大规模前瞻性研究, 纳入11 579例研究对象, 随访15年发现生活在地中海区域的人群具有相对低的全因死亡率和冠心病死亡率, 进一步病因学分析揭示其归因于地中海饮食模式。其膳食结构特点: 以植物性食物为主, 包括全谷类、豆类、蔬菜、水果、坚果等; 鱼、家禽、蛋、乳制品适量, 红肉及其产品少量; 食用油主要是橄榄油; 适量饮红葡萄酒。其营养特点: 脂肪供能比为25%~35%, 其中饱和脂肪酸摄入量低(7%~8%), 不饱和脂肪酸摄入量较高。

**问题18:** 与常规饮食相比, 地中海饮食是否有助于超重/肥胖者减重?

与常规饮食相比, 地中海饮食可有效降低超重/肥胖者、糖尿病和代谢综合征患者及产后女性的体重。(证据等级A, 强推荐; 同意比例94.5%)

Esposito等<sup>[101]</sup>对16项RCT进行Meta分析, 纳入3436名受试者, 结果显示地中海饮食组受试者体重和BMI均显著降低。Huo等<sup>[102]</sup>对9项RCT进行Meta分析, 纳入1178例T2DM患者, 结果显示地中海饮食组患者BMI、体重、HbA<sub>1c</sub>、空腹血糖、空腹胰岛素水平均显著降低。Stendell-Hollis等<sup>[103]</sup>对129名产后17.5周的超重女性进行4个月的RCT研究发现, 地中海饮食组受试者体重、体脂含量均显著降低。

Di Daniele等<sup>[104]</sup>对80例意大利代谢综合征患者进行6个月地中海饮食干预, 干预后患者体重、BMI、腰围、LDL-C、TG水平均显著降低。Di Renzo等<sup>[105]</sup>对188名意大利受试者进行4周的RCT研究发现, 地中海饮食组受试者体脂含量显著降低。

**2.7 代餐食品减重** 代餐食品是为满足成人控制体重期间一餐或两餐的营养需要, 代替部分膳食, 专门加工配制而成的一种控制能量食品。中国营养学会发布的首个《代餐食品》团体标准(T/CNSS 002-2019), 对于代餐食品的原料、感官、营养成分、标签、名称等做出了明确要求<sup>[106]</sup>。Astbury等<sup>[107]</sup>纳入23项研究8253例超重/肥胖成人的系统评价表明, 采用代餐食品减重在1年内的减重效果更好, 可作为社区和卫生保健机构管理肥胖的有效选择。Davis等<sup>[108]</sup>对90名肥胖成人进行为期40周的RCT研究表明, 代餐组受试者减重效果更显著, 且在第16周和第40周体重下降>5%的受试者更多, 体成分、生化指标均显著改善, 并在维持阶段改善炎症和氧化应激。Kruschitz等<sup>[109]</sup>对奥地利1237名超重/肥胖者给予代餐食品治疗, 干预12个月时分别有61%、36%、19%的受试者体重减轻大于基础体重的5%、10%、15%。Coleman等<sup>[110]</sup>对310名超重/肥胖者的24周系统回顾队列分析表明, 代餐食品可通过减少食物种类、控制食物份量, 达到可持续性减重效果, 改善肥胖相关疾病的危险因素, 并能最小化瘦体重损失, 从而保持力量和身体功能及长期维持体重。

然而, 由于代餐食品长期应用的有效性并不确定, 许多指南并未提及或不建议将代餐食品用于超重/肥胖者的日常管理。

**问题19:** 代餐食品减重期间应如何保证营养充足?

选择符合标准的代餐食品, 结合复合维生素和矿物质补充剂保证减重期间营养充足。(证据等级C, 弱推荐; 同意比例94.5%)

Ashley等<sup>[111]</sup>报道96名超重/肥胖女性的RCT研究显示, 两组受试者1年都能保持充足的常量和微量营养素摄入, 但传统饮食组受试者需要补维生素和矿物质制剂的比例低于代餐组, 强调在执行代餐食品减重期间有必要应用膳食补充剂。Flechtner-Mors等<sup>[112]</sup>开展的100人参与的前瞻性、随机、双臂平行研究,

干预4年，结果提示，代餐食品配合补充维生素和矿物质来提供结构化的饮食计划是安全有效的饮食策略，还可改善疾病风险的某些生物标志物。多项研究均指出，适当增加每日代餐中蛋白质的比例，可减少体脂含量，并有效保留瘦体重，防止肌肉流失<sup>[113,114]</sup>。

#### 问题20：代餐食品减重的安全性如何？

短期应用代餐食品减重是安全的，严重不良反应少，耐受性较好。其长期安全性仍待进一步研究。（证据等级B，弱推荐；同意比例95.4%）

Coleman等<sup>[110]</sup>对310名超重/肥胖者给予代餐食品干预24周，结果显示，不良反应均较轻，发生率>5%的不良反应主要为胃肠道紊乱或抱怨饥饿、疲劳和压力/焦虑，有2.9%的严重不良事件，包括脑卒中、心脏病发作、胆囊切除术以及因凝血、痔疮、高热住院等。Astbury等<sup>[107]</sup>纳入23项研究的系统性综述中，仅2项研究报道不良事件，5145名参与者低血糖、骨折、截肢、充血性心力衰竭或胆结石发生率组间比较差异均无统计学意义。Furlow等<sup>[115]</sup>对173例在医学监督下进行代餐食品减重的患者进行回顾性分析，大部分不良反应是轻度和瞬时的，仅4例患者出现较严重的不良反应，且在成功减重后，症状得到控制，另有2例患者接受过胆囊切除术。Noakes等<sup>[116]</sup>观察66例TG水平升高的超重/肥胖者，采用代餐食品 and 传统结构化减重饮食干预6个月，代餐组保持和增强了减重期间饮食的营养充足性，且参与者对饮食的依从性和获取食物的便捷性较好。

#### 问题21：代餐食品减重对糖尿病患者的效果如何？

糖尿病患者短期应用代餐食品可通过减轻体重进而改善血糖。（证据等级B，弱推荐；同意比例92.8%）

Xu等<sup>[117]</sup>对88例糖耐量受损者的干预研究显示，采用低GI代餐并随访12个月，代餐组受试者的体重、BMI、体脂、腰围、臀围下降更显著，且74%的减重是减少了脂肪量，血糖和HbA<sub>1c</sub>水平也均显著降低，葡萄糖耐量改善率更高，转归为正常糖耐量的比例更高。Cheskin等<sup>[118]</sup>报道代餐食品对112例T2DM患者减重的研究表明，代餐组患者干预34周的减重效果和86周的体重维持效果均显著优于标准

饮食组，代餐组减重>5%的患者比例更高，且维持率更高。张倩等<sup>[119]</sup>对66例T2DM患者进行6周的代餐食品干预，结果显示代餐食品主导的生活方式管理在改善患者体重、腰围、BMI、内脏脂肪率、体脂率、空腹血糖、空腹胰岛素、HOMA-IR指数和HbA<sub>1c</sub>方面效果更显著，并且可减少降糖药物剂量，甚至停药，而传统糖尿病饮食则无此效果。郑欣等<sup>[120]</sup>对200例糖尿病合并肥胖者进行代餐食品干预12周，结果显示代餐组患者空腹血糖、HbA<sub>1c</sub>、体脂含量、内脏脂肪面积、腰围等较传统低能量饮食组改善更显著。Brown等<sup>[121]</sup>的RCT研究对90例接受胰岛素治疗的T2DM伴肥胖者进行低能量代餐饮食干预12个月，结果显示，与对照组相比，代餐组患者获得更大的体重减轻，胰岛素治疗比例显著降低，停用胰岛素比例显著增加，改善了血糖控制和生活质量。

#### 问题22：代餐食品对代谢综合征和心血管疾病患者的减重效果如何？

短期使用代餐食品可有效控制代谢综合征和心血管疾病患者的体重，减少其心血管事件的危险因素。（证据等级B，弱推荐；同意比例93.7%）

Coleman等<sup>[110]</sup>对310名超重/肥胖者的24周系统回顾队列分析表明，代餐食品减重最初4周内即出现血压和心率降低，38%的高血压前期人群、48%的高血压患者在12周平均降低收缩压（11.3±16.7）mmHg和舒张压（6.6±12.6）mmHg，腰围和臀围均有所缩小，心血管危险因素得到改善。König等<sup>[122]</sup>对90例代餐食品和限能量低脂饮食受试者进行的RCT研究显示，代餐组受试者体重、脂肪量、TG、胰岛素和瘦素水平下降及腰围缩小均更显著，两组受试者大部分代谢危险因素均有所减少，代餐组代谢综合征患病率降低了12%，而限能量低脂饮食组则无变化。杨炯贤等<sup>[123]</sup>对100例高蛋白代餐饮食者的12周干预研究结果显示，高蛋白和标准蛋白代餐均能降低超重/肥胖者的BMI，改善TG水平，但高蛋白代餐降低尿酸等代谢性指标的作用更优。Chaiyasoot等<sup>[124]</sup>对110例肥胖者给予代餐食品干预12周，结果显示，生活方式+代餐组参与者体重下降更明显，空腹血糖、胰岛素、HbA<sub>1c</sub>水平及HOMA-IR指数均显著低于单纯生活方式组，16%的参与者不再符合

代谢综合征诊断标准。Astbury等<sup>[125]</sup>纳入278名肥胖并寻求减重支持的成人的RCT研究显示,与常规节食减重+行为支持组相比,完全代餐组在减轻体重、降低心血管代谢疾病发病风险和控制血糖方面的效果更佳,且完全代餐组受试者减重超过10%的比例显著高于对照组。

**2.8 生物节律与减重** 时间限制进食法(time-restricted feeding, TRF)是指限制每天进食时间,禁食在3~21 h,在白天或夜间禁食均可的一种饮食方式<sup>[126]</sup>。常见有4 h、6 h、8 h进食3种限制类型。与CRD、HPD等相比,TRF只限定进食时间,不限定进食种类和数量,实践更轻松,更易让人接受和坚持。研究显示,短期应用TRF干预可减轻体重<sup>[126-129]</sup>,但关于TRF对体成分产生的影响结果不一。Pellegrini等<sup>[126]</sup>的系统评价纳入6项为期4~8周的观察性研究结果,显示TRF组受试者体重下降更多,但同时减少了更多的瘦体重。另一项纳入20名肥胖者为期12周的试验也发现,TRF可有效减少体脂含量和内脏脂肪含量,但也减少了瘦体重,其中主要是下肢肌肉<sup>[127]</sup>。也有研究认为TRF对体成分没有明显影响。Gabel等<sup>[129]</sup>在46例肥胖者的RCT研究中发现,经过12周的8 h TRF干预,TRF尽管有轻微的限热量摄入、体重减轻和改善收缩压的作用,但对体脂含量、瘦体重和内脏脂肪含量无明显影响。目前尚无足够证据证明TRF对减重的长期效果。

**问题23: TRF对血脂、血糖代谢的影响如何?**

TRF可能改善空腹血糖,但对胰岛素抵抗、血脂代谢的影响,研究结果尚不一致。(证据等级D,弱推荐;同意比例90.7%)

Parr等<sup>[130]</sup>在11名肥胖男性中进行5 d随机交叉试验,结果显示,TRF组参与者夜间血糖曲线下面积更低,但白天血糖曲线下面积组间比较差异无统计学意义,因此TRF组参与者24 h血糖曲线下面积更低;胰岛素和TG曲线下总面积比较差异均无统计学意义,但峰值TG浓度升高。近期一项纳入11项研究的系统评价显示,TRF可以改善空腹血糖,但对空腹胰岛素、HOMA-IR指数、TG、TC、HDL及LDL均无显著影响<sup>[126]</sup>。Sutton等<sup>[131]</sup>对8例糖尿病前期伴肥胖参与者进行为期5周的随机交叉等能量对照试验,在维持体重不变的前提下,TRF干预即

可降低胰岛素水平,改善胰岛素敏感性和胰岛β细胞功能,但空腹血糖和餐后血糖无明显差异。

**2.9 微量营养素** 医学营养减重除了关注总能量和宏量营养素比例外,微量营养素缺乏也同样需要引起重视。Pereira-Santos等<sup>[132]</sup>经Meta分析发现,肥胖者维生素D缺乏风险较正常体重人群高35%,较超重人群高24%。对肥胖者进行低能量膳食干预时,由于食物总摄入量减少或种类受限,营养素缺乏的风险上升。Gardner等<sup>[133]</sup>对4种不同能量和宏量营养素占比的减重饮食方案的研究发现,在减重者中存在维生素和微量元素摄入不足的风险。

**问题24: 医学营养减重期间是否需要补充微量营养素?**

CRD,尤其极低能量饮食干预时,应同时补充复合维生素与微量元素。(证据等级C,强推荐;同意比例94.9%)

CRD,尤其是极低能量饮食可能引起肥胖者体内微量营养素缺乏,维生素或微量元素摄入不足的风险更高<sup>[133]</sup>。减重饮食干预期间,需补充复合微量营养素,以预防因限制饮食所致的营养缺乏。Truby等<sup>[134]</sup>的多中心研究显示,在调整能量结构的饮食干预中,微量营养素摄入量也产生变化;对特定微量营养素(如叶酸、铁或钙)需求较高的人群,可能从个体化饮食方案或强化食品中获益。减重期间积极补充复合微量元素,对减重也有积极作用。Slusher等<sup>[135]</sup>研究发现,在减重的同时补充维生素D和钙,亦可增强减重效果。

**问题25: 医学营养减重期间是否需要补充钙和/或维生素D?**

有缺乏风险的减重者应补充钙和/或维生素D。(证据等级B,强推荐;同意比例97.1%)

一项针对136例患者减重术前的前瞻性研究发现,57%的患者存在不同程度的维生素D缺乏<sup>[136]</sup>。2019年的一项Meta分析纳入11项RCT共947例患者,结合CRD和运动,补充维生素D 1~12个月后,维生素D的补充与BMI和腰围的下降均呈正相关<sup>[137]</sup>。Lotfi-Dizaji等<sup>[138]</sup>亦发现,在维生素D缺乏的肥胖者中,维生素D状态的改善与减重饮食相结合,能降低代谢性炎症水平,对降低体重、脂肪含量有协同作用。肥胖者维生素D推荐摄入量也高于一般健

康成人。《维生素D及其类似物临床应用共识》建议BMI  $\geq 30 \text{ kg/m}^2$ 的肥胖儿童和成人进行血25-羟维生素D[25-hydroxyvitamin D, 25(OH)D]水平筛查<sup>[139]</sup>。2011年美国内分泌学会发表的《维生素D缺乏的评价、预防及治疗临床实践指南》中，对于有维生素D缺乏风险的肥胖者，建议至少补充同年龄段2~3倍推荐量的维生素D以满足需求量<sup>[140]</sup>。

一项研究观察CRD干预期间微量营养素水平变化，发现63%的女性和61%的男性均存在钙摄入不足的现象<sup>[141]</sup>。2004年一项RCT研究发现，高钙饮食者较低钙饮食者实施CRD干预期间体重和体脂含量下降更显著，且补充乳制品来源的钙效果优于补充非乳制品来源的钙<sup>[142]</sup>。《中国居民膳食营养素参考摄入量速查手册（2013版）》建议18岁以上人群钙摄入量为800 mg/d，50岁以上人群钙摄入量为1000 mg/d<sup>[143]</sup>。

问题26：医学营养减重期间是否需要强化铁的补充？

医学营养减重期间宜采用个体化饮食方案，防止铁缺乏。（证据等级C，弱推荐；同意比例97.1%）

Teng等<sup>[144]</sup>研究显示，通过CRD干预导致的体重下降，对肥胖者体内铁的生理稳态产生有益影响。但减重期间若长期不注重饮食中铁的摄入，会导致铁缺乏风险增高。18~50岁人群铁的推荐摄入量为男性12 mg/d，女性20 mg/d；50岁以上人群铁的推荐摄入量为12 mg/d。但正常饮食以外摄入较多的铁容易出现铁超载，这种情况常见于过度摄入富铁补充剂的人群<sup>[145]</sup>，尤其是长期服用铁剂，补铁期间应注意监测血清铁蛋白和肝铁浓度，避免补铁过量出现继发性铁超载。

**2.10 肠道微生态** 近年来研究表明肠道微生物在代谢调节和食物消化中发挥作用，并且肠道菌群与肥胖存在密切联系<sup>[146,147]</sup>。肠道菌群的代谢活动能够影响营养物质吸收，可通过促进饮食成分的能量代谢并在能量存储和消耗中影响能量平衡<sup>[148,149]</sup>。肥胖的发病机制中也包含肠道菌群对能量代谢调节和全身性炎症的影响。与肥胖相关的代谢性疾病，如T2DM和心血管疾病也都与肠道菌群有关<sup>[150-152]</sup>。近年来，益生菌、益生元以及粪菌移植等针对肠道微生态用于减重的临床研究逐渐开展<sup>[153-157]</sup>。但由

于刚刚起步，在评判减重临床结局指标方面仍以体重、BMI、体脂、腰围等指标作为主要结局，将血脂、血糖、炎症因子等作为辅助指标，尚未将评判肠道菌群改变作为影响减重的结局指标。

问题27：是否可以通过补充益生菌使成人肥胖者改善代谢指标？

成人肥胖者可通过服用含有特定菌株的益生菌协助减重，并因此获得代谢指标改善。（证据等级C，弱推荐；同意比例91.1%）

研究显示，鼠李糖乳杆菌CGMCC1.3724 (*Lactobacillus rhamnosus* CGMCC1.3724) 对肥胖人群的干预有性别差异，每天服用含低聚果糖和菊粉以及 $3.24 \times 10^8$ 菌落形成单位 (colony forming unit, CFU) 的鼠李糖乳杆菌或安慰剂，12周后，肥胖女性的平均体重减轻显著大于安慰剂组，24周后该差异仍显著并且24周后脂肪含量减少显著大于安慰剂组<sup>[158]</sup>。动物双歧杆菌乳酸亚种B420 (*Bifidobacterium animalis subsp. Lactis* B420) 配合聚葡萄糖可降低健康超重/肥胖个体的体脂含量，还可减少食物摄入量。与安慰剂组相比，体重、腹部脂肪含量下降显著。而单纯聚葡萄糖或单纯益生菌B420与安慰剂相比并不能有效降低体重，这可能与聚葡萄糖+益生菌B420可增加肠道中的 *Akkermansia*、*Christensenella* 和 *Methanobrevibacter*，降低肠道中的 *Paraprevotella* 有关。针对肥胖成人，经过12周的短双歧杆菌B-3 (*Bifidobacterium breve* B-3) ( $2 \times 10^{10}$  CFU/d) 干预，体脂含量显著低于安慰剂组。每天服用复合益生菌胶囊UB0316  $5 \times 10^9$  CFU和100 mg低聚果糖12周后，肥胖者BMI和腰臀比均显著降低<sup>[159]</sup>。

一项研究将60名肥胖成人随机分组后服用500 mg复合菌胶囊共8周，结果显示，益生菌组受试者体重、TC、TG、LDL-C水平均显著降低，压力、焦虑、抑郁评分均显著改善<sup>[160]</sup>。采用格氏乳杆菌BNR17对62名BMI  $\geq 23 \text{ kg/m}^2$ 和空腹血糖  $\geq 100 \text{ mg/dl}$  的超重/肥胖成人干预12周，结果显示，格氏乳杆菌BNR17组受试者体重略有降低，并无显著差异，但腰围和臀围缩小更显著<sup>[161]</sup>。

问题28：伴有非酒精性脂肪性肝炎、糖尿病等代谢性疾病的肥胖者是否可服用含有特定菌株的益生菌？

罗伊氏乳杆菌可帮助非酒精性脂肪性肝炎患者减轻体重、降低BMI、缩小腰围。含有乳酸杆菌、双歧杆菌和嗜热链球菌的复合益生菌联合减重饮食可改善代谢综合征患者的BMI、胰岛素抵抗及食欲相关激素水平。(证据等级C, 弱推荐; 同意比例93.3%)

Rabiei等<sup>[162]</sup>研究中46例代谢综合征成人患者分别服用复合益生菌或安慰剂胶囊, 持续3个月, 再联合个体化减重饮食, 结果显示, 两组患者体重、BMI、血糖、胰岛素水平、HOMA-IR指数和GLP-1的平均变化比较差异均有统计学意义。此外, 复合益生菌组中的PYY显著增加, 体重减轻趋势在研究结束前是显著的。在一项针对50例非酒精性脂肪性肝炎患者的RCT研究中, 患者使用 $1 \times 10^8$  CFU罗伊氏乳杆菌(包含瓜尔胶和菊粉)或安慰剂3个月, 结果发现, 非酒精性脂肪性肝炎患者的肠道通透性较高, 但小肠细菌过度生长的患病率较低。干预后, 益生菌组患者的脂肪变性减少, 体重、BMI和腰围均显著降低<sup>[163]</sup>。

问题29: 医学营养减重者是否可以从益生元中获益?

儿童或成人肥胖者短期服用特定益生元或富含益生元食品可获得更好的减重效果。(证据等级B, 弱推荐; 同意比例91.6%)

42名超重/肥胖的7~12岁儿童分别接受富含低聚果糖的菊粉或安慰剂(剂量为等能量)干预, 每天1次, 持续16周, 食用菊粉的儿童16周后体重z评分显著下降3.1%, 体脂百分比显著下降2.4%, 躯干脂肪百分比显著下降3.8%, IL-6水平较基线水平显著降低, 血清TG水平显著降低, 肠道双歧杆菌属显著增加, 而寻常小杆菌(*Bacteroides vulgatus*)减少<sup>[164]</sup>。48名超重成人被随机分配接受低聚果糖或安慰剂(麦芽糊精)干预12周, 结果显示, 补充低聚果糖可有效减轻体重, 低聚果糖组参与者生长激素释放肽的曲线下面积较低, PYY的曲线下面积较高<sup>[165]</sup>。

问题30: 通过粪菌移植可以减重吗?

不建议肥胖者常规通过粪菌移植减重。但合并糖尿病、代谢综合征等并发症的肥胖者可考虑短期采用粪菌移植改善菌群定植。(证据等级C, 弱推荐;

同意比例89.0%)

粪菌移植是一种针对肠道微生物的调节策略, 已被用于治疗多种人类疾病, 包括与肥胖相关的代谢性疾病。由于人类肠道细菌群落可以自我调节并具有适应变化的能力, 与艰难梭状芽孢杆菌感染患者相比, 肥胖者植入后供体菌的占比低得多, 肥胖者的定植抗性也更高。一项研究对22例未诊断为糖尿病、非酒精性脂肪性肝炎或代谢综合征的肥胖( $BMI \geq 35 \text{ kg/m}^2$ )者分别给予粪菌移植胶囊或安慰剂胶囊, 其中粪菌移植胶囊来自1例体型偏瘦的供体( $BMI$ 为 $17.5 \text{ kg/m}^2$ ), 持续26周。结果发现, 接受粪菌移植胶囊或安慰剂胶囊的参与者在不良事件方面比较差异无统计学意义, 两组GLP-1曲线下面积均未增加, 接受粪菌移植胶囊者的菌群构成逐步向供者菌群特征转变。与基线相比, 接受粪菌移植胶囊者粪便中牛磺胆酸水平持续下降, 且胆汁酸分布开始与供体分布更加相似。两组均未观察到第12周时的平均BMI显著变化, 说明来自瘦捐献者的粪菌移植胶囊, 其肠道微生物组和胆汁酸谱更倾向瘦供体的微生态持续变化<sup>[166]</sup>。FMT-TRIM是一项单中心进行的为期12周的口服粪菌移植胶囊双盲RCT研究, 将24例肥胖和轻至中度胰岛素抵抗的成人(HOMA-IR指数为2.0~8.0)随机分为两组, 分别给予健康瘦捐献者粪菌移植胶囊或安慰剂胶囊。与安慰剂组相比, 粪菌移植组的胰岛素敏感性没有统计学意义的显著改善, 两组平均差异为9%; 但粪菌移植组中供体肠道细菌存在不同定植, 在12周后持续存在, 但并未观察到临床上明显的代谢作用<sup>[167]</sup>。

2.11 医学营养减重与教育 营养教育将各种能促进营养信息交流的教育策略进行组合, 辅以环境支持, 从个人、社区和政策等多种层面在多种场合以多种形式开展, 以便参与者充分了解营养教育活动的目的, 培养或引导个体及群体自愿采用有益健康的食物以及采取其他与食品、营养相关的行为<sup>[168]</sup>。对受试者进行访谈、填写问卷、营养咨询、营养教育有助于改善饮食模式和减轻体重; 通过在学生中开展同伴营养咨询模式, 可以预防青少年肥胖<sup>[169]</sup>。由专业人士以小组形式进行烹饪体验和营养教育课程, 以增加水果和蔬菜摄入为重点, 可以改变

膳食纤维摄入量,从而降低BMI和体重<sup>[170]</sup>。多项研究表明,营养教育能增加个体与群体的营养相关知识<sup>[171]</sup>,改变其饮食结构、饮食习惯和饮食依从性<sup>[172]</sup>,降低能量摄入<sup>[172]</sup>,增加运动量<sup>[173]</sup>,降低血脂<sup>[173]</sup>、血压<sup>[173]</sup>,改善血糖、HbA<sub>1c</sub>水平和胰岛功能<sup>[174]</sup>,进而达到减轻体重、降低BMI和肥胖发病率<sup>[171,172]</sup>的目的。另外,营养教育能显著改善社会心理相关指标<sup>[174]</sup>,对肥胖者予以营养教育,能显著降低其抑郁评分<sup>[175]</sup>。

#### 问题31:如何进行有效的营养教育?

基于互联网小程序/手机应用程序,在线进行营养知识的理论教学,提供营养和运动等建议。线下开展饮食/营养咨询会议、主题会议等学习营养知识和技能。(证据级别C,强推荐;同意比例96.6%)

Nutri-Expert是营养教育的电子系统,可在任意时间对使用者进行自由管理,对个体的需求和食物成分进行具体分析,并在饮食成分和数量方面进行个性化建议。mHealth是一种可进行营养和生活方式干预的移动应用程序,通过定期按时向使用者发送语音和短信来促进其学习相关知识<sup>[176]</sup>。一项研究通过为期3个月的多媒体、互动和自我管理的在线干预,可使受试者的BMI、体脂含量和血糖水平显著降低<sup>[177]</sup>。

线下模式中,由注册营养师讲授营养教育课程,告知受试者健康的重要性,并对个体饮食情况进行记录,可改善其饮食结构<sup>[178]</sup>。以肠道菌群组成为重点的营养教育可改善肥胖女性的肥胖和心理因素<sup>[179]</sup>。一项研究纳入557名肥胖成人,随机分为传统管理组和使用Nutri-Expert系统组,两种营养教育模式均可显著改善受试者的BMI、总胆固醇、LDL、载脂蛋白和TG水平,但使用Nutri-Expert系统的受试者饮食知识测试得分显著高于传统管理组<sup>[180]</sup>。

**2.12 医学营养减重与行为辅导** 行为辅导是指一系列运用心理学和健康行为学原理塑造良好的个体健康行为,矫正不良生活方式的干预措施<sup>[181]</sup>,即用行为科学分析肥胖者摄食行为的特征和运动类型,并以此为基础,合理培养正确行为,帮助肥胖者建立支持性环境,提供实施持续的行为改变,最

终达成减重的目的<sup>[181,182]</sup>。医学营养减重除了关注体重等生理指标外,也应将膳食依从性的行为指标纳入主要结局之一<sup>[183-186]</sup>。饮食干预应基于个人喜好、文化、生活等背景信息进行个性化,且需包含多方面策略,并适时纳入社会支持<sup>[187-189]</sup>。

行为辅导过程的核心训练技能包括自我监测、目标设定、问题解决。目标设定是与患者共同制订可达成的目标体重,并明确行为目标,进而形成一个具体的行动计划并尝试执行<sup>[182,186,189-193]</sup>。目标需要具体、可测量、现实可行和有时间范围的特征。问题解决是指提前设想或事后及时探讨发现可能出现的难题与障碍,通过脑力激荡和互动沟通找到可以解决问题的新方法,对预防复重也有帮助<sup>[183,186,190]</sup>;保证减重患者获得持续性支持对其长期坚持健康行为非常重要<sup>[189]</sup>,持续性支持的实践有助于医患沟通并建立及时反馈和调整策略。可通过定期的团队活动、知识学习、健康行动竞赛、兴趣组等多样化方式来鼓励患者持续坚持良好的膳食和减重相关行为<sup>[182,194,195]</sup>。

#### 问题32:谁需要在医学减重中进行行为辅导?

所有医学减重者都应给予行为辅导。(证据等级A,强推荐;同意比例95.6%)

2018美国预防医学服务工作小组的系统评价纳入122项RCT共62 533例患者,结果发现以行为辅导为主进行干预在12~18个月间较对照组有更多的体重减轻和更少的体重反弹<sup>[196]</sup>。Rudolph等<sup>[197]</sup>系统评价纳入15项研究共1008例患者,其中13项研究发现术后接受行为辅导者较一般性辅导体重减轻更显著。Whitlock等<sup>[198]</sup>系统评价分析15项研究1258名4~18岁的儿童和青少年进行行为辅导,提示中至高等强度的短期综合性行为干预可有效减重。

#### 问题33:对于成人肥胖者如何进行饮食行为改变?

对于成人肥胖者应首先培养自我监测的行为,采用动机访谈、同伴支持等方式可能有助于饮食行为的改变。(证据等级B,强推荐;同意比例96.2%)

Burke等<sup>[199]</sup>纳入22项试验的系统评价发现自我监测与体重减轻之间存在显著关联。Teixeira等<sup>[200]</sup>纳入32项干预研究的系统评价发现自我调节的技巧是能否达到有益体重下降的最佳预测因子。

Armstrong等<sup>[201]</sup>的系统评价和Meta分析纳入11项RCT,显示行为辅导干预能强化成人患者的减重效果,BMI下降更显著。Barnes等<sup>[202]</sup>的系统回顾纳入24项RCT,其中9项RCT的动机访谈干预组患者体重减轻与对照组比较差异均有统计学意义。Borek等<sup>[203]</sup>针对基于小组的饮食和身体活动减重干预的系统评价和Meta分析纳入47项RCT,基于小组的减重干预在干预12个月时能有效促进体重减轻。近年来发现减重患者使用线上社群来获取同伴支持已十分普遍,Ashrafian等<sup>[204]</sup>发现线上社群干预虽能帮助患者短期降低BMI(-0.64%),但并未发现长期有效影响。

问题34:对于特定减重人群是否需要进行特定的行为辅导?

对于重度肥胖、减重手术后、儿童和青少年、PCOS等人群,通过特定的行为辅导均有助于减重和维持减重效果。(证据等级B,强推荐;同意比例96.6%)

Hassan等<sup>[205]</sup>对于重度肥胖者生活行为干预进行系统评价,纳入17项RCT共7981例患者,结果显示行为干预组减轻了更多的体重。Livhits等<sup>[206]</sup>系统评价纳入10项前瞻性队列试验共735例患者,结果发现术后支持小组参与与患者术后体重减轻程度呈正相关。数篇针对儿童和青少年行为辅导效用或干预模式的系统评价均在结合家庭支持和营养教育的基础上,鼓励儿童和青少年改变饮食行为和身体活动<sup>[207,208]</sup>。Oberg等<sup>[209]</sup>纳入68例超重/肥胖PCOS女性、接受为期4个月行为矫正干预并完成12个月随访的RCT显示,行为矫正干预4个月,干预组女性体重显著减轻,平均体重减轻率虽然仅为2%,但54%的女性改善了生殖功能。

问题35:采用远程医疗进行医学营养减重是否有效?

采用远程医疗进行医学营养减重可能对成人减重有效,建议实施远程医疗干预至少6个月,并应重视干预后的随访。(证据等级B,强推荐;同意比例93.7%)

Tarraga Marcos等<sup>[210]</sup>的一项RCT研究中,试验组接受远程医疗平台支持,使用地中海饮食依从筛选工具(mediterranean diet adherence screener, MEDAS)

并追踪参与者的依从性。12个月后两组受试者BMI均有所下降,但试验组受试者体重下降更多,6~12个月后两组体重均有所增加。

Huang等<sup>[211]</sup>的一项系统评价纳入25项RCT共6253名成人,干预时间为9周至2年,结果显示,远程医疗组和对照组受试者BMI变化比较差异有统计学意义。需注意的是,只有持续6个月的干预才能显著降低BMI。

问题36:哪些人群适合接受远程医疗指导下的医学营养减重干预?

远程医疗指导下的医学营养减重可提供多种干预方法,适合多种人群,尤其可提高一些特殊状况(如行动障碍、精神疾病等)人群的参与性。(证据等级C,强推荐;同意比例94.1%)

远程医疗指导下的医学营养减重在减重和减重维持方面有很好的应用效果,可提高减重者的参与性和依从性,不仅对成人肥胖者有效,对超重/肥胖儿童和老年人也有作用<sup>[212,213]</sup>。Nosek等<sup>[214]</sup>研究通过网络虚拟世界中同伴支持为行动障碍的女性提供体重管理,可避免在传统治疗时需要面对和处理残疾相关的环境和卫生问题,并提供新的学习和社交机会。Young等<sup>[215]</sup>对276例患有严重精神疾病的超重者进行研究,受试者被随机分为接受WebMOVE即计算机化的体重管理和同伴健康教练、临床医生亲自指导的体重服务及常规诊疗三组。在6个月时,WebMOVE组受试者减重2.8 kg,超过1/3的WebMOVE参与者体重减轻5%或以上。该研究提示,这种远程减重方法可能对其他有认知障碍等特殊状况也有效。

Stephens等<sup>[216]</sup>使用人工智能行为指导的聊天机器人Tess来支持儿童肥胖症和糖尿病前期的治疗,其中行为干预技术将技术和心理学结合起来,通过各种媒体来解决不同的健康需求。机器人Tess可在工作时间之外继续进行治疗互动,未来迭代可能增加功能来提高用户体验。

2.13 医学营养减重与药物治疗 2016年版美国临床内分泌协会(American Association of Clinical Endocrinologists, AACE)和美国内分泌学会(American College of Endocrinology, ACE)发布的肥胖症诊疗指南和2014年内分泌学会临床实践指南中的肥胖症药物减重治疗部分提到,  $BMI \geq 30 \text{ kg/m}^2$ 或

BMI  $\geq 27$  kg/m<sup>2</sup>合并肥胖相关并发症之一的患者,建议在生活方式和行为干预基础上应用药物减重治疗<sup>[217,218]</sup>。考虑到种族差异并结合我国人口特点,2016年版共识指出,建议中国人群中BMI  $\geq 28$  kg/m<sup>2</sup>且经过3个月的生活方式干预仍不能减重5%,或BMI  $\geq 24$  kg/m<sup>2</sup>合并高血糖、高血压、血脂异常、NAFLD、负重关节疼痛、睡眠呼吸暂停综合征等肥胖相关并发症之一的患者,在生活方式和行为干预基础上推荐应用药物减重治疗,本指南建议维持该适应证标准。美国食品药品监督管理局(Food and Drug Administration, FDA)批准长期应用的减重药物( $\geq 12$ 周)包括phentermine和topiramate缓释胶囊、bupropion hydrochloride-naltrexone hydrochloride和liraglutide 3.0 mg,短期应用的减重药物( $< 12$ 周)包括diethylpropion、phendimetrazine、phentermine、benzphetamine等。我国目前批准应用的减重药物有奥利司他。2021年6月,司美格鲁肽2.4 mg注射剂是全球首个用于肥胖症体重管理的每周注射1次的GLP-1受体激动剂。

问题37:在饮食或运动等生活方式干预的基础上,使用奥利司他是否有进一步减重的效果?

在饮食控制、运动调节和行为干预等生活方式干预的基础上,使用奥利司他可进一步有效减轻体重。(证据等级A,强推荐;同意比例89.5%)

一项纳入123例超重/肥胖者、为期24周的多中心RCT研究显示,在低脂CRD基础上,奥利司他组受试者平均体重降低、总体脂肪减少和内脏脂肪减少均具有显著性差异<sup>[219]</sup>。Madsen等<sup>[220]</sup>对93例肥胖者采用极低能量饮食联合奥利司他治疗3年,试验组受试者体重降幅增加显著,脂联素浓度上升,机体炎症状态显著改善。Richelsen等<sup>[221]</sup>对383例肥胖者采用极低能量饮食干预8周后体重下降显著,而加用奥利司他3年后体重仍进一步下降,奥利司他组出现T2DM的新发病例数明显少于安慰剂组。一项为期16周、纳入391例超重者的多中心RCT表明,采用低能量饮食联合奥利司他治疗组受试者体重、TC、LDL-C水平、舒张压和收缩压降低更显著<sup>[222]</sup>。此外,1313例超重/肥胖者在维持低能量饮食6个月后,其中近50%肥胖者体重下降 $\geq 8\%$ ,并随机分配入三餐服用奥利司他30 mg组、60 mg组、120 mg

组和安慰剂组,服药1年后,奥利司他120 mg组受试者较安慰剂组的体重反弹程度更轻<sup>[223]</sup>。

问题38:目前可选用减重药物的减重效果与安全性如何?

目前可选用的减重药物奥利司他在配合低脂饮食基础上可显著减轻体重,减少体内脂肪组织。其主要不良反应为胃肠道不适,包括胃肠胀气、油性大便等。推荐用药期间每天口服补充复合维生素,特别是维生素D。(证据等级B,强推荐;同意比例90.7%)

1187例肥胖者经过4周的低能量饮食和安慰剂口服导入期后,随机决定口服安慰剂或奥利司他,首次治疗1年后,奥利司他组受试者较安慰剂组体重下降更显著。再将服用奥利司他者随机分配入三餐各服用奥利司他120 mg组和奥利司他60 mg组,安慰剂组则维持原方案,1年后,奥利司他120 mg组较奥利司他60 mg组和安慰剂组中出现体重回升者的占比更少<sup>[224]</sup>。为评估奥利司他用于减重治疗的有效性与耐受性, Van Gaal等<sup>[225]</sup>采用多中心RCT设计,将676名肥胖者先进行5周的安慰剂导入期,之后随机予口服奥利司他30 mg、60 mg、120 mg、240 mg或与之匹配的安慰剂,3次/d。在连续服药24周后,服用奥利司他者较服用安慰剂者平均体重下降更显著,其中,奥利司他120 mg组受试者体重降幅最大(9.8%),药物耐受性良好。

Shirai等<sup>[226]</sup>纳入200例内脏脂肪过多的日本患者、为期24周的RCT研究结果显示,三餐时均服用60 mg奥利司他对于减轻体重和减少内脏脂肪含量均有显著效果。146例肥胖者在低能量饮食和运动干预模式下服用奥利司他,体重、收缩压、舒张压、LDL-C水平较安慰剂组均显著下降,而主要药物不良反应为胃肠道反应,但程度较轻,可自行缓解,故并无受试者中途退出<sup>[227]</sup>。在青少年肥胖者的多项队列研究中,有1/3的受试者出现胃肠道反应而中止服药<sup>[228]</sup>,尽管服用含有维生素D的复合维生素,但仍有受试者出现低维生素D血症<sup>[229]</sup>。McDuffie等<sup>[230]</sup>通过对17名青少年肥胖者研究发现,在服用奥利司他的同时每日补充复合维生素,治疗3~6个月后仍出现血清维生素D低水平,而维生素A、E、K等水平均无显著变化。

问题39: 对于超重/肥胖的T2DM患者, 选择哪些药物有助于减重?

(1) 二甲双胍作为T2DM一线治疗药物, 适用于超重/肥胖的T2DM患者, 有助于减重。(证据等级A, 强推荐; 同意比例94.9%)

一项RCT研究纳入48例肥胖合并T2DM患者, 在饮食控制的同时, 分别给予二甲双胍或安慰剂治疗24周, 发现二甲双胍组患者平均最大减重较安慰剂组多8 kg, 同时治疗后HbA<sub>1c</sub>和空腹血糖水平更低, 且二甲双胍对食欲的抑制与剂量有相关性<sup>[231]</sup>。一项希腊RCT研究也发现, 新诊断糖尿病的患者给予二甲双胍联合饮食控制18周可以使体重下降<sup>[232]</sup>。DPP研究纳入3234例超重/肥胖的高血糖患者, 随机分为二甲双胍组、生活方式管理组和对照组, 随访15年后发现二甲双胍组患者体重下降最显著(达6.2%), 生活方式管理组为3.7%, 对照组为2.8%, 也提示二甲双胍相比生活方式管理有更显著且持久的减重作用<sup>[11]</sup>。

(2) GLP-1受体激动剂可以使超重/肥胖的T2DM患者有明确的减重获益。(证据等级A, 强推荐; 同意比例94.9%)

GLP-1受体激动剂属肠促胰岛素类药物, 主要通过增加葡萄糖依赖胰岛素分泌, 降低胰高血糖素分泌, 减缓胃排空, 增加饱腹感, 降低血糖<sup>[220,233]</sup>。利拉鲁肽3.0 mg作为GLP-1受体激动剂已成为美国FDA批准的减重药物。一篇系统评价分析GLP-1受体激动剂与胰岛素及其他口服降糖药物对T2DM患者的疗效, 发现GLP-1受体激动剂有更显著的减重效果<sup>[234]</sup>。在非T2DM肥胖患者中, 持续接受司美格鲁肽注射液2.4 mg注射治疗68周的肥胖者实现17%~18%的平均减重<sup>[235-237]</sup>。并显示安全性和耐受性良好, 最常见不良事件为胃肠道事件。

(3) 钠-葡萄糖协同转运蛋白2(sodium glucose cotransporter 2, SGLT-2)抑制剂在有效控制血糖的同时可使糖尿病患者体重下降。(证据等级A, 强推荐; 同意比例94.1%)

SGLT-2抑制剂通过减少肾脏对葡萄糖的重吸收、增加葡萄糖排泄而降低血糖水平, 伴随着葡萄糖从尿液中的排泄, 也同时损失能量(约300 kcal/d), 从而使体重下降<sup>[238]</sup>。一项RCT研究纳入252例T2DM

和中度肾功能损害患者, 使用达格列净5 mg和10 mg后患者体重平均下降1.54 kg和1.89 kg, 安慰剂组患者体重平均增加0.21 kg<sup>[239]</sup>。

(4) 二肽基肽酶4(dipeptidyl peptidase-4, DPP-4)抑制剂、α-葡萄糖苷酶抑制剂在糖尿病患者治疗中减重作用不确切, 目前认为对体重呈中性影响。(证据等级B, 弱推荐; 同意比例94.1%)

DPP-4抑制剂通过抑制GLP-1的失活, 增加胰岛素分泌, 减少胰高血糖素分泌, 从而降低血糖水平。目前临床研究认为DPP-4抑制剂对T2DM患者的体重改变为中性作用<sup>[238]</sup>, 对T2DM患者使用DPP-4抑制剂治疗, 其体重变化范围为-0.09~+1.11 kg<sup>[240]</sup>。α-葡萄糖苷酶抑制剂延迟胃肠道对碳水化合物的吸收, 从而减缓餐后葡萄糖的峰值。AAACE/ACE糖尿病综合管理共识认为α-葡萄糖苷酶抑制剂对体重的作用为中性<sup>[241]</sup>, 也有相关研究评估了α-葡萄糖苷酶抑制剂对体重影响变化范围为-1.80~-0.43 kg<sup>[240]</sup>。

2.14 减重与代谢手术相关的营养问题 减重与代谢手术, 通过外科或者内镜方式改变胃肠道的解剖和/或连接关系, 以调整营养摄入、吸收和代谢转化, 从而减轻体重, 逆转肥胖相关的代谢紊乱, 降低心脑血管事件发生率, 最终改善生活质量、延长预期寿命。目前具有较多临床证据且获得多个国家学会正式认可的减重手术治疗方式包括胃袖状切除术(sleeve gastrectomy, SG)、Roux-en-Y胃旁路术(Roux-en-Y gastric bypass, RYGB)等或联合术式。

问题40: 拟行减重手术的患者是否需要通过限制饮食进行术前减重?

所有拟行减重手术的患者均应通过限制饮食进行术前预减重。(证据等级B, 强推荐; 同意比例95.4%)

在减重手术前进行预减重的获益显著且证据充分, 术前减重不仅可减轻体重<sup>[242,243]</sup>, 也可有效减少肝脏体积和内脏脂肪含量<sup>[244-251]</sup>, 降低外科手术风险, 减少术中出血量, 并缩短手术时间<sup>[243,252]</sup>。制订术前体重减轻的目标可基于多余体重减轻率(excessive weight loss, EWL)≥8%, 研究发现术前总体重减轻的百分比比较高者术后体重减轻的百分比也更高, 手术时间亦更短<sup>[253]</sup>。部分RCT研究采

用术前2周极低能量饮食方案(760 kcal/d)虽然能减少内脏脂肪含量,但却未能观察到明显的与围手术期并发症和手术时间的相关性<sup>[251]</sup>。但另一项为期2周的RCT研究表明极低能量饮食可充分减少手术困难,降低腹腔镜手术转开腹手术率<sup>[252]</sup>。特别是对于BMI > 50 kg/m<sup>2</sup>的患者,部分前瞻性研究观察推荐使用极低能量饮食方案<sup>[244]</sup>。

问题41:围手术期应采取何种营养管理策略?

(1)围手术期营养管理应以多学科综合治疗协作组(multiple disciplinary team, MDT)为诊疗模式。MDT应贯穿术前评估、术中监测、术后康复、术后随访整个过程。营养治疗在其中至关重要。(证据等级C,强推荐;同意比例96.2%)

减重手术患者需由MDT综合评估和管理<sup>[254]</sup>。术前应从MDT角度进行预减重,术后应根据在医院内由MDT专家参与制订的计划进行规律随访,频次取决于手术方式和合并症,并进行常规的代谢和营养学监测<sup>[255]</sup>。MDT应以减重外科、内分泌科医生、临床营养师、精神心理科医生为核心成员,目的在于明确手术指征、排查手术禁忌证、评估手术风险和术前干预以降低手术风险<sup>[256,257]</sup>。Sarwer等<sup>[258]</sup>研究发现术后规律地由注册营养师进行饮食指导组患者在术后4个月和24个月时有更大幅度的体重减轻,且进食行为显著改善。

(2)减重术后营养摄入在维持机体负能量平衡的同时保证蛋白质及其他营养素充足,不同术式应针对性补充所需营养素,以降低营养不良相关并发症的发生风险。(证据等级B,强推荐;同意比例96.6%)

减重术后营养相关并发症和不良反应常与手术方式的选择相关。其中SG不改变肠道结构,术后营养不良的发生风险相对较低。其常见的营养相关并发症有胃食管反流、呕吐、蛋白质摄入不足、营养性缺铁、钙与维生素D缺乏、维生素B<sub>12</sub>及叶酸不足、微量元素如锌、镁缺乏等<sup>[259,260]</sup>。RYGB则有发生倾倒综合征和脂肪痢的风险,因此术后应适当限制脂肪和精制碳水化合物的摄入,避免摄入单糖,增加纤维和复合糖的摄入<sup>[261]</sup>。

减重手术者建议蛋白质摄入量为60~80 g/d<sup>[262]</sup>。RYGB和SG术后3~6个月内,每日营养补充全部

以可常规经口进食的形式给予,维生素B<sub>12</sub>可肌肉注射给药来维持正常水平<sup>[263]</sup>。Coupaye等<sup>[264]</sup>对86例减重手术者的RCT研究发现,RYGB组术后超过90%的患者服用复合维生素,SG组仅为50%;术后1年随访发现,RYGB组患者血清铁蛋白、维生素B、维生素D、钙浓度远低于SG组,可能与肝脏代谢改变有关。Gehrer等<sup>[136]</sup>的临床对照研究中,86例行RYGB,50例行SG,术后随访36个月,RYGB组患者维生素B与维生素D显著缺乏,部分存在甲状旁腺激素水平升高,而SG组主要表现为叶酸水平降低。

(3)将加速康复外科(enhanced recovery after surgery, ERAS)理念应用于围手术期综合营养管理,可为患者带来更多益处。(证据等级B,强推荐;同意比例96.6%)

ERAS的营养原则主要包括术前营养评估、缩短术前禁食时间、术后镇痛止吐、尽快经口摄入清流质、少食多餐、保证蛋白和纤维的摄入量、监控铁、钙和维生素B<sub>12</sub>等微量营养素以及在糖尿病患者中严格控制糖脂摄入等方面。一项纳入了80例行SG手术患者的RCT研究,ERAS组患者术后住院天数、胃管留置时间、肠道排气时间、术后进食时间均显著缩短,疼痛程度也较对照组减轻。

问题42:减重术后如何预防营养不良及相关并发症的发生?

(1)在减重术后应补充足量的蛋白质。(证据等级B,强推荐;同意比例94.5%)

一项研究纳入了244名中国肥胖者,接受SG和RYGB,术后1年内低白蛋白血症发生率分别为1.2%和8.9%<sup>[265]</sup>。《减重手术的营养与多学科管理专家共识》建议减重术后患者的蛋白质摄入量为60~80 g/d<sup>[257]</sup>。Thorell等<sup>[266]</sup>的快速康复外科减重手术围手术期护理指南建议患者术后蛋白质摄入量为60~120 g/d。Clifton等<sup>[267]</sup>的系统评价分析了32项研究、3492例患者,在术后12个月依从HPD长期减重的获益更大。Clifton等<sup>[268]</sup>观察HPD对减重的长期效果,结果发现饮食记录中的蛋白质越高,体重下降越多,且血脂、血糖、C反应蛋白、同型半胱氨酸等各项指标均有好转。

(2)应对所有减重术后者进行维生素D和骨密度筛查,并推荐预防性口服维生素D<sub>3</sub> 3000 U/d;钙

摄入量要求为1200 ~ 1500 mg/d。(证据等级B, 强推荐; 同意比例94.5%)

一项针对中国肥胖患者的回顾性研究发现, SG和RYGB术后1年内维生素D缺乏发生率分别为42.7%和65.8%<sup>[264]</sup>。Hegazy等<sup>[269]</sup>的前瞻性研究发现, SG术后6个月维生素D缺乏和低钙血症的发生率可达84%和78%; 64%的患者术前已存在维生素D缺乏, 这与因心理障碍不喜外出导致日照不足可能相关。美国内分泌学会、肥胖学会、美国代谢与减重外科学会等共同编写的《减重手术患者围手术期营养、代谢和非手术支持临床实践指南(2019年版)》(以下简称美国指南)建议, 应对所有减重术后者进行维生素D筛查, 并推荐预防性口服维生素D<sub>3</sub> 3000 U/d; 钙摄入量(饮食与钙剂补充)与不同术式相关, SG、RYGB术后患者剂量要求为1200 ~ 1500 mg/d<sup>[270]</sup>。

(3) 减重术后常规补充350 ~ 1000 μg/d维生素B<sub>12</sub>。对已存在维生素B<sub>12</sub>缺乏的患者, 每日需补充1000 μg直至指标正常, 并以推荐剂量维持。(证据等级B, 强推荐; 同意比例93.4%)

针对中国肥胖者的回顾性研究发现, SG和RYGB术后1年内维生素B<sub>12</sub>缺乏发生率分别为7.3%和25.3%<sup>[265]</sup>。一项回顾性研究评估SG术后维生素B<sub>12</sub>水平, 虽然要求患者每日口服复合维生素, 仍有20%的患者出现维生素B<sub>12</sub>不足, 但无明显临床症状。若额外肌内注射维生素B<sub>12</sub> (1000 μg, 第1个月每周1次, 此后每月1次), 将导致维生素B<sub>12</sub>水平升高。为此美国指南推荐所有减重术后患者每日补充维生素B<sub>12</sub> 350 ~ 1000 μg, 若通过肌内注射或皮下注射补充则为每月1000 μg; 对于存在维生素B<sub>12</sub>不足的患者, 每日需补充1000 μg直至指标正常, 并以推荐剂量维持<sup>[270]</sup>。

(4) 减重术后可按需补充维生素B<sub>1</sub>, 对于已存在维生素B<sub>1</sub>缺乏者, 口服补充剂量为200 mg/d直至症状消失; 若采用静脉或皮下途径补充, 剂量为200 ~ 500 mg/d至症状消失, 口服100 mg/d维持。(证据等级B, 弱推荐; 同意比例94.5%)

一项纳入151例RYGB术后患者的前瞻性研究显示, 维生素B<sub>1</sub>缺乏的发生率达18%, 平均症状出现时间为术后5年, 其中近半数缺乏患者表现为便

秘, 并在补充维生素B<sub>1</sub>后即缓解<sup>[271]</sup>。为此美国指南提出补充维生素B<sub>1</sub>的解决方案<sup>[270]</sup>。

(5) 减重术后应常规监测铁代谢指标, 一旦发生缺铁性贫血应即时补充铁剂与维生素C。(证据等级B, 强推荐; 同意比例95.4%)

Lin等<sup>[265]</sup>研究发现SG和RYGB术后1年内贫血发生率分别为4.8%和22.8%。另有一项研究发现SG术后铁缺乏发生率在3个月达到20.0%, 6个月下降至12.5%, 而在术后1年未发现铁缺乏者, 可能与其长期饮食调整有关<sup>[272]</sup>。减重术后患者需定期监测铁代谢相关指标, 一旦发生缺铁性贫血应及时补充铁剂与维生素C, 药物包括硫酸亚铁、富马酸铁和葡萄糖酸铁, 口服推荐剂量为150 ~ 200 mg/d<sup>[257]</sup>。

问题43: 减重术后如何防止术后减重不足或复重?

减重术后减重不足或复重者的营养干预需调整膳食结构、提高蛋白质比例, 按照本指南推荐的方式改变生活行为。(证据等级A, 强推荐; 同意比例95.8%)

术后减重不足是指减重术后12个月或18个月EWL不足50%<sup>[273]</sup>。复重则指体重成功下降至EWL > 50%后逐渐回升。一项针对30例RYGB术后复重者的研究并进行2个月的限能量管理, 结果显示82.5%的受试者体重下降且体重下降幅度达2.3% ~ 10.8%<sup>[274]</sup>。Lopes Gomes等<sup>[275]</sup>的RCT研究纳入34例RYGB术后复重的女性患者, 进行16周的乳清蛋白补充, 结果显示干预组患者体重和体脂含量均显著下降。Faria等<sup>[274]</sup>对30例术后复重者进行3个月低GI/GL营养治疗, 结果显示86%的患者成功减重, 且超过半数患者的EWL再次顺利达到50%标准。为此多个学会提出以下建议: ①每日进食3次正餐和1 ~ 2次加餐; ②为正餐和加餐预留时间, 降低进食速度并充分咀嚼; ③选择小份量固体食物, 每顿正餐或加餐大约低于250 ml; ④在正餐和加餐中选择固体食物; ⑤避免选择难以咀嚼的食物(即黏稠的、夹生的、多筋的和坚硬的食物); ⑥固体和液体食物进食时间应间隔30 min, 不要在正餐或加餐时进食液体食物, 餐后30 min再饮入液体; ⑦补充推荐的所有维生素和矿物质; ⑧每日预留体力活动时间; ⑨记录每日进食情况; ⑩定期记录体重, 至少每月记录1次,

但每周记录不要超过1次<sup>[276-279]</sup>。

**2.15 医学减重后的体重维持** 有研究表明超重/肥胖成人平均4个月可有效减轻体重的13%，但21个月时约有48%的人发生体重反弹<sup>[280]</sup>。造成体重反弹的因素主要包括不受抑制的进食行为、负面情绪和压力以及对减重困难的消极反应等<sup>[281]</sup>。减重维持与内在动机、社会支持、更好的应对策略和处理生活压力的能力、自我效能感、对生活的责任感以及整体上更强的心理强度和稳定性有关。因此，减重成功后仍需参与长期的综合减重维持计划，并采用传统面对面或互联网等方式进行随访管理<sup>[282,283]</sup>。

**问题44：如何制订减重后维持期的饮食方案？**

（1）执行3～6个月的限能量HPD更有助于体重维持。（证据等级A，强推荐；同意比例95.4%）

一项多中心RCT研究纳入了8个欧洲国家538例受试者，完成>6个月的随访，结果显示高蛋白质摄入组受试者较正常蛋白质摄入组体重反弹更少<sup>[284]</sup>。Westerterp-Plantenga等<sup>[285]</sup>的RCT研究纳入148例受试者，减重后随机分组进行3个月的体重维持，结果显示额外添加蛋白质组受试者较非添加蛋白质组体重反弹率降低50%，相同能量摄入情况下饱腹感更强。Layman等<sup>[286]</sup>纳入130例受试者采用CRD进行减重后维持，与限能量平衡膳食组相比，限能量高蛋白组受试者对减少脂肪和升高HDL-C水平更有效。此外，Soenen等<sup>[287]</sup>纳入132例受试者，按宏量营养素占比随机分为高蛋白低碳水化合物饮食组、高蛋白正常碳水化合物饮食组、正常蛋白低碳水化合物饮食组和正常蛋白正常碳水化合物饮食组，在3个月减重期和9个月维持期均使用CRD干预，结果表明更好的体重减轻与维持，取决于“高蛋白”而非“低碳水化合物”成分，同时与脂肪占比无关。

（2）与持续CRD相比，IER在减重后体重维持中的作用并无显著劣势。（证据等级C，弱推荐；同意比例94.9%）

Trepanowski等<sup>[288]</sup>研究纳入100例受试者，随机分配至隔日禁食组、持续限能量组和无干预对照组，试验包括6个月减重期和6个月维持期，结果显示与无干预对照组相比，隔日禁食组和持续限能量组受试者在体重维持期的结果相似。Headland等<sup>[289]</sup>研究纳入332例受试者，随机分为持续限能量组、

隔周限能量组和5+2间歇禁食组，试验包括8周强化期和12个月减重维持期，研究结束时三组受试者体重下降程度相似。

**问题45：减重后应继续随访管理多长时间为宜？**

减重后参与长期（≥1年）综合减重维持计划，更有助于减重维持。（证据等级C，强推荐；同意比例96.6%）

Middleton等<sup>[290]</sup>发表的系统评价和Meta分析纳入了11项研究，结果表明与不随访组相比，减重后进行面对面或电话随访者在17.6个月内额外减轻体重3.2 kg。Dutton等<sup>[291]</sup>针对体重减轻≥5%的108例受试者，随机分为集群管理组和自我管理组进行为期12个月的体重维持计划，结果表明集群管理组受试者体重反弹明显少于自我管理组。

**问题46：如何提高减重维持期生活方式管理的依从性？**

减重维持期通过有效的行为干预策略可提高生活方式管理的依从性并达到良好的减重效果。常见的行为干预策略包括自我监测（体重、饮食和运动等）、目标设定、解决问题和刺激控制等。（证据等级B，强推荐；同意比例96.6%）

有效的行为干预策略能够帮助超重/肥胖者提高认识，增强减重维持的动力和依从性。Madigan等<sup>[292]</sup>研究显示，定期自我称重者较没有定期自我称重者在1年减重维持期体重反弹更少。Wing等<sup>[293]</sup>随机选取314例成功减重者分别采用面对面、互联网方式实施自我监测计划，结果显示包括每日称重的自我监测计划通过面对面方式实施更有助于减少体重反弹。有系统评价也显示与常规护理相比，使用移动设备进行生活方式管理的坚持程度更高，并指出智能手机是有效体重管理的自我监测方法<sup>[294]</sup>。Burgess等<sup>[184]</sup>的系统评价和Meta分析表明，通过目标设定、解决问题和刺激控制等行为干预策略能够改善患者对生活方式管理计划的坚持和依从性。

**2.16 精准营养与医学减重** 随着智能信息技术、遗传学等现代科技的发展，通过收集基于个体基因、环境、生活习惯等信息数据进行分析整合，实现真正意义上的个体、动态化营养方案称为精准营养<sup>[295]</sup>。根据国际营养遗传学与营养基因组学会

(International Society of Nutrigenetic/Nutrigenomics, ISNN) 的建议<sup>[295]</sup>, 精准营养应包括3个层级: 群体层面, 考虑传统的年龄、性别等因素; 个体化层面, 根据个体的人体测量、生化代谢数据、身体活动等营养状况表型信息给予营养建议; 基因营养层面, 根据个体不同基因对食物产生不同反应等信息给予营养建议, 精准营养方案可通过结合饮食习惯、食物行为、身体活动、营养基因组学、代谢组学、微生物、深度表型等方面综合考虑的精准营养罗盘指导实施<sup>[296]</sup>。一项小规模RCT对74例超重/肥胖者分别实施标准减重方案和个体化减重方案32周后, 个体化减重方案减重效果更好<sup>[297]</sup>。另一项Meta分析探究相比于常规教育, 有营养师介入的个体化干预体重下降更显著<sup>[298]</sup>。

近年通过定向营养素和疾病相关基因检测或给予能改善有益肠道菌群的特定膳食可更加精准指导饮食从而增强减重效果。Ramos-Lopez等<sup>[299]</sup>分析了基因表型和环境因素对232例超重西班牙人群低能量饮食的应答, 分别给予低脂和高蛋白两种CRD, 实施16周, 最终多元线性回归模型结果显示, 使用加权后的单核苷酸多态性构建模型可将高蛋白组受试者的腰围下降预测值由6%~10%提高至21%。另一项研究纳入了50例减重失败者, 并进行19个基因中24个变异位点的基因检测, 同时将43例未进行基因检测的人群纳入对照组, 两组人群均接受地中海饮食体重管理, 营养师根据个人基因检测结果调整饮食方案。300 d后基因检测组人群的平均BMI下降更显著<sup>[300]</sup>。但是凭借单基因型指导减重并不理想, 尚需更多的证据支持<sup>[301]</sup>, 而整合多基因型、表型分析等多种因素用于指导减重更具应用前景。

问题47: 实施肥胖相关基因检测是否有利于达到减重目标?

传统方法治疗难以达到减重目标的肥胖者可考虑进行肥胖相关基因检测并进行对应的饮食干预。(证据等级D, 弱推荐; 同意比例90.7%)

脂肪组织和肥胖相关基因(fat mass and obesity associated, *FTO*)被认为是非常重要的肥胖基因, 一项研究对44例*FTO*基因RS9939609变异受试者根据等位基因分型实施限能量代餐食品减重, 结果发现存在A等位基因的受试者在减重、降脂和改善胰

岛素敏感性方面优于不含A等位基因者<sup>[302]</sup>。另一项RCT研究纳入了742例*FTO*基因RS1558902变异的肥胖成人患者, 分别给予4种不同饮食, 发现给予高蛋白饮食更有利于体重减轻以及身体组成和脂肪分布的改善<sup>[303]</sup>。在欧洲进行的Food4Me研究纳入了683例超重患者, 与对照组相比, 基于携带*FTO* RS9939309等位基因AT/AA的超重患者进行个体化干预后体重和腰围降低更明显<sup>[304]</sup>。提示对于传统治疗难以达标的减重者, 可考虑对相关基因进行检测, 以判断其对不同饮食模式、饮食成分、运动类型等的反应, 用于制订更有针对性的精准营养治疗方案。

问题48: 基于肠道菌群的普氏杆菌/拟杆菌(*Prevotella/Bacteroidetes*, P/B)比值分型的强化膳食纤维饮食干预能否作为精准减重的干预方式?

富含膳食纤维的饮食对于高P/B比值人群具有更好的减重效果。(证据等级B, 强推荐; 同意比例94.1%)

46例超重的具有高普氏杆菌丰度的成人受试者食用全谷物食物较精制小麦减重更明显, 而低普氏杆菌丰度者则体重更稳定, 提示肠型可作为肥胖管理中个性化营养的潜在生物标志物<sup>[305]</sup>。对62例腰围增加者, 分别采用纤维/全谷物含量高的新北欧饮食(new Nordic diet, NND)或普通丹麦饮食(average Danish diet, ADD)干预26周后发现, 肠道中P/B比值高者, 采用NND方式减少内脏脂肪含量更显著, 而在P/B比值低的人群中则未观察到差异<sup>[306]</sup>。80例超重者选用500 kcal/d饮食, 配合高微量营养素组合物(钙 $\approx$ 1500 mg/d)或低营养素组合物(钙 $\leq$ 600 mg/d)补充, 持续24周。结果发现与低P/B比值者相比, 高P/B比值者体重下降更显著。同时发现高P/B比值者纤维摄入与体重变化之间的偏相关系数为0.90, 而低P/B比值者偏相关系数仅为0.25, 证实高P/B比值者采用富纤维饮食更容易减重<sup>[307]</sup>。

2.17 运动与医学营养减重 缺乏身体活动是超重/肥胖的重要危险因素之一, 运动的作用是通过增加能量消耗达到负能量平衡。Cheng等<sup>[308]</sup>对11项临床研究进行系统回顾和Meta分析, 结果显示运动可使超重/肥胖女性体重显著降低。Kim等<sup>[309]</sup>纳

入64项RCT研究、5025例肥胖者,结果显示,运动干预对肥胖者BMI、腰围的影响可能较体重、体脂含量更大。Mora-Rodriguez等<sup>[310]</sup>对160例超重/肥胖者进行为期16周的运动干预,结果显示运动组受试者体重、腰围均显著下降。由此可见,运动应作为医学营养减重治疗的重要基石。

问题49:运动减重是否存在剂量-效应关系?

运动减重存在显著的剂量-效应关系。超重和肥胖个体每周至少150 min中等强度运动以达到适度减重的效果;如要达到减重 $\geq 5\%$ 的效果,每周运动时间应达到300 min,运动强度应为中-高强度运动量或运动能量消耗达2000 kcal/周及以上。(证据等级A,强推荐;同意比例95.8%)

《2018韩国肥胖研究学会肥胖管理指南》推荐超重/肥胖者的减重运动量为中等强度,每天30~60 min,每周5 d<sup>[311]</sup>。2019年《欧洲实践指南:初级医疗中成年人肥胖的管理》建议,肥胖者每周应至少进行150 min的中等强度有氧运动,相当于速度5~6 km/h的健步走<sup>[312]</sup>。《ACSM运动测试与运动处方指南》(第9版)建议,对于超重/肥胖的个体,至少应将中等强度的运动从150 min/周(30 min/d)逐渐增加到300 min/周(60 min/d)<sup>[313]</sup>。《美国身体活动指南》建议,每周需要进行至少300 min的中等强度运动以达到减重的目的<sup>[314]</sup>。一项纳入64项RCT研究的系统评价显示,运动与体重、身体成分的变化有显著的剂量-效应关系。每周运动时间超过120 min,对身体成分有显著的改善作用(效应量为中等效应及以上);且中等强度运动对BMI、体脂含量和腰围的改善作用明显高于低强度和高强度运动<sup>[309]</sup>。Slentz等<sup>[315]</sup>关于运动对40~65岁超重/肥胖者干预的RCT研究结果显示,运动与减重、减脂存在显著的剂量效应关系。高剂量/高强度运动[23 kcal/(kg·周),时长207 min,强度65%~80%最大氧耗量]减重和减脂效果显著优于低剂量/中等强度运动[12 kcal/(kg·周),时长203 min,强度40%~55%最大氧耗量]。Reid等<sup>[316]</sup>关于不同运动量对超重/肥胖者影响的RCT研究显示,经不同运动量[(8 kcal/(kg·周)和20 kcal/(kg·周)]干预24周后,20 kcal组受试者减重明显优于对照组。以上研究说明,在不限能量摄入的情况下,每周

150 min的中-高强度运动仅会轻度地减轻体重,很难达到临床减重(体重减少 $\geq 5\%$ )。Donnelly等<sup>[317]</sup>关于运动和减重的剂量效应研究中,以每周运动消耗2000 kcal(400 kcal/次,5 d/周)为目标对超重/肥胖者进行干预,男性的体重减轻较女性更显著。

问题50:采用何种类型的运动方式减重效果最好?

(1)建议以有氧运动结合抗阻训练作为减重的运动方式。(证据等级A,强推荐;同意比例95.8%)

有氧运动通过增加能量消耗、脂肪供能比来减少体内脂肪的蓄积。抗阻运动可通过增加瘦体重的比例提高代谢率或增加肌肉力量来增加身体活动量。高强度间歇运动(high-intensity interval training, HIIT)是以短时间、高强度运动与休息或低强度运动交替进行为特点的运动方式。O'Donoghue等<sup>[318]</sup>进行的Meta分析纳入了45项RCT研究、3566例超重/肥胖者,结果显示干预组(高强度有氧运动+高负荷抗阻运动)受试者的减重效果显著优于对照组和单纯抗阻运动组;减少腹部脂肪、增加瘦体重和改善心肺功能的效果均优于其他任何运动方式。Willis等<sup>[319]</sup>为期8个月的STRIDE AT/RT研究结果显示,有氧运动组与有氧运动+抗阻运动组受试者减重和减脂效果显著优于单纯抗阻运动组;而有氧运动+抗阻运动组与抗阻运动组受试者增加瘦体重的效果均显著优于单纯有氧运动组。此外,Schroeder等<sup>[320]</sup>比较了相同运动时间的有氧运动组、抗阻运动组和有氧运动+抗阻运动组超重/肥胖者的效果,结果显示有氧运动组受试者体成分改善效果最好,抗阻运动组受试者表现为下肢肌力显著改善,但体重反而增加0.9 kg,有氧运动+抗阻运动组受试者上、下肢肌力和瘦体重均显著增加。

(2)与中等强度连续运动(moderate-intensity continuous training, MICT)相比,HIIT可作为减重、减脂和提高心肺功能的有效运动方式,并且具有时效优势。(证据等级C,弱推荐;同意比例95.4%)

Türk等<sup>[321]</sup>的关于高强度运动的Meta分析结果显示,高强度运动在减轻体重、降低BMI和缩小腰围方面与MICT比较差异均无统计学意义,但在改善运动心肺能力和减脂方面效果更好,尤其

是HIIT。Viana等<sup>[322]</sup>比较HIIT和MICT减脂效果的Meta分析显示,两种运动方式均能显著降低体脂含量和降低绝对脂肪量,但对于降低绝对脂肪量,HIIT较MICT更有优势。Su等<sup>[323]</sup>的Meta分析结果显示,HIIT和MICT均有显著降低体重、BMI、体脂含量和提高最大氧耗量的作用,但HIIT改善运动心肺能力的效果更好。Türk等<sup>[321]</sup>和Jelleyman等<sup>[324]</sup>的Meta分析报道,HIIT能够节省约40%的运动时间,提示HIIT更具时效性优势。

问题51:一次持续性运动和累积性运动的减重效果是否相同?

对于运动依从性较差的个体,可利用零碎时间累积多次短时运动,在运动量相同的情况下,减重效果甚至优于一次连续长时间运动。(证据等级B,弱推荐;同意比例92.4%)

Murphy等<sup>[325]</sup>的系统评价纳入19项研究、1080例受试者,结果显示,比较累积性运动和持续性运动对心肺功能或血压的影响比较差异均无统计学意义。但有5项研究的结果支持累积性运动对体重的干预效果较持续性运动更好;而与一次持续运动150 min相比,每天多次运动且累积运动超过150 min对体脂含量的影响较小。Madjd等<sup>[326]</sup>进行了为期6个月的RCT研究,每周运动300 min,6 d/周,一组为每天一次性运动50 min,另一组为每次运动25 min、每天2次,结果显示每次运动25 min、每天2次的减重效果明显优于每天一次性运动50 min。Alizadeh等<sup>[327]</sup>的RCT研究也支持该结论。

2.18 心理治疗与医学营养减重 流行病学调查显示双相情感障碍患者的超重/肥胖患病率约为30%,精神分裂症和抑郁障碍患者的超重/肥胖患病率则分别为30%~70%和20%~50%<sup>[5,328,329]</sup>。部分抑郁障碍患者可能通过反复进食来暂时缓解心情低落,长此以往会使患者摄入营养过剩而促进其体重增加,而肥胖症所导致的体型和外观变化及其躯体并发症又会带来自卑、自责等负性心理感受,诱发抑郁障碍的同时也会进一步加重患者的过量进食行为<sup>[330-334]</sup>。焦虑症状也认为与肥胖相关性较高,但研究的异质性较大<sup>[330,335-337]</sup>。另一类与肥胖相关性较高的精神异常是暴食症,这是一种以长达数月反复发作难以主观自控的暴食行为(每周1次以上)

为主要表现的饮食失调类精神疾病,常伴有自责、罪恶感等心态,也常与双相障碍、抑郁障碍和焦虑障碍等共病<sup>[338]</sup>。WHO对14个中高收入国家暴食症的调查数据显示,有41.7%的暴食症患者达到肥胖程度<sup>[339]</sup>。我国的一项调查发现,肥胖症人群中有25.4%者伴有暴食症<sup>[340]</sup>。

心理治疗通过改善患者不健康饮食习惯的心理因素,能够更好地贯彻减重饮食方案和行为训练,从而对控制体重和降低BMI发挥增效作用。很多国家的减重指南均已将心理治疗纳入常规的减重措施<sup>[5,341]</sup>。

问题52:哪些患者在医学减重过程中应进行心理治疗?

伴有精神障碍,特别是焦虑、抑郁情绪和暴食行为等症状的肥胖者,应在医学减重中配合心理治疗。(证据等级B,强推荐;同意比例95.8%)

Dawes等<sup>[342]</sup>的Meta分析发现,接受减重手术者中分别有19%共病抑郁症、17%共病暴食症。Hjelmæsæth等<sup>[343]</sup>对28例接受减重手术者进行术后4年的长期随访,发现当其伴有轻至中度抑郁症时,进行认知行为治疗后对其远期预后有更积极的影响。Munsch等<sup>[344]</sup>对80例暴食症患者开展认知疗法和行为减重的RCT研究发现,认知治疗组患者的暴食行为可更快地改善,但是行为减重组患者的BMI可以更快降低。在12个月的远期随访中,两种治疗方式间没有显著性差异。Grilo等<sup>[345]</sup>将90例暴食症患者随机分配至认知行为治疗组、行为减重组和空白对照组进行为期12周的干预,结果发现认知行为治疗组患者的依从性和对暴食行为的改善最好,但是在短期内降低BMI方面并无优势。

问题53:认知治疗能否协助患者进行医学减重?

认知治疗能够协助治疗暴食症所致肥胖,还可以整合其他心理治疗方法,如人际关系治疗、正念治疗等共同进行。(证据等级B,弱推荐;同意比例94.1%)

目前支持认知行为治疗减重的有效性证据是充分的<sup>[346-348]</sup>。有多项研究证实认知行为治疗可有效缓解暴食行为<sup>[344,345,349]</sup>。然而,Wilfley等<sup>[350]</sup>研究发现,人际关系治疗与认知行为治疗对改善暴食症患者症状具有等效作用。此外,近年来正念治疗减重领域

中的应用证据在也与日俱增。Spadaro等<sup>[351]</sup>研究显示,在传统行为减重计划基础上增加正念疗法6个月,可以培养更好的进食习惯,并降低参与者的平均体重。Daubenmier等<sup>[352]</sup>对194例肥胖受试者研究发现,正念训练可在18个月内有效降低体重。Kristeller等<sup>[353]</sup>对150例伴有肥胖的暴食症患者开展正念饮食觉知训练和心理教育/认知行为疗法干预,结果发现正念饮食觉知训练可以减少95%的暴食行为,与认知行为疗法效果相当。Carrière等<sup>[354]</sup>和Rogers等<sup>[355]</sup>先后进行的Meta分析均证实正念治疗可以有效降低BMI,但其长期效果仍存在较大的差异。Sala等<sup>[356]</sup>的Meta分析证实正念与进食障碍的精神病理学呈负相关,为正念减重提供了理论依据。

**2.19 医学营养减重与保健成分** 在医学营养减重的临床实践过程中,经常面对各种宣称具有辅助减重和改善相关指标的保健成分。虽然当前我国保健食品市场存在质量参差不齐、鱼龙混杂的情况,但是保健食品在改善人民体质、减少公共医疗费用开支、促进国民经济可持续发展等方面,仍发挥着不可替代的作用。因此,在较高质量循证医学证据的支持下,保健成分应当在临床实践中被理性地认识和科学严谨地应用。本指南针对鱼油、中链甘油三酯(medium-chain triglyceride, MCT)、左旋肉碱、抗性淀粉(resistant starch, RS)4种保健成分,全面检索了其在医学营养减重中的相关临床研究,进行资料提取、分析与证据评级,以期能够为合理选择和应用保健成分提供依据。

**2.19.1 鱼油** 鱼油是从鱼或鱼副产物中提取的脂质成分,因其富含二十碳五烯酸(eicosapentaenoic acid, EPA)和二十二碳六烯酸(docosahexaenoic acid, DHA)等多种长链多不饱和脂肪酸(polyunsaturated fatty acid, PUFA)而受到广泛关注<sup>[357]</sup>。EPA和DHA是人体必需脂肪酸,缺乏EPA和DHA会对人体造成损害或导致功能性障碍。人体可通过饮食摄入或补充 $\alpha$ -亚麻酸后在体内代谢转化为DHA与EPA,但通常转化率较低。因此,人体可通过补充适量的鱼油以达到最佳的健康获益、维持正常的细胞代谢和生理功能<sup>[358]</sup>。近年来,研究人员对鱼油的作用进行了深入研究,发现适量补充鱼油可以预防心血管疾病<sup>[359]</sup>、糖尿病<sup>[360]</sup>、癌症、精神疾病、

关节炎等健康问题。

**问题54: 鱼油作为膳食补充剂,是否有助于超重/肥胖者获得更好的减重效果?**

单独应用鱼油制剂对超重/肥胖者体重和体脂的改善作用证据不足,但可能改善腰围、腰臀比及血脂谱指标。(证据等级B,弱推荐;同意比例94.9%)

Du等<sup>[361]</sup>纳入21项RCT研究、1652例成人超重/肥胖者的系统评价显示,单独摄入鱼油或鱼油配合饮食及运动的减重方案对体重没有改善,但鱼油配合减重饮食可显著降低腰围和腰臀比。Huerta等<sup>[362]</sup>的RCT研究结果显示,在健康超重/肥胖女性中使用EPA配合CRD干预10周后,与单独CRD相比,没有显著降低体重,但是降低了腰臀比。Huang等<sup>[363]</sup>的一项RCT研究表明,与单纯减重餐比较,鱼油配合减重餐在减重和腰围方面并无优势,但在CRD干预的基础下,肥胖者每天补充1.4~4.2 g鱼油,或每周食用3次水产鱼(150 g鳕鱼或鲑鱼),可改善血脂并降低心脑血管疾病发生风险<sup>[364,365]</sup>。Munro等<sup>[366]</sup>的RCT研究也证明了补充鱼油(4.2 g/d)结合CRD对肥胖者的体重和血脂均有改善作用。

鱼类和膳食补充剂均可作为鱼油的良好来源。《美国膳食指南(2015—2020)》建议成人每周至少使用8盎司(约250 g)各种鱼类,相当于每天至少摄入250 mg EPA和DHA<sup>[367]</sup>。同时美国FDA建议,所有来源的EPA + DHA摄入每天不超过3 g,膳食补充剂不超过2 g<sup>[368]</sup>。《中国居民膳食指南(2016)》建议,每天吃鱼40~75 g,每周吃鱼280~525 g<sup>[369]</sup>。而且,调查数据显示中国居民的 $\omega$ -3 PUFA摄入量远低于推荐水平<sup>[370,371]</sup>。

**2.19.2 MCT 与长链甘油三酯(long-chain triglyceride, LCT)相比,**MCT具有独特的生理生物学特性<sup>[372]</sup>。MCT通过门静脉系统被吸收,不会在肠细胞中重新合成甘油三酯,并且它在线粒体内转运不需要线粒体 $\beta$ -氧化的限速酶——肉碱棕榈酰转移酶(carnitine palmitoyltransferase, CPT)<sup>[373]</sup>,更易被 $\beta$ -氧化,从而不易在脂肪组织和肝组织中累积。MCT主要存在于椰子油(占比约58%)、棕榈仁油(占比约54%)等<sup>[374]</sup>。

**问题55: MCT是否可以帮助超重/肥胖者减重?**

适量补充MCT,且连续使用12周以上,可能有助于超重/肥胖者减重。(证据等级C,弱推荐;同意比例92.0%)

Mumme等<sup>[374]</sup>纳入13项研究、749例受试者的系统评价和Meta分析表明,摄入MCT可能会降低受试者的体重和腰围。Han等<sup>[375]</sup>的一项RCT纳入40例中国超重T2DM患者,MCT组患者食用MCT 18 g/d,LCT组患者食用玉米油18 g/d,干预90 d,结果表明MCT组患者的体重和腰围均显著降低。St-Onge等<sup>[376]</sup>的一项RCT纳入24例肥胖男性,MCT组受试者饮食中添加脂肪的2/3来自MCT,LCT组受试者则摄入橄榄油。研究结果表明,MCT组受试者体重和上身脂肪组织均显著降低。该作者后续对比摄入含MCT的减肥饮食和以橄榄油形式提供LCT的减肥饮食对体重和体成分的影响,纳入49例肥胖者,干预16周,结果表明,MCT组受试者体重下降较LCT组更显著<sup>[377]</sup>。

**2.19.3 左旋肉碱** 左旋肉碱是一种具有生物活性的类维生素营养素,化学名称为左旋-3-羟基-4-三甲胺丁酸盐。除在肝脏和肾脏合成外,膳食中主要从动物性食物中摄取,其中红肉类和乳制品是左旋肉碱的良好来源。研究表明,左旋肉碱可通过将长链脂肪酸转运至线粒体而在脂质代谢中发挥重要作用<sup>[378]</sup>,还可能直接作用于下丘脑,从而降低食欲和食物摄入量<sup>[379,380]</sup>。我国《食品营养强化剂使用标准GB14880-2012》规定左旋肉碱为食品营养强化剂,可将其应用于果蔬汁饮料、含乳饮料、固体饮料等饮料类产品。

**问题56:左旋肉碱是否可以减重和改善体成分?**

每天摄入左旋肉碱2~3 g,摄入8周以上可能有助于减重。(证据等级C,弱推荐;同意比例89.5%)

Askarpour等<sup>[381]</sup>的系统评价纳入43项RCT研究、2703例健康肥胖受试者,研究左旋肉碱对人体体成分的影响。结果显示,单独补充左旋肉碱或联合生活方式干预均可显著降低体重和BMI;亚组分析结果显示,单纯补充左旋肉碱还可显著缩小肥胖者的腰围;非线性剂量反应关系表明,随着左旋肉碱摄入量的增加,BMI有进一步下降趋势,较多证据支

持每天摄入2~3 g左旋肉碱有助于减重;BMI降低量与疗程存在非线性相关关系,提示干预8~10周效果较好。Talenezhad等<sup>[382]</sup>的系统评价探究补充左旋肉碱对体重的影响,结果显示摄入左旋肉碱相比对照组能显著降低体重和BMI,对腰围则无明显影响。杨敏等<sup>[383]</sup>发表系统评价显示,与对照组相比,补充左旋肉碱组受试者减重更有效、BMI降低显著,同时在降低腰臀比方面也有优势。

**2.19.4 RS** RS是一类无法被小肠吸收利用,但在结肠可被大肠菌群发酵或部分发酵的营养物质<sup>[384,385]</sup>,主要包括5种类型:RS1、RS2、RS3、RS4和RS5。某些天然食物含有RS,如马铃薯、玉米、莲子、大米等,其中高直链玉米淀粉含RS高达60%。在芽孢杆菌产生的环糊精葡萄糖基转移酶作用下,直链淀粉可生成一系列环状低聚糖,总称 $\alpha$ -环状糊精,能与膳食脂肪形成一种稳定的复合物,降低脂肪的吸收和生物利用度<sup>[386]</sup>。

**问题57:减重期间摄入RS是否可以改善超重/肥胖者的减重效果、血糖、胰岛素和血脂等指标?**

减重期间摄入RS可能有助于改善超重/肥胖者的体重和体成分,同时还有助于改善血脂、血糖水平和胰岛素敏感性。(证据等级C,弱推荐;同意比例94.5%)

Nichenametla等<sup>[387]</sup>的RCT研究纳入86例受试者干预26周,在面粉中添加30%(v/v)RS4未能显著改善受试者的体重和BMI,但可显著提高瘦体重、降低体脂含量;同时显著降低非代谢综合征受试者的体脂含量和腰围,以及代谢综合征患者的TC、非HDL和HDL-C水平,但对空腹血糖、餐后血糖、LDL-C和TG水平未见显著改善。Comerford等<sup>[388]</sup>的RCT研究显示,每日摄入6 g  $\alpha$ -环状糊精可显著降低体重,但对体脂含量无显著改善;同时可显著降低TC和LDL水平,但对血糖、空腹胰岛素、血清瘦素、HDL、TG、载脂蛋白B水平和TC/HDL比值无显著改善。Johnstone等<sup>[389]</sup>进行了一项RCT研究,在21 d高蛋白减重饮食结束后,将受试者随机分为两组,一组继续采用维持体重的饮食方案,另一组添加RS3,结果显示两组受试者空腹血糖水平显著降低,腰围、臀围、血脂水平均无显著改善。Johnston等<sup>[390]</sup>的一项RCT研究结果显示,摄入RS2(40 g/d)可显

著提高代谢综合征患者胰岛素敏感性,但对HOMA则无显著改善。

## 2.20 医学营养减重与饮料

**2.20.1 咖啡与医学营养减重** 咖啡因是天然存在的生物碱,低至中等剂量的咖啡因可能通过增加去甲肾上腺素和多巴胺释放,进而刺激几个脑区的神经元活动<sup>[391]</sup>,也可能通过抑制磷酸二酯酶和拮抗腺苷对去甲肾上腺素释放来增加脂肪氧化<sup>[392]</sup>。绿咖啡豆是指未烘焙的成熟或未成熟的咖啡豆,是多酚的丰富来源,含有大量的绿咖啡豆提取物(green coffee extraction, GCE)。绿原酸(chlorogenic acid, CGA)是GCE中具有抗氧化特性的主要酚类成分,食用GCE或CGA可能产生抑制脂肪累积<sup>[393]</sup>、降低体重和血压的作用,并通过减少肠道吸收来调节餐后葡萄糖代谢<sup>[394]</sup>。甘露寡糖是咖啡的另一种提取物,可能通过减少内脏脂肪和皮下脂肪以利于身体成分的改善<sup>[395]</sup>。

**问题58:咖啡或咖啡提取物饮料是否可以帮助减重?**

咖啡或咖啡提取物饮料可能有助于体重减轻、体脂减少,并有助于保持减重效果。(证据等级C,弱推荐;同意比例86.9%)

一项系统评价纳入13项研究、606例参与者,干预时间4~36周。结果显示,与每天摄入1 mg/kg咖啡因相比,每天摄入2 mg/kg咖啡因者体重减少22%,BMI降低17%,体脂含量下降28%<sup>[396]</sup>。另一项系统评价研究纳入13项研究,随访1~12周,每日推荐的GCE剂量为46~6000 mg,结果显示受试者BMI显著降低,而体重和腰围则无明显变化<sup>[397]</sup>。一项RCT研究纳入60例超重/肥胖者,比较持续6周单纯能量转换饮食(calorie shifting diet, CSD)和CSD+咖啡因[口服5 mg/(kg·d)]的效果,结果显示CSD+咖啡因组受试者体重和体脂含量降幅更大<sup>[398]</sup>。减重后维持4周的观察发现,CSD+咖啡因组受试者体重仍有进一步下降趋势。

Sarria等<sup>[399]</sup>对年龄18~45岁、BMI 18~25 kg/m<sup>2</sup>的胆固醇正常和高胆固醇血症的男性和女性进行了交叉RCT研究,50%的受试者喝咖啡产品,50%喝对照饮料,为期8周。经过3周的洗脱期,再换用另一种饮料观察8周。结果显示两组受试者饮用咖啡

后收缩压和舒张压均显著下降;瘦素、纤溶酶原激活物-1和抵抗素也有所降低。高胆固醇血症患者以上指标的下降幅度更大。一项RCT研究纳入60例超重者,服用咖啡提取物中的甘露寡糖(4 g/d),配合减肥饮食并使用磁共振成像评估脂肪组织分布,结果显示服用甘露寡糖饮料的男性体重下降幅度大于服用安慰剂饮料的男性,总脂肪组织、皮下脂肪组织和内脏脂肪组织的减少幅度也更大<sup>[395]</sup>。

**2.20.2 甜味剂与医学营养减重** 过量糖摄入是现代社

会导致肥胖的饮食因素之一。蔗糖的替代品较以往任何时候都受到更多的关注。开发经济、安全的甜味剂来取代糖是非常必要的。

**问题59:饮用含蔗糖或人工甜味剂的饮料对体重和血糖产生何种影响?**

摄入大量含蔗糖饮料更容易增加能量摄入、体重、脂肪量。人工甜味剂则可能有助于减轻体重,但其长期安全性仍有待评估。(证据等级B,弱推荐;同意比例91.1%)

Raben等<sup>[400]</sup>随机分组比较摄入蔗糖与人工甜味剂对超重者食物摄入量和体重的影响,结果显示,蔗糖组受试者体重和脂肪量增加,而人工甜味剂组受试者则显著减少,组间比较差异均有统计学意义。Raben等<sup>[401]</sup>分别使用蔗糖和人工甜味剂进行RCT研究,受试者分别食用含蔗糖(2 g/kg)或人工甜味剂的饮料或固体食物,其余饮食自由选择,结果显示蔗糖组受试者葡萄糖、胰岛素、乳酸、甘油三酯、瘦素、胰高血糖素和GLP-1水平均显著高于人工甜味剂组。选取154例超重或肥胖成人比较摄入4种低聚糖和蔗糖对体重、摄食行为和糖耐量的影响。受试者被随机分配饮用含5种甜味剂(蔗糖、糖精、阿斯巴甜、莱鲍迪苷A或三氯蔗糖)中的任1种饮料,连续饮用12周。结果显示,蔗糖和糖精组受试者体重均显著增加,而阿斯巴甜、莱鲍迪苷A和三氯蔗糖组受试者体重均无显著变化<sup>[402]</sup>。

**问题60:非营养性甜味剂(non-nutritive sweeteners, NNS)对肥胖者是否有减重作用?**

与蔗糖饮料相比,NNS饮料对肥胖者有一定减重作用,但仍推荐水作为减重者的常规饮品。(证据等级B,强推荐;同意比例92.4%)

一项纳入20项研究、2914例肥胖者的系统回顾

和系统评价结果表明,干预时间至少持续4周,与未使用NNS的受试者相比,使用NNS的受试者体重/BMI下降,用NNS代替蔗糖可减轻体重,特别是对不愿限制饮食的超重/肥胖者<sup>[403]</sup>。为探讨低热量甜味剂L-阿拉伯糖对人体空腹血糖、餐后血糖及血糖耐受水平的影响,选取22~24岁志愿者50名随机分为5组(L-阿拉伯糖:蔗糖分别为:3:97、5:95、10:90、100:0和0:100)。结果显示3%的L-阿拉伯糖即能抑制血糖水平,5%~10%的配比则能显著降低餐后血糖,100%与10%配比结果则无统计学意义<sup>[404]</sup>。Madjd等<sup>[405]</sup>选取了71例超重/肥胖女性,将其随机分为两组,一组受试者午餐后用一杯水代替习惯性的减肥饮料摄入,另一组受试者午餐后喝一次减肥饮料,两组受试者均可自由饮水,但不允许饮用减肥饮料。24周后两组受试者体重均显著下降,但饮水组受试者BMI下降幅度大于减肥饮料组。一项RCT研究纳入148名护士并随机分为三组:不允许饮用含糖饮料,只允许饮用白开水、茶或无糖咖啡;允许饮用含无热量甜味剂的饮料;以及对含糖饮料无限制。结果显示不喝含糖饮料组受试者的体重、臀围和钠摄入量均有更大程度地降低;相比之下,喝无热量甜味剂组受试者体重降低小于前者,且碳水化合物的摄入量也有增加趋势<sup>[406]</sup>。

Peters等<sup>[407]</sup>在一项为期1年的行为减肥治疗计划中选取303例肥胖者,评估水与添加了NNS的饮料对体重的影响,结果显示1年后NNS饮料组受试者体重下降更显著。

### 3 特殊人群部分

**3.1 重度肥胖者的医学营养减重** BMI  $\geq 37.5 \text{ kg/m}^2$  时(或存在合并疾病的情况下BMI  $\geq 32.5 \text{ kg/m}^2$ )称为重度肥胖,健康风险会随体重增加而升高。减轻体重有助于降低并发症发生风险<sup>[408,409]</sup>。重度肥胖个体应接受包括强化的综合性生活方式干预、药物治疗和代谢手术在内的积极治疗。尽管代谢手术仍然是减重和维持减重效果以及改善合并症和死亡率的最有效方法<sup>[410,411]</sup>,但仍建议将生活方式干预作为实现减重和治疗与肥胖相关合并症的基础方法。由于重度肥胖者可能存在多种合并症,如高血压、高脂血症、糖尿病、痛风、睡眠呼吸暂停综合

征等,应由MDT团队共同参与,评估其整体风险、治疗意愿、既往减重病史、膳食习惯、运动习惯与活动能力以及心理/精神状态,制订个体化治疗计划。多项研究证实,在MDT管理下,6~24个月内超过22%的重度肥胖者可以减重5%以上<sup>[412,413]</sup>。在一项纳入32项RCT研究的系统评价中,将体重管理计划与常规护理或主动控制进行了比较,证实主动控制干预组重度肥胖者减重效果最佳并具有成本效益<sup>[414]</sup>。

**问题61: 重度肥胖者如何设定营养干预的目标能量?**

重度肥胖者减重期间的每日摄入量可设定为能量减少400~600 kcal/d或执行低能量摄入模式(800~1200 kcal/d)。(证据等级C,强推荐;同意比例94.5%)

多项研究证实每日摄入能量800~1200 kcal是安全且有效的,包括采用代餐食品。DROPLET研究采用每日提供810 kcal的代餐食品作为唯一能量摄入来源,干预8周后改为CRD并延续至12个月,138例重度肥胖者在研究结束时平均体重减轻10.7 kg,且在心血管和代谢风险的生物标志物方面有较大改善。重度肥胖者可根据估算体重 $\times 22 \text{ kcal} \pm 20\%$ ,计算出维持体重的能量需求,在此基础上每日减少400~600 kcal能量摄入,可在初始减重时达到体重减轻约0.5 kg/周的效果,但随着非脂肪组织的减少,机体对能量变化的反应会减弱,需要增加能量消耗或进一步限制能量摄入来继续减重<sup>[125,415]</sup>。

**问题62: 极低能量代餐食品能否应用于重度肥胖者?**

在MDT团队规律监测、严密随诊的条件下,可短期选择极低能量代餐食品( $< 800 \text{ kcal/d}$ )作为重度肥胖者的营养干预方案。(证据等级B,弱推荐;同意比例91.6%)

19项RCT研究使用 $\leq 800 \text{ kcal/d}$ (400~800 kcal/d)的极低能量代餐作为重度肥胖者干预措施的一部分,干预4~12周,总随访期为12个月,与其他干预措施(18项RCT)或常规护理(1项RCT)对照组比较,极低能量代餐组受试者体重减轻更多,在降低舒张压、HbA<sub>1c</sub>、空腹血糖水平和减轻骨关节炎症状等方面均优于对照组,但24个月时,两组间

则无明显差异。极低能量代餐组受试者常见的不良反应为便秘、胃肠胀气、头晕、易感冒、头痛、乏力、肌无力等<sup>[221,416-432]</sup>。

**3.2 围孕期管理与医学营养减重** 中国育龄女性超重率和肥胖率分别达到25.4%和9.2%。其中仅有34.9%的女性能够正确自我判定超重或肥胖,仅17.1%的女性采取体重控制措施<sup>[433]</sup>。孕前肥胖会增加早期流产和反复流产的风险<sup>[434,435]</sup>,同时母亲孕前和孕期肥胖均增加孕期并发症和不良妊娠结局风险<sup>[219]</sup>。对超重/肥胖孕妇进行生活方式干预可改善孕期增重和妊娠结局<sup>[436]</sup>。合理的饮食干预可以减少孕期增重<sup>[437,438]</sup>,但对妊娠结局的改善作用并不一致<sup>[439-442]</sup>,孕前减重是改善肥胖女性生育能力的有效手段,能有效提高自然受孕率<sup>[443]</sup>,但短时间大幅度减重并不能增加活产率<sup>[444]</sup>。肥胖女性孕前减重后接受辅助生殖治疗的妊娠率和活产率均有所提高<sup>[445,446]</sup>。

**问题63:综合干预可以改善超重/肥胖孕妇的孕期增重吗?**

对超重/肥胖孕妇实施包含饮食干预在内的生活方式干预(个性化饮食指导、低GI饮食、DASH饮食等)可改善孕期增重。(证据等级B,强推荐;同意比例96.6%)

一项Meta分析纳入4项RCT研究共537例肥胖孕妇,结果显示强化饮食干预能更有效地减少孕期增重<sup>[437]</sup>。另一项纳入21项RCT研究的Meta分析,仅有4项研究涉及超重或肥胖孕妇,共719人进行了健康饮食干预,显示孕期增重显著下降<sup>[438]</sup>。

一项多民族、多中心RCT研究对1555例肥胖孕妇进行低GI饮食加体力活动干预,结果显示干预组孕妇孕期增重显著减少<sup>[439]</sup>。一项纳入520例超重孕妇的RCT研究结果显示,低GI饮食组孕妇孕期增重显著低于对照组<sup>[447]</sup>。一项探讨孕期低GI饮食能否改善妊娠糖尿病高危人群妊娠结局的研究中,超重孕妇亚组分析显示干预组孕妇孕期增重显著低于对照组,但肥胖孕妇亚组则无显著差异<sup>[448]</sup>。Zhang等<sup>[449]</sup>分析了低GI饮食对孕妇妊娠结局和新生儿胰岛素抵抗的影响,结果显示低GI饮食组与对照组孕妇的孕期增重比较差异无统计学意义。Vesco等<sup>[450]</sup>探讨DASH饮食对肥胖孕妇孕期增重和妊娠结局的

改善作用,结果显示,与对照组相比,干预组孕妇孕期增重较少,这与Van Horn等<sup>[442]</sup>的研究结果类似。H Al Wattar等<sup>[451]</sup>针对205例具有代谢危险因素孕妇(肥胖、慢性高血压或高甘油三酯血症)的多中心RCT研究显示,地中海饮食可减少孕妇体重增加。

**问题64:超重/肥胖女性孕期补充维生素D可以改善妊娠结局吗?**

超重/肥胖女性孕期存在维生素D缺乏高风险,应加强孕期检测。补充高剂量维生素D可能改善妊娠结局。(证据等级D,弱推荐;同意比例94.9%)

孕前BMI增加将增加维生素D缺乏症的发生风险,BMI从22 kg/m<sup>2</sup>增加至34 kg/m<sup>2</sup>,孕妇和新生儿维生素D缺乏症的发生率分别增加2倍和2.1倍。一项前瞻性队列研究发现,肥胖女性预防性服用高剂量维生素D可有效抑制体重增长,提高维生素D水平,改善妊娠结局和新生儿结局,且并不影响其内分泌代谢<sup>[452]</sup>。

**3.3 儿童和青少年肥胖者与医学营养减重** 《中国儿童肥胖报告》指出我国儿童的超重/肥胖率不断攀升。1985—2005年,我国大城市0~7岁儿童肥胖检出率由0.9%增至3.2%;1985—2014年,7岁以上学龄儿童肥胖率由0.5%增至7.3%。若不采取有效干预措施,2030年我国0~7岁儿童肥胖检出率将达到6.0%,肥胖儿童数将增至664万人;7岁及以上学龄儿童超重/肥胖检出率将达到28.0%,超重/肥胖儿童数将增至4948万人。儿童肥胖可能出现包括心血管系统、皮肤、内分泌系统、消化系统、神经系统、骨骼系统、心理和肺部健康的异常。持续的饮食管理和有效运动是肥胖儿童的长期管理模式。营养治疗为肥胖儿童和青少年首选的一线治疗方式,但管理模式不同于成人,在限能量的同时还要保障其正常生长发育,肥胖儿童和青少年减重膳食三大营养素比例建议按照《中国居民膳食指南(2016)》推荐饮食结构,碳水化合物50%~60%,脂肪20%~30%,蛋白质15%~25%,由MDT团队(包括内分泌医生、营养医生/营养师、运动专家、心理医生等)以及更多的家庭、学校及社会参与。

**问题65:超重/肥胖儿童和青少年宜采用何种营养减重方式?**

CRD对超重/肥胖儿童和青少年控制体重有益。在保证正常生长所需能量的前提下,减少能量供给,但不建议采用极低能量饮食。(证据等级B,强推荐;同意比例95.4%)

李明伟等<sup>[453]</sup>给予诊断单纯性肥胖的青少年营养干预,营养治疗前、中、后期分别对受试青少年进行膳食调查,确定饮食能量,使每日能量摄入按一定梯度阶段性递减,蛋白质、脂肪和碳水化合物的摄入量各占总能量的25%、30%和45%。结果显示,3个月后营养干预组青少年BMI和血脂水平均显著低于对照组。张耀东等<sup>[454]</sup>短期干预8~14岁肥胖儿童饮食,在保证正常生长所需能量的前提下,减少能量供给,以富含纤维食物为主,避免食用高能量、高脂肪食物,主食量稍加控制,经过3周干预,肥胖儿童体重、腰围、臀围、BMI、体脂含量较干预前均显著降低。

Andela等<sup>[455]</sup>检索24项临床研究,在5~18岁肥胖儿童中实施极低能量饮食,持续干预3~20周后,体重较对照组显著下降。但对于极低能量饮食的安全性仍应进行长期随访,全面监测所有不良事件。Sondike等<sup>[456]</sup>对比LCDs和低脂饮食在肥胖儿童和青少年中的影响,12周后LCDs组受试者体重下降更多,但LDL-C水平则无明显改善。

问题66:超重/肥胖儿童和青少年减重过程中是否需要补充维生素D及钙?

超重/肥胖儿童和青少年维生素D缺乏率高,减重过程中可能需要加倍补充才能使血清维生素D维持在正常水平。建议保证充足的膳食钙摄入。(证据等级C,弱推荐;同意比例94.9%)

一项研究招募了18例肥胖和18例非肥胖青少年,研究结果显示25(OH)D<sub>3</sub>不足率分别为78%和61%,12周内每天给予2000 U维生素D<sub>3</sub>,结果显示,肥胖青少年25(OH)D<sub>3</sub>水平增加,缺乏率显著降低<sup>[457]</sup>。另一项RCT研究给予肥胖青少年每天补充1000 U或5000 U维生素D<sub>3</sub>,持续3个月后,5000 U组25(OH)D<sub>3</sub>≥20 ng/ml的受试者占83%,1000 U组为30%;5000 U组25(OH)D<sub>3</sub>≥30 ng/ml的受试者占50%,1000 U组为0<sup>[458]</sup>。

Tylavsky等<sup>[459]</sup>研究调查了186例有超重/肥胖风险的非裔美国青少年钙摄入量对身体成分的作

用,与钙摄入量≥600 mg/d的女性相比,钙摄入量<300 mg/d的女性脂肪百分比更高,其他矿物质和维生素摄入量低。Nappo等<sup>[460]</sup>对6696例儿童进行6年随访,结果显示基线钙摄入量较高的男孩BMI、腰围和脂肪质量指数z值增幅较低,女孩中仅观察到腰围z值增幅较低;而在非乳制品钙和肥胖指数之间没有观察到关联。

问题67:超重/肥胖儿童和青少年如何运动更能有效减重?

对于超重/肥胖儿童和青少年,每天至少60 min中-高强度有氧运动,其中每周至少有3 d高强度有氧运动,每周2~3次抗阻运动和骨骼负重运动。(证据等级B,强推荐;同意比例97.2%)

WHO《关于身体活动有益健康的全球建议》推荐,5~17岁儿童和青少年每天至少应有60 min中-高强度身体活动以维持健康和生长发育,大于60 min以获得更多的健康效益;同时,每周至少应进行3次高强度身体活动,包括强壮肌肉和骨骼的活动等<sup>[461]</sup>。2018年《美国身体活动指南》建议,6~17岁的青少年每天应进行至少60 min的中-高强度身体活动,以有氧运动为主,并且包括每周3 d的较大强度体力活动、抗阻运动和骨骼负重运动<sup>[314]</sup>。Stoner等<sup>[462]</sup>的Meta分析纳入20项研究、1091例超重/肥胖青少年,结果显示运动干预可减轻体重,且运动量与体重减轻量之间存在正线性关系。Lee等<sup>[463]</sup>的研究显示,有氧运动组、抗阻运动组和同步运动组受试者的总脂肪量减少相似。Sigal等<sup>[464]</sup>对304例肥胖青少年研究发现,同步训练、有氧运动、力量训练的体脂含量下降比较差异无统计学意义。

问题68:以家庭为中心的治疗在儿童和青少年超重/肥胖治疗中是否发挥重要作用?

以家庭为中心的综合减重方式对于超重/肥胖儿童和青少年在改善健康和社会认知方面具有积极影响。(证据等级B,强推荐;同意比例96.2%)

Sweeney等<sup>[465]</sup>的前瞻性RCT研究纳入82例11~16岁非裔美国超重/肥胖青少年,进行8周的面对面小组干预和8周线上干预,课程内容包含自我监督策略、积极沟通、有效目标设定、改善行为等,结果表明,综合性减重方式对改善非裔美国青少年的认

知和社会幸福感有积极影响;在社会结果方面,青少年更多地受益于与父母的积极沟通。另一项RCT研究表明,父母鼓励身体活动减重对青春期女孩体重、BMI和客观测量的身体活动具有直接影响<sup>[466]</sup>。

问题69:如何维持超重/肥胖儿童和青少年减重后的效果?

坚持减重后的长期随访,包括面对面问诊或电话等形式,对维持超重/肥胖儿童和青少年减重成果、促进身心健康及改善生活质量具有积极影响。(证据等级B,强推荐;同意比例96.2%)

Savoie等<sup>[467]</sup>对209例不同人种肥胖儿童进行1年的肥胖干预治疗和1年随访,治疗效果在第24个月随访时依然得到维持,包括BMI z值、BMI、体脂含量、总体脂量、TC、LDL-C和HOMA-IR指数等指标的改善。Mameli等<sup>[468]</sup>对864例儿童和青少年长达11年的随访研究显示,坚持门诊随访者减重效果更好。Nguyen等<sup>[469]</sup>评估附加治疗接触对减重维持的效果,结果显示,每2周采用电话、短信、邮件交流对维持减重具有积极作用,BMI z值也显著降低。

3.4 老年肥胖者与医学营养减重 截至2019年底,我国65岁及以上人口达17 603万,占总人口的12.6%<sup>[470]</sup>。随着年龄增长,人体成分会发生较大变化,脂肪越来越多地沉积在骨骼肌和肝脏,骨骼肌质量和力量逐渐衰退,更容易发生少肌性肥胖。老年少肌性肥胖可定义为与年龄相关的骨骼肌力量降低、质量减少、功能减退及肥胖为主要特点的老年常见综合征<sup>[471]</sup>。有文献报道,我国老年人少肌性肥胖患病率为4%~20%<sup>[472]</sup>。在少肌性肥胖的发病机制中,肌肉减少与肥胖密切相关,共同引发多种并发症。研究表明,与单纯肥胖和肌少症相比,少肌性肥胖的老年人更易患身体残疾和平衡障碍,并增加摔倒的风险<sup>[473]</sup>。一篇纳入12项前瞻性研究、35 287例老年人的Meta分析表明,少肌性肥胖者的全因死亡风险增加24%<sup>[474]</sup>。因此,老年少肌性肥胖者适度减重对提高生活质量和健康至关重要。

问题70:少肌性肥胖老年人是否应该提高膳食蛋白质摄入?

(1)少肌性肥胖老年人适当提高膳食蛋白质摄入,在限能量的同时保证蛋白质摄入在1.0~1.5 g/(kg·d);

不推荐选择极低能量饮食。(证据等级C,强推荐;同意比例95.4%)

Villareal等<sup>[12]</sup>研究报道在52周的低能量饮食干预后,肥胖老年人的平均脂肪量减少7.1 kg,但同时也减少了3.2 kg的骨骼肌量。因此,建议保证摄入足够的蛋白质。研究显示,老年人肌肉合成代谢能力减弱,机体对蛋白质或氨基酸的合成代谢刺激反应迟钝,因此,提供足量的蛋白质或氨基酸有助于刺激肌肉蛋白合成<sup>[475]</sup>。Kim等<sup>[476]</sup>系统分析评价低能量饮食中蛋白质摄入量对老年人体质量、骨骼肌质量、脂肪量的影响,结果显示,摄入较高蛋白质饮食[ $\geq 1.0$  g/(kg·d)]的老年人,在减重过程中保留更多的骨骼肌,减少了更多的脂肪。Beavers等<sup>[477]</sup>对96例肥胖老年人进行为期6个月的高蛋白饮食减重计划,结果显示,该方案可有效减轻肥胖老年人总体重和脂肪质量,且有助于保持瘦体重和活动能力。但是,老年人应避免使用极低能量饮食,否则可能会下调骨骼肌蛋白质合成并加速蛋白质分解,导致老年人骨骼肌肌肉质量和肌力降低,并增加体液和电解质失衡风险<sup>[478]</sup>。因此,不推荐少肌性肥胖老年人选择极低能量饮食。

(2)膳食蛋白质应均衡分配至各餐中,每餐至少含25~30 g蛋白质,既要保证数量又要保证质量,以刺激肌肉蛋白合成。(证据等级C,弱推荐;同意比例94.9%)

研究显示,当老年人每餐蛋白质摄入量少于20 g时,肌肉蛋白合成变得迟钝;而每餐摄入蛋白质为25~30 g时,可最大限度地刺激老年人肌肉蛋白的合成<sup>[475,479]</sup>。不同来源的蛋白质(植物蛋白和动物蛋白)对脂肪量的减少或增加有不同影响,从动物源食品中提取的蛋白质在诱导肌肉蛋白合成方面似乎最有效。与动物蛋白质相比,大多数植物蛋白质亮氨酸含量较低,可能降低肌肉蛋白的合成代谢<sup>[480]</sup>。

问题71:少肌性肥胖老年人是否需要补充β-甲基-β-羟基丁酸(β-hydroxy-β-methyl-butyrate, HMB)?

适量补充HMB,并联合适当运动可改善老年人骨骼肌质量和力量,维持骨骼肌功能。(证据等级B,弱推荐;同意比例94.5%)

必需氨基酸尤其是亮氨酸是促进肌肉合成的主

要营养调节物质,可促进蛋白质合成,抑制蛋白质分解,同时可以促进胰岛素合成。Katsanos等<sup>[481]</sup>研究发现,较高浓度亮氨酸能促进老年人肌肉合成。其代谢产物HMB具有促进骨骼肌蛋白质合成、抑制骨骼肌蛋白质降解以及减轻机体炎症反应等作用,被证实可作为营养补充剂用于提高健康或虚弱老年人的肌肉蛋白合成,减轻老年人肌少症进展<sup>[482]</sup>。HMB常存在于葡萄柚、鳄梨、芦笋和鲈鱼等食物中。有研究表明,养老院老年人补充HMB 2~3 g/d,1年后骨骼肌质量显著增加。Fuller等<sup>[483]</sup>给社区老年人补充HMB 3 g/d且联合每周5 d的抗阻运动,1年后HMB联合抗阻运动组老年人瘦体重显著增加,且上肢与下肢力量显著增强。

问题72:少肌性肥胖老年人是否需要补充维生素D?

建议每天补充800~1000 U维生素D。(证据等级B,强推荐;同意比例96.6%)

Morley等<sup>[484]</sup>对社区老年人的横向研究发现,维生素D水平与身体活动能力直接相关,特别是25(OH)D<sub>3</sub>水平低于75 nmol/L的老年人。在美国的NHANES研究中,超过30%的70岁以上老年人维生素D水平低于50 nmol/L<sup>[485]</sup>。Scott等<sup>[486]</sup>研究显示,每天服用800~1000 U维生素D,可改善老年人肌少症的指标。欧洲骨质疏松、骨关节炎及肌肉骨骼疾病临床与经济学会建议每天摄入至少800 U的维生素D,以维持血清25(OH)D<sub>3</sub>水平>50 nmol/L<sup>[487]</sup>。《肌肉衰减综合征营养与运动干预中国专家共识》建议维生素D的补充剂量为15~20 μg/d(600~800 U/d);维生素D<sub>2</sub>与维生素D<sub>3</sub>可以替换使用<sup>[488]</sup>。总的来说,维生素D缺乏预示着老年人体质衰弱和骨骼肌减少症的发展,有维生素D缺乏症风险的个体应注重改善维生素D水平,预防肌少症发生。

问题73:少肌性肥胖老年人是否需要补充ω-3 PUFA?

少肌性肥胖老年人可适量补充ω-3 PUFA。(证据等级C,弱推荐;同意比例92.8%)

Zhang等<sup>[489]</sup>纳入11项RCT研究、617例受试者,发现补充ω-3 PUFA者腰围显著缩小。Rodacki等<sup>[490]</sup>的RCT研究纳入45例老年女性,在力量训练中补充鱼油者下肢肌群的肌肉力量和功能能力较单纯力量训练者

显著增加。Dupont等<sup>[491]</sup>指出补充ω-3 PUFA对肌少症的老年人有益,可能会增加锻炼和/或蛋白质补充的效果。

问题74:对于肥胖老年人,是否可采用限能量HPD减重?

短期应用限能量HPD可以有效降低老年人总体重和脂肪量,改善代谢综合征相关指标。(证据等级B,弱推荐;同意比例94.1%)

Porter Starr等<sup>[492]</sup>对BMI≥30 kg/m<sup>2</sup>和简单体能状况测试评分4~10分的老年人给予低能量饮食(减少500 kcal),对照组老年人蛋白质摄入量为0.8 g/(kg·d),试验组老年人蛋白质摄入量为1.2 g/(kg·d),干预6个月后,两组受试者体重均显著降低,但试验组老年人炎症状况改善,特别是脂联素、瘦素、高敏C反应蛋白和细胞间黏附分子-1。Weaver等<sup>[493]</sup>进行的为期6个月的RCT研究中,将肥胖老年人随机分为体重稳定组和减重组。减重组采用低能量、营养完整、HPD并鼓励保持基本饮食和体力活动习惯,结果显示减重组髋部和脊椎骨密度较体重稳定组均有改善。一项为期10周的RCT研究,采用2×2归因设计,将100例超重/肥胖老年人随机分为低能量正常蛋白质饮食组、低能量高蛋白质饮食组、低能量正常蛋白质饮食结合运动组和低能量高蛋白质饮食结合运动组,结果显示低能量高蛋白质饮食组老年人体重和腰围均显著降低<sup>[494]</sup>。

问题75:对于肥胖老年人,减重是否可以采用限能量代餐饮食?

短期采用限能量代餐饮食能够降低肥胖老年人体重和脂肪,但应保证充足营养素的摄入。(证据等级A,强推荐;同意比例94.1%)

Miller等<sup>[495]</sup>的RCT研究纳入454例超重/肥胖老年人并随机分为强化饮食减重(D组)、运动(E组)和强化饮食减重结合运动(D+E组)。每天提供低能量平衡营养饮食,其中D组和D+E组老年人使用部分代餐,每天2次代餐。E组和D+E组老年人的运动训练为每周3 d,每天60 min。最终结果显示D组和D+E组老年人减重更明显,而E组老年人体重下降很少,说明以代餐饮食辅助减肥对老年人是适用的。在为期6个月的预试验中,28例志愿者被随机分配至限能量平衡饮食组或强化低能量

代餐饮食组。两组志愿者的行为干预和锻炼处方均相似,结果显示,强化低能量代餐组重度肥胖老年人体重和脂肪量减少得更多,且不良事件发生率更低<sup>[496]</sup>。在一项为期8周的限能量饮食研究中,12例肥胖老年人被随机分为两组,一组使用乳清蛋白+必需氨基酸配方的代餐,另一组使用普通代餐,结果显示,使用乳清蛋白+必需氨基酸配方代餐可促进老年人脂肪组织的优先减少并保存瘦组织<sup>[497]</sup>。

**3.5 PCOS与医学营养减重** PCOS是女性最常见的内分泌疾病,影响8%~13%的育龄女性,其中50%以上的患者合并肥胖<sup>[498]</sup>。95%的超重PCOS女性存在胰岛素抵抗和代偿性高胰岛素血症。Lim等<sup>[498]</sup>纳入了15项RCT、498例超重/肥胖PCOS女性的系统评价表明,生活方式干预可以改善超重/肥胖PCOS女性游离雄激素指数,降低体重、BMI和胰岛素水平,缩小腰围以及改善生活质量。Jiskoot等<sup>[499]</sup>研究发现生活方式干预可以改善超重/肥胖PCOS女性抑郁,提高身体形象评分并增强自尊心。

**问题76: 超重/肥胖PCOS女性的营养减重目标是什么?**

超重/肥胖PCOS女性6个月内应减少初始体重的5%~10%。(证据等级C, 弱推荐; 同意比例95.4%)

14例超重/肥胖PCOS女性给予1000~1500 kcal/d的低能量饮食后体重下降5%~10%,恢复正常的排卵性月经周期,腰臀比、血浆雄激素和血清黄体生成素水平均显著降低,血浆雄激素水平和腰臀比降低与胰岛素改善呈正相关<sup>[500]</sup>。18例超重/肥胖的不孕无排卵PCOS女性经过6个月的饮食和运动干预,体重下降10%,可减少内脏脂肪并改善胰岛素敏感性,从而恢复排卵<sup>[501]</sup>。Crosignani等<sup>[502]</sup>的前瞻性研究评估了体重减轻对BMI>25 kg/m<sup>2</sup>无排卵PCOS女性人体测量指标和卵巢形态的影响,给予1200 kcal/d饮食并辅以体育锻炼6个月。结果显示,76%的患者体重减轻了至少5%,卵巢体积缩小,每个卵巢微囊的数量显著减少;在27例少经或闭经患者中,18例恢复规律月经周期,15例自然排卵。Nybacka等<sup>[503]</sup>的RCT研究纳入57例肥胖PCOS女性,减重后游离睾酮下降2/3的女性恢复了月经,1/3确

认排卵。此外,针对149例PCOS女性的多中心研究报告,辅助生殖前生活方式干预16周可使体重较基线下降7%,可以提高排卵率和活产率,并显著消除口服避孕药的不良代谢影响<sup>[504]</sup>。

**问题77: 超重/肥胖PCOS女性应采取何种饮食模式减重?**

所有超重/肥胖PCOS女性都应在选择健康食物的前提下,减少膳食总能量摄入以减轻体重。(证据等级C, 强推荐; 同意比例95.8%)

Barrea等<sup>[505]</sup>的病例对照横断面研究发现,在摄入总能量相似的前提下,与年龄和BMI相匹配的健康女性相比较,PCOS女性食用初榨橄榄油、豆类、鱼类/海鲜和坚果的量较低,调整总能量和BMI后,PCOS女性雄激素水平与健康饮食评分、蛋白质、复杂碳水化合物、膳食纤维等均呈负相关,而与C反应蛋白水平、简单碳水化合物、饱和脂肪酸及 $\omega$ -6 PUFA摄入量均呈正相关。一项为期12周、纳入28例超重PCOS女性比较限能量高蛋白/LCDs和低蛋白/高碳水化合物饮食模式的RCT研究表明,两种饮食在减轻体重、减少腹部脂肪以及改善月经周期、胰岛素抵抗和血脂异常的效果相当<sup>[506]</sup>。Moran等<sup>[507]</sup>的系统评价纳入了5项RCT研究、137例超重/肥胖PCOS女性,结果表明,PCOS女性无论采用何种饮食模式,体重减轻即可改善其代谢、生殖和心理健康,但没有一种饮食结构较限制能量摄入更有益。Lie Fong等<sup>[508]</sup>的系统评价纳入11项RCT研究,随访>24周,结果表明,热量限制为基础的健康饮食、高蛋白饮食、素食、低GI饮食或低脂饮食在减轻体重方面并无差异。2018年PCOS评估和管理国际循证指南指出,在PCOS女性中,没有证据或仅有限的证据表明何种膳食类型更好,建议采取各种均衡膳食并减少能量摄入以使超重/肥胖的PCOS女性减轻体重<sup>[509]</sup>。

**问题78: 低能量饮食是否适用于超重/肥胖的PCOS女性?**

PCOS合并超重/肥胖女性可在妇科和营养医生联合指导下进行短期低能量饮食减重,执行期间应定期监测酮体和激素水平。(证据等级B, 弱推荐; 同意比例94.9%)

一项纳入8项RCT、327例受试者的Meta分析

发现, LCDs组受试者BMI、HOMA-IR指数、TC、LDL-C水平降低更明显, 特别是干预4周以上者其卵泡刺激素、性激素结合球蛋白水平显著增加, 雄激素水平显著下降, 而且低脂LCDs组相比高脂LCDs组激素水平改善更加明显<sup>[510]</sup>。Galletly等<sup>[511]</sup>的RCT研究发现, 与低蛋白高碳水化合物饮食模式相比, 高蛋白低碳水化合物饮食干预16周后能更好地控制PCOS女性食欲, 使其自我认知和心理评估均显著改善, 更有助于长期管理。

**3.6 糖尿病与医学营养减重** 2019年我国预估有1.16亿糖尿病患者, 位居全球第一<sup>[512]</sup>。成人糖尿病患病率高达11.2%, 而超重/肥胖T2DM患者约占糖尿病总患者的58.3%<sup>[513,514]</sup>。医学营养治疗能够有效帮助超重/肥胖糖尿病患者达到并维持目标体重, 同时可以预防或缓解糖尿病。包括糖尿病患者健康行动研究、DiRECT研究、DPP研究等多项基于人群强化生活方式干预的前瞻性研究, 均证实营养干预对于糖尿病患者减重和并发症防治具有重要卫生经济学意义<sup>[29,195,515]</sup>。

**问题79: 超重/肥胖糖尿病患者应设立何种减重目标?**

超重/肥胖糖尿病患者应将减重初始目标设立为减轻体重5%~10%。(证据等级A, 强推荐; 同意比例95.4%)

2021年美国糖尿病学会糖尿病医学诊疗标准建议, 对于超重/肥胖T2DM患者, 应制订饮食、体力活动和行为治疗, 以达到并保持≥5%的减重效果; 而更显著的减重效果将带来糖尿病防控和减少心血管危险因素的更大获益<sup>[516]</sup>。《中国2型糖尿病防治指南(2020年版)》建议超重/肥胖T2DM成人患者的减重目标为降低5%~10%的体重<sup>[514]</sup>。多项研究提示, 体重减少>5%的干预即能有助于糖尿病患者控制HbA<sub>1c</sub>、血脂以及血压<sup>[517-519]</sup>。

**问题80: 何种膳食模式可以更有效地帮助超重/肥胖糖尿病患者/糖尿病前期人群减重?**

糖尿病医学营养治疗鼓励限能量平衡膳食(证据等级A, 强推荐; 同意比例96.2%)。采用多种膳食模式, 强调食物多样性, 应关注个体化饮食的适用人群和不良反应(证据等级C, 强推荐; 同意比例97.4%)。

目前证据尚不能证明某种膳食模式更有优势, 在制订膳食结构时应注意食物多样性, 首选全谷类食物, 增加非淀粉类蔬菜的摄入。对糖尿病患者来说并不推荐单一产能营养素比例的膳食模式。多种膳食模式均可推荐以帮助糖尿病患者/糖尿病前期人群减重, 但要求在专业人员的指导下并结合患者/人群的代谢目标和个人喜好完成, 同时监测血脂、肾功能以及内脏蛋白质的变化。

**CRD:** CRD作为医学营养治疗的基石, 推荐按照25~30 kcal/(kg·d)计算能量并个性化制订膳食模式, 但不推荐长期进行极低能量膳食模式(<800 kcal/d)。糖尿病患者健康行动研究在美国16个研究中心纳入5145例超重/肥胖T2DM患者进行强化生活方式干预, 每天饮食能量减少500~750 kcal, 结果显示生活方式干预组患者体重较对照组明显减轻<sup>[515]</sup>。DiRECT研究显示, 干预组患者首先接受低能量饮食3~5个月, 随后6~8周逐渐恢复正常饮食。随访到12个月时, 24%的干预组患者体重降低15 kg, 平均减重10 kg, 其中46%的患者实现糖尿病缓解<sup>[29]</sup>。

**LCDs:** 系统评价纳入25项RCT研究包括2412例糖尿病患者, 结果提示干预3个月后低碳水化合物组患者较高碳水化合物组减重更多<sup>[520]</sup>。另一项系统评价纳入16项研究比较LCDs与低脂饮食, 结果提示两组患者体重和BMI降低比较差异均无统计学意义<sup>[46]</sup>。一项系统评价纳入23项RCT研究、1357例糖尿病患者, 评价LCDs和VLCDs对T2DM的缓解作用, 结果提示, 干预6个月后LCDs组患者体重显著降低, 降糖药使用减少, TG水平改善, 而VLCDs组患者因依从性不佳, 体重降低不足<sup>[521]</sup>。需要注意的是, 目前我国糖尿病患者使用LCDs模式的安全性和有效性仍需大样本RCT研究明确。2018年《柳叶刀》杂志发表研究提示LCDs显著增加全因死亡率<sup>[522]</sup>。因此, 超重/肥胖糖尿病患者使用LCDs需要谨慎权衡, 对于血糖未达标的患者, 可通过LCDs减少总碳水化合物摄入量来降糖减重, 但需要警惕低血糖事件; 而存在酮症酸中毒风险或使用SGLT-2抑制剂的患者, 应更谨慎应用LCDs。

**江南饮食:** 以粗粮糙米为主食, 适度摄入鸡、鸭、鱼、虾、蟹等白肉、豆制品、坚果、奶类及黄

酒，保证蔬菜摄入及适量水果，使用植物油如菜籽油进行低温烹饪，推荐蒸、煮、涮的烹饪方式，减少精米精面、红肉的食用，更适合我国国情。

地中海饮食：系统评价纳入57项研究、12 751例糖尿病患者随访10 d至7年，结果提示地中海饮食可以显著降低患者体重，改善血脂、血压、糖脂代谢等指标<sup>[523]</sup>。

DASH饮食：由水果、蔬菜、全麦谷物和精瘦肉组成，强调减少盐分的摄入。系统评价汇总了7项Meta分析，包含了涉及942 140例受试者的15项前瞻性队列研究以及涉及4414例受试者的31项RCT研究，结果提示使用DASH饮食有助于糖尿病患者减轻体重<sup>[524]</sup>。

3.7 代谢相关脂肪性肝病与医学营养减重 代谢性脂肪性肝病（metabolic associated fatty liver disease, MAFLD），既往称为NAFLD，是危害我国人民健康的主要肝脏疾病之一，我国约有2.4亿MAFLD患者，其中约3000万为脂肪性肝炎患者<sup>[525]</sup>。超重/肥胖是MAFLD最常见的危险因素之一<sup>[526]</sup>，MAFLD患者通过改善生活方式或减重手术减轻体重后肝病情况也能得到不同程度的改善<sup>[527,528]</sup>。

问题81：MAFLD患者减重过程中是否需要限制饮酒？

MAFLD患者减重过程中应禁酒。（证据等级A，强推荐；同意比例97.9%）

《酒精性肝病防治指南（2018年更新版）》关于酒精性肝病诊断中对饮酒量的要求为：酒精摄入量男性 $\geq 40$  g/d，女性 $\geq 20$  g/d，超过5年<sup>[529]</sup>。对于有饮酒但饮酒量未达到酒精性肝病诊断标准的患者可定义为少量饮酒<sup>[529-532]</sup>。Younossi等<sup>[533]</sup>前瞻性研究纳入4246例MAFLD患者，平均随访20年，分析患者生存相关因素，多因素分析结果显示过量饮酒是死亡的高危因素。Ajmera等<sup>[534]</sup>报道的285例MAFLD患者中59%为少量饮酒患者，41%为戒酒患者，对其进行生活方式调整但不应用药物治疗，平均随访47个月后对比肝活检发现，戒酒患者肝脂肪变、纤维化改善情况均显著优于适度饮酒患者，谷草转氨酶水平、NAFLD活动度积分显著低于适度饮酒患者，非酒精性脂肪性肝炎的改善率高于适度饮酒患者。

问题82：何种饮食模式更有助于MAFLD患者减重？

MAFLD患者在减重过程中可根据个体情况酌情选择地中海饮食、IER等膳食模式，在控制能量摄入的同时改善MAFLD预后。（证据等级B，弱推荐；同意比例96.2%）

对MAFLD合并超重/肥胖者，有大量研究分别探索地中海饮食、IER、低脂饮食等不同饮食模式对MAFLD患者体重和肝功能的改善作用<sup>[535-537]</sup>。Saeed等<sup>[537]</sup>进行系统综述，结果提示地中海饮食、IF、低脂饮食等对于患者体重、肝脂肪变均有不同程度的改善作用。Cai等<sup>[535]</sup>进行了RCT研究来评估隔日禁食对MAFLD患者体重和脂质分布的影响，271例MAFLD患者被随机分至隔日禁食组、限时进食组或对照组，分别接受饮食干预12周。结果发现，与对照组相比，隔日禁食组和限时进食组患者体重、TG水平均显著下降，但HDL、LDL、空腹胰岛素、葡萄糖水平、肝硬度、收缩压或舒张压的变化比较差异均无统计学意义。Kouvari等<sup>[538]</sup>报道地中海饮食不仅能改善患者的脂肪变情况，还能降低糖尿病与心血管疾病发生风险。2020年版亚太肝病学会关于MAFLD的指南建议，对于MAFLD患者，其饮食控制的核心是达到能量摄入与消耗的负平衡，可根据个体情况酌情选择相应的饮食模式<sup>[539]</sup>。

3.8 痛风与医学营养减重 在正常嘌呤饮食状态下，非同日两次空腹血尿酸浓度 $> 420 \mu\text{mol/L}$ 可定义为高尿酸血症<sup>[540]</sup>。在许多大型流行病学研究中，高BMI已被确定为痛风的危险因素。Aune等<sup>[541]</sup>的Meta分析纳入10项研究、215 739例参与者，其中27 944例为痛风患者。结果发现，BMI每升高5个单位，痛风的总体相对风险为1.55。肥胖会促进胰岛素抵抗，进而减少肾尿酸排泄，从而导致高尿酸血症<sup>[542]</sup>。肥胖患者减轻体重可以降低尿酸水平，减少痛风性关节炎的发生<sup>[543,544]</sup>。一项纳入20项研究的Meta分析表明，减重手术后第1个月血尿酸水平增加，从术后第3个月血尿酸水平开始下降并持续至术后第3年。术后BMI与血尿酸水平呈正相关，血尿酸水平随BMI下降而降低<sup>[545-547]</sup>。Nguyen等<sup>[548]</sup>的一项纳入11 896例研究对象的队列研究表明，体重下降 $> 5\%$ 的受试者反复痛风发作风险降低40%，

而体重升高>5%的受试者反复痛风发作风险增加60%。

问题83:肥胖的痛风患者宜选用何种饮食方案?

肥胖的痛风患者可选择地中海饮食或DASH饮食,不仅可以减轻体重,还可以降低痛风发生风险。(证据等级C,强推荐;同意比例96.6%)

一项Meta分析表明,高尿酸血症和痛风的发生风险与红肉、海鲜等高嘌呤食物、酒精或果糖的摄入呈正相关,而与乳制品或大豆食品摄入呈负相关;高嘌呤蔬菜与高尿酸血症无关,但与痛风呈负相关<sup>[549]</sup>。一些队列研究表明,乳制品<sup>[550]</sup>、素食<sup>[551]</sup>、高纤维食物<sup>[552]</sup>均能够降低血尿酸水平。研究发现,地中海饮食不仅可以帮助肥胖人群减轻体重,降低BMI和腰围<sup>[553]</sup>,还可以降低血尿酸水平<sup>[554,555]</sup>,改善代谢综合征<sup>[556]</sup>。地中海饮食可以有效降低高尿酸血症患者的血尿酸水平,尤其是在干预后第1个月<sup>[557]</sup>。

对于BMI<30 kg/m<sup>2</sup>的男性,严格遵守DASH饮食、不饮酒能够显著降低痛风的发生风险<sup>[558]</sup>。此外,一项纳入6项研究的Meta分析表明,与常规饮食相比,坚持DASH饮食可有效改善成人循环血清炎症生物标志物,如高敏C反应蛋白<sup>[559]</sup>。而一项横断面研究中发现,促炎饮食摄入较多的女性,高尿酸血症的发生风险增加<sup>[560]</sup>。

超重与肥胖既属于科学问题又属于社会问题,医学营养减重模式将不断引入新的临床证据,遵循标准化流程,以防治肥胖相关并发症、改善肥胖者的健康为目标,为“健康中国2030”提出的“健康体重”提供更多的科学基础。

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## 《中国超重/肥胖医学营养治疗指南(2021)》

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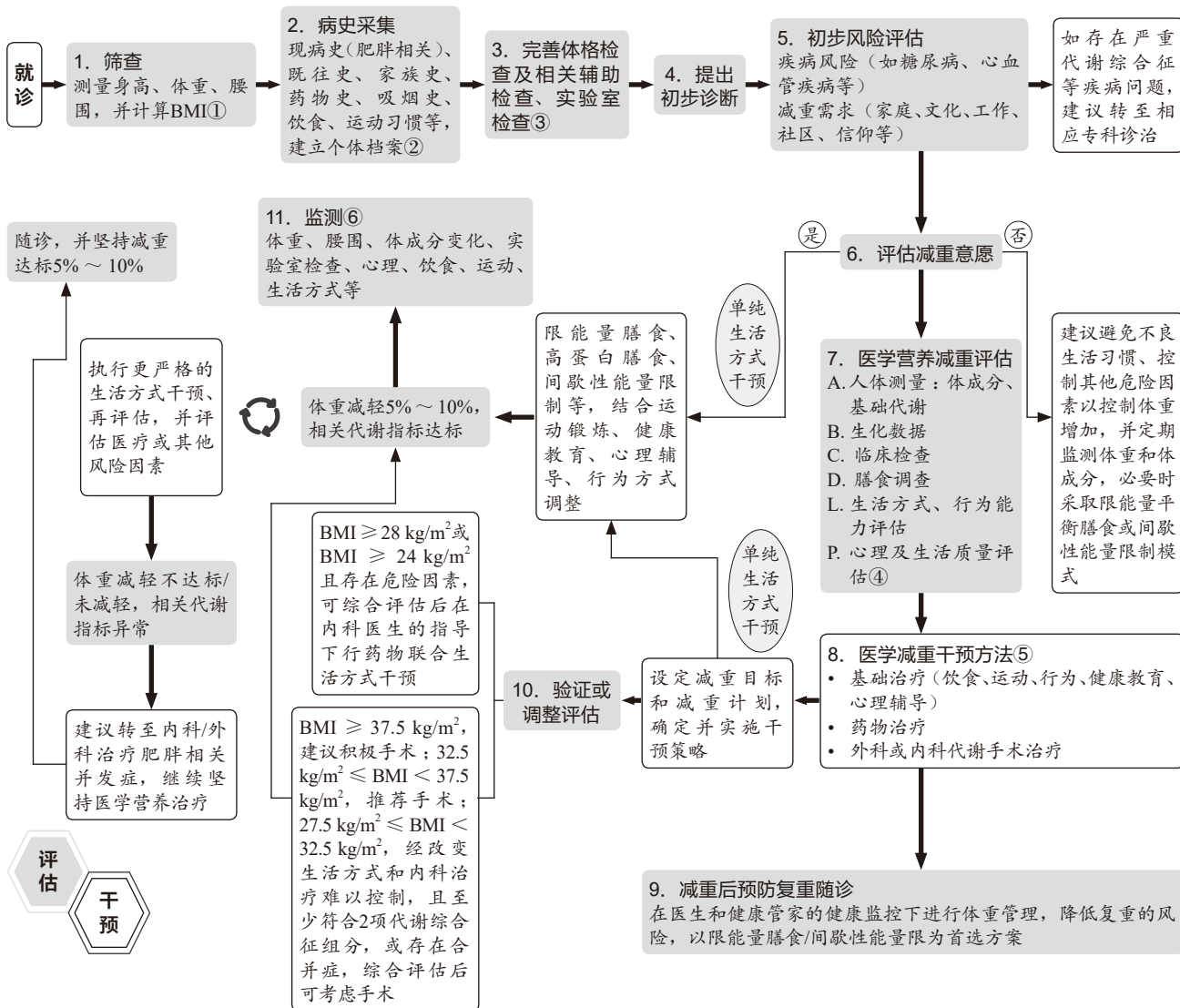
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## 附录 肥胖症的医学营养减重诊疗流程



①筛查, 测量身高、体重, 并计算BMI (正常  $18.5 \sim 23.9 \text{ kg/m}^2$ ; 超重  $24.0 \sim 27.9 \text{ kg/m}^2$ , 肥胖  $\geq 28.0 \text{ kg/m}^2$ ); 腰围, 男性  $\geq 90 \text{ cm}$ /女性  $\geq 85 \text{ cm}$  为中心性肥胖

②病史采集, 询问病史采用《诊断学》(第9版) 问诊内容

③完善体格检查以及相关辅助检查、实验室检查, A. 体格检查; B. 辅助检查, BIA体成分、间接测热仪、骨密度、常规心电图、负荷试验心电图等; C. 实验室检查, 空腹血糖、胰岛素、血脂、血压、肝肾功能、血常规等安全指标

④心理及生活质量评估按照相关量表进行

⑤医学减重干预, A. 基础治疗 (饮食、运动、行为、健康教育、心理辅导); B. 药物治疗 ( $\text{BMI} \geq 28 \text{ kg/m}^2$  或  $\text{BMI} \geq 24 \text{ kg/m}^2$  存在危险因素, 可综合评估后在内科医生的指导下选择药物联合生活方式干预); C. 外科手术 (单纯肥胖患者手术适应证: a.  $\text{BMI} \geq 37.5 \text{ kg/m}^2$ , 建议积极手术;  $32.5 \text{ kg/m}^2 \leq \text{BMI} < 37.5 \text{ kg/m}^2$ , 推荐手术;  $27.5 \text{ kg/m}^2 \leq \text{BMI} < 32.5 \text{ kg/m}^2$ , 经改变生活方式和内科治疗难以控制, 且至少符合2项代谢综合征组分, 或存在合并症, 综合评估后可考虑手术; b. 男性腰围  $\geq 90 \text{ cm}$ 、女性腰围  $\geq 85 \text{ cm}$ , 参考影像学检查提示中心型肥胖, 经多学科综合治疗协作组广泛征询意见后可酌情提高手术推荐等级; c. 建议手术年龄为  $16 \sim 65$  岁)

⑥监测 (设立周、月目标), 定期评估患者体重、腰围、饮食、生活方式、行为能力、人体成分分析、生化数据、心理状态。减重目标: 按减重现体重的5%、10%、15%划分, 减肥周期为3~6个月。初级目标: 体重下降  $\geq 5\%$ ; 中期目标: 体重下降  $\geq 10\%$ ; 高级目标: 体重下降  $\geq 15\%$

注: BMI为体质质量指数; BIA为生物电阻抗法。

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本文编辑: 李佳玉, 张瑜

## ·指南与共识·

中国超重/肥胖医学营养治疗专家共识  
(2016年版)

中国超重/肥胖医学营养治疗专家共识编写委员会

## 一、背景

近二十年来,我国超重/肥胖的患病率逐年增长,呈流行态势。中国健康营养调查(China Health and Nutrition Survey, CHNS)的数据显示<sup>[1]</sup>,从1993年至2009年的17年间,成年人超重/肥胖的患病率从13.4%增加至26.4%,总体呈线性增长;成年人腹型肥胖的患病率从18.6%增长至37.4%,平均年增长1.1%,显著高于超重/肥胖的增长速度。肥胖是糖尿病、心血管疾病及其他代谢性疾病和肿瘤的潜在危险因素。减重治疗包括生活方式(膳食和体育运动)调整、内科药物及外科手术治疗等多种手段。科学合理的营养治疗联合运动干预仍是目前最有效、最安全的基础治疗。近年来,国际上对肥胖/超重的营养管理已经形成了一些共识<sup>[2-3]</sup>。然而,以营养和生活方式干预为核心的肥胖/超重管理必须与特定的地域性饮食习惯及社会文化相适应。为更好地发挥医学营养治疗在肥胖防治中的作用,结合国内外发表的诸多证据和专家的集体智慧,特制定本共识,以便使医学减重更加科学、规范和易于实施。

## 二、证据分级与推荐意见的形成

在制定本共识的过程中,首先参照世界卫生组织(World Health Organization, WHO)出版的《WHO指南编写手册》<sup>[4]</sup>和AGREE(Appraisal of Guideline

Research and Evaluation)<sup>[5]</sup>协作网发表的临床指南编写的方法学原则(表1),结合中国现况,建立制定本共识的方法学,将2009年更新后的AGREE II协作网推出的指南方法学质量评价标准作为质控标准<sup>[5]</sup>。2015年9月,成立了超重/肥胖医学营养治疗专家共识(2016)(以下简称“共识”)撰写证据方法学小组,负责起草方法学工作方案,并协助编委会进行证据评价的相关工作。证据级别与推荐意见分级标准的制定见表2。

## 三、共识编写委员会组织机构

由中国医疗保健国际交流促进会营养与代谢管理分会以及中国医师协会营养医师专业委员会、中国营养学会的67位专家组成了本共识编写委员会。所有参与指南编写的人员均基于志愿工作。

## 四、目标及愿景

通过“共识”的撰写与发布,期望能提高社会及专业人士对营养干预在代谢性疾病治疗中的重要性认识。并能进一步规范医学营养减重的原则和路径,设立标准化医学营养治疗减重管理工作流程,以便临床营养专业人员及医疗保健人员掌握和使用,更好地为减重者服务。

## 五、本共识常用名词

1. 体质指数(body mass index, BMI):结合身高和体重用于判断人体超重/肥胖与否和程度的指数,

表1 证据检索——数据库和关键词

|        |                                                                                                    |
|--------|----------------------------------------------------------------------------------------------------|
| 检索时限   | 2000年1月1日至2015年9月1日                                                                                |
| 语言     | 英语、汉语                                                                                              |
| 数据库    | 二级文献数据库:Guideline Clearing House、Cochrane Library、SumSearch 一级文献数据库:Medline、EMBASE、SCI、中国生物医学文献数据库 |
| 筛选项目   | 人类                                                                                                 |
| 文献出版类型 | 有效性:指南、Meta分析、系统性综述、随机对照试验、观察研究、病例报告、共识意见<br>安全性:指南、Meta分析、系统性综述、随机对照试验、不良反应报告、共识意见                |
| 主要检索词  | medical nutrition therapy、weight loss、weight management、obesity、营养治疗、减重、体重管理、减肥、肥胖等检索词             |

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表 2 共识证据分级和推荐意见整合体系

| 推荐意见 | 证据级别 | 描述                                                                                   |
|------|------|--------------------------------------------------------------------------------------|
| A    | 1    | 单个多中心 RCT 研究(原始数据开源); 基于 RCTs 的系统性综述(有同质性, 原始数据开源); 大样本数据挖掘研究(原始数据开源); Meta 分析和系统性综述 |
| B    | 2a   | 单个 RCT(原始数据不开源); 经典的基于病例对照研究的系统性综述(有同质性); 大样本队列研究(原始数据开源)                            |
|      | 2b   | 单个病例对照研究                                                                             |
| C    | 3    | 病例报道(低质量队列研究); 横断面研究                                                                 |
| D    | 4    | 专家意见或评论                                                                              |

注: RCT: 随机对照试验; A、B、C、D: 推荐意见优先级别从高到低

计算公式为体重/身高<sup>2</sup>(kg/m<sup>2</sup>)。目前我国成人 BMI 的切点为: 18.5≤BMI<24 kg/m<sup>2</sup> 为正常体重范围, 24≤BMI<28 kg/m<sup>2</sup> 为超重, BMI≥28 kg/m<sup>2</sup> 为肥胖。

2. 肥胖(obesity): 由于体内脂肪的体积和(或)脂肪细胞数量的增加导致的体重增加, 或脂肪占体重的百分比异常增高, 并在某些局部过多沉积脂肪, 通常用 BMI 进行判定。在本共识中, 肥胖的主要定义即基于 BMI 做出, 在一些情况下(如代谢综合征), 也酌情采纳权威国际学术组织(如 WHO、美国糖尿病学会等)推荐的相关诊断指标(如腰围, 腰臀比)。

3. 超重(overweight): 介于正常和肥胖间的身体状态。通常以 24≤BMI<28 kg/m<sup>2</sup> 作为判断标准。

4. 儿童肥胖(childhood obesity): WHO 推荐以身高标准体重法对儿童肥胖进行判定, 同等身高、营养良好的儿童体重为标准体重(100%), ±10% 标准体重的范围为正常。>15% 为超重, >20% 为轻度肥胖, >30% 为中度肥胖, >50% 为重度肥胖。

5. 限能量平衡膳食(calorie-restricted diet, CRD): 一类在限制能量摄入的同时保证基本营养需求的膳食模式, 其宏量营养素的供能比例应符合平衡膳食的要求。

6. 低能量膳食(low calorie diet, LCD): 一类在满足蛋白质、维生素、矿物质、膳食纤维和水这五大营养素的基础上, 适量减少脂肪和碳水化合物的摄取, 将正常自由进食的能量减去 30%~50% 的膳食模式。通常需要在医生监督下进行。

7. 极低能量膳食(very-low calorie diet, VLCD): 通常指每日只摄入 400~800 kcal(1 kcal=4.2 kJ) 能量, 主要来自于蛋白质, 而脂肪和碳水化合物的摄入受到严格限制。机体处于饥饿状态, 因其能引起瘦体重减少、痛风发生风险增加以及电解质平衡紊乱等不良反应并不作推荐。该方法必须在医生严格指导下进行, 预防并发症的发生。

8. 高蛋白质膳食(high protein diet, HPD): 高蛋

白质膳食是一类每日蛋白质摄入量超过每日总能量的 20% 或 1.5 g·kg<sup>-1</sup>·d<sup>-1</sup>, 但一般不超过每日总能量的 30%(或 2.0 g·kg<sup>-1</sup>·d<sup>-1</sup>) 的膳食模式。

9. 轻断食模式(intermittent fasting): 也称间歇式断食, 一类采用 5+2 模式, 即 1 周中 5 天相对正常进食, 其他 2 天(非连续)则摄取平常的 1/4 能量(约女性 500 kcal/d, 男性 600 kcal/d)的膳食模式。

10. 血糖指数(glycemic index, GI): 进食恒量的食物(含 50 g 碳水化合物)后, 2~3 h 内的血糖曲线下面积相比空腹时的增幅除以进食 50 g 葡萄糖后的相应增幅。通常定义 GI≤55% 为低 GI 食物, 55%~70% 为中 GI 食物, GI≥70% 为高 GI 食物。

## 总 论

### 一、肥胖的病理生理

众所周知, 肥胖的发生常常是由遗传、少动以及摄入过多能量共同导致的结果。从代谢研究角度看则是基于代谢紊乱(metabolic disorders), 代谢紊乱是肥胖从基因到临床表现的中心环节。肥胖者多存在脂类代谢紊乱, 脂肪合成过多, 而脂肪水解和脂肪分解氧化无明显异常。血浆甘油三酯、游离脂肪酸和胆固醇一般高于正常水平。应用低能量饮食治疗肥胖症时, 血浆酮体增加或酮血症倾向往往低于正常人。随着基因组学研究的快速进展, 人们发现在基因多态性上的差异, 使得在各年龄层次的人群都有对肥胖更易感者。在上述背景下, 加之膳食结构变化后肠道菌群结构发生的适应性变化<sup>[6-7]</sup>, 使得这类具有遗传易感性者对三大宏量营养素(碳水化合物、蛋白质、脂肪)的应答出现显著差异, 进而造成肥胖的发生。

二、限制能量平衡膳食(calorie restrict diet, CRD)

#### (一)背景

CRD 对于延长寿命、延迟衰老相关疾病的发生

具有明确干预作用<sup>[8]</sup>。CRD 目前主要有三种类型<sup>[9]</sup>:(1)在目标摄入量基础上按一定比例递减(减少 30%~50%);(2)在目标摄入量基础上每日减少 500 kcal 左右;(3)每日供能 1 000~1 500 kcal。

## (二)证据

Huffman 等<sup>[10]</sup>对超重者进行了 6 个月 CRD 干预(能量摄入减少 25%),发现与非 CRD 相比,CRD 组的胰岛素敏感性有明显改善,并认为这是降低体重的原因。Yoshimura 等<sup>[11]</sup>对内脏脂肪面积 $\geq 100\text{ cm}^2$  的成人进行 12 周 CRD(CRD 目标:25 kcal/kg,基线能量摄入约为 30 kcal/kg)干预后,有效降低了体重、脂肪组织重量、内脏脂肪面积以及动脉粥样硬化的发生风险。

1. 脂肪:多项研究证实 CRD 的脂肪供能比例应与正常膳食(20%~30%)一致<sup>[12-13]</sup>,过低或过高都会导致膳食模式的不平衡。在 CRD 中补充海鱼或鱼油制剂的研究均报道 n-3 多不饱和脂肪酸(polyunsaturated fatty acids, n-3PUFA)对肥胖者动脉弹性、收缩压、心率、血甘油三酯及炎症指标等均有明显改善,可增强 CRD 的减重效果<sup>[14-15]</sup>。

2. 蛋白质:由于 CRD 降低了摄入的总能量,必然导致产热的宏量营养素摄入降低,应适当提高蛋白质供给量比例(1.2~1.5 g/kg,或 15%~20%),这样就能在减重过程中维持氮平衡,同时具有降低心血管疾病风险、增加骨矿物质含量等作用<sup>[16-18]</sup>。不同来源蛋白质的减重效果可能不同,有研究发现大豆蛋白的减脂作用优于酪蛋白,且其降低血液中总胆固醇和低密度脂蛋白胆固醇的作用也更明显<sup>[19]</sup>。

3. 碳水化合物:根据蛋白质、脂肪的摄入量来确定碳水化合物的供给量(40%~55%)<sup>[20]</sup>。过高或过低都将导致膳食模式不平衡。碳水化合物的来源应参照《中国居民膳食指南》,以淀粉类复杂碳水化合物为主,保证膳食纤维的摄入量 25~30 g/d。严格限制简单糖(单糖、双糖)食物或饮料的摄入。

4. 微量营养素:肥胖与某些微量营养素的代谢异常相关,尤其是钙、铁、锌、维生素 A、维生素 D 及叶酸的缺乏<sup>[20]</sup>。肥胖和膳食减重也可引起骨量丢失<sup>[18,21]</sup>。一项 Meta 分析显示肥胖群体患维生素 D 缺乏的风险比正常人群高 35%,比超重人群高 24%<sup>[22]</sup>。在减重干预的同时补充维生素 D 和钙可以增强减重效果<sup>[23-24]</sup>。

CRD 除能量摄入限制之外,也对营养均衡提出推荐。近年研究认为采用营养代餐方法能兼顾体重减轻和营养均衡。Wadden 等<sup>[25]</sup>对 Look AHEAD

研究(纳入 5 145 例肥胖合并糖尿病的患者)进行了后续分析,该后续分析考察了接受膳食支持和教育以及强化生活方式干预的减重情况。强化生活方式干预,在对患者进行均衡营养模式教育的同时也给以营养代餐作为一种支持措施。总的来说,配合营养代餐的强化生活方式干预比单纯的膳食支持和教育能更有效地降低患者的体重(强化生活方式干预组中 37.7% 的患者在干预第一年结束时达到了减重 10% 的目标,而膳食支持和教育组只有 3.3% 的患者达到此目标)。

## (三)推荐意见

具体意见见表 3。

表 3 CRD 应用推荐意见

| 推 荐                                         | 证据级别 | 推荐意见 |
|---------------------------------------------|------|------|
| 1. CRD 具有减轻体重、降低脂肪含量的作用                     | 1    | A    |
| 2. 保证蛋白质充足供给(1.2~1.5 g/kg),可能增强 CRD 的减重效果   | 2a   | B    |
| 3. 使用大豆蛋白部分替代酪蛋白可增强 CRD 的减重效果               | 2a   | B    |
| 4. CRD 中脂肪的供能比例以 20%~30% 为宜                 | 2a   | B    |
| 5. 适当增加富含 n-3PUFA 的食物或补充鱼油制剂,可以增强 CRD 的减重效果 | 2a   | B    |
| 6. CRD 中碳水化合物的供能比例以 40%~55% 为宜              | 2a   | B    |
| 7. 增加蔬菜、水果、燕麦等富含膳食纤维的食物可增强 CRD 的减重效果        | 2b   | B    |
| 8. 适当补充维生素 D 制剂和钙可增强 CRD 减重效果               | 2a   | B    |
| 9. 采用营养代餐模式的 CRD 更有助于减轻体重                   | 2b   | B    |

注:CRD:限制能量平衡膳食;n-3PUFA:n-3 多不饱和脂肪酸

## 三、高蛋白膳食模式

### (一)背景

高蛋白膳食中,蛋白质的供给量一般为占供热比的 20% 以上,或至少在 1.5 g/kg 体重以上<sup>[26]</sup>。

### (二)证据

研究表明,接受高蛋白膳食 6 个月的肥胖者比接受正常蛋白质饮食者体重下降更明显,1 年随访后高蛋白膳食仍较对照组多降低了 10% 腹部脂肪<sup>[27]</sup>。Noakes 等<sup>[28]</sup>证实,采用高蛋白膳食比高碳水化合物膳食的肥胖人群体重下降更多(6.4 kg 比 3.4 kg,  $P=0.035$ )。当受试者每日允许能量摄入为 20 kcal/kg 时,其蛋白质占总能量的 30%,碳水化合物占 45%,脂肪占 25%,同时补充维生素和钾,12 周后体重明显减轻( $4.72\pm 4.09$ )kg, BMI、腰围和腰臀比(WHR)也分别下降( $1.87\pm 1.57$ )kg/m<sup>2</sup>、( $3.73\pm 2.91$ )cm 和( $0.017\pm 0.029$ )<sup>[29]</sup>。Layman 等<sup>[30]</sup>将健康成

年肥胖个体随机分为高蛋白低碳水化合物组(PRO 组)和低蛋白高碳水化合物饮食组(CHO 组),4 个月,两组体重减少量虽无明显差别,但是 PRO 组的机体脂肪(体脂)含量减少更明显;相对于 CHO 组,PRO 组对肥胖者血清中的甘油三酯、高密度脂蛋白胆固醇的改善更明显,并且依从性更高。一项为期 2 年的实验比较了高蛋白和高碳水化合物饮食在糖尿病超重者的减重效果,结果提示高蛋白膳食可能对存在糖尿病、心血管疾病和代谢综合征风险的患者有帮助<sup>[31]</sup>。113 例中度肥胖患者经过 4 周的极低能量饮食的减重治疗后,体重降低了 5%~10%,而随后 6 个月采用高蛋白膳食(18%)及正常蛋白饮食(15%)进行体重维持,结果显示高蛋白膳食体重反弹率更低<sup>[32]</sup>。由于慢性肾病患者可能因高蛋白饮食而增加肾脏血流负荷,建议合并慢性肾病患者应慎重选择高蛋白饮食。

### (三)推荐意见

具体推荐见表 4。

表 4 高蛋白膳食推荐意见

| 推 荐                                                                         | 证据级别 | 推荐意见 |
|-----------------------------------------------------------------------------|------|------|
| 1. 对于单纯性肥胖以及合并高甘油三酯血症者、高胆固醇血症者采用高蛋白膳食较正常蛋白膳食更有利于减轻体重以及改善血脂情况;并有利于控制减重后体重的反弹 | 2a   | B    |
| 2. 合并慢性肾病患者应慎重选择高蛋白饮食                                                       | 4    | D    |

## 四、轻断食膳食模式

### (一)背景

轻断食模式也称间歇式断食(intermittent fasting)5:2 模式,即 1 周内 5 d 正常进食,其他 2 d(非连续)则摄取平常的 1/4 能量(女性约 500 kcal/d,男性 600 kcal/d)的饮食模式<sup>[33]</sup>。

### (二)证据

20 世纪 80 年代,Vertes 等<sup>[34]</sup>对 519 例门诊患者进行断食治疗,78% 的患者体重下降超过 18.2 kg,总体减重为每周 1.5 kg,女性平均每周减重 1.3 kg,男性每周减重 2.1 kg,大多数均能接受该方案而无任何严重副作用。一项基于 16 例肥胖患者的研究显示<sup>[35]</sup>,在隔日断食法干预 8 周后,患者体重平均下降(5.6±1.0)kg,腰围平均缩小 4.0 cm,体脂含量从原来的(45±2)%降到(42±2)%,收缩压由(124±5)mmHg(1 mmHg=0.133 kPa)降到(116±3)mmHg,总胆固醇、低密度脂蛋白胆固醇和甘油三酯浓度也分别下降(21±4)%、(25±10)%和(32±6)%,而高密

度脂蛋白胆固醇水平无变化。Johnson 等<sup>[36]</sup>的研究也发现,在隔日断食法干预 8 周后,肥胖患者的 BMI 较基线值下降 8%,而低密度脂蛋白胆固醇和甘油三酯分别下降 10%和 40%。2013 年发表的一项基于 115 例肥胖女性的研究<sup>[37]</sup>显示,干预 3 个月后,两日断食法的肥胖患者体重平均下降 4 kg,而传统能量限制的肥胖患者体重平均下降 2.4 kg,且前者胰岛素抵抗改善更明显。2014 年一项关于 2 型糖尿病预防的 Meta 分析发现轻断食可有效减重及预防 2 型糖尿病,对超重和肥胖患者的血糖、胰岛素及低密度脂蛋白胆固醇、高密度脂蛋白胆固醇等代谢标记物均有改善<sup>[38]</sup>。

### (三)推荐意见

具体推荐见表 5。

表 5 轻断食膳食推荐意见

| 推 荐                                                                  | 证据级别 | 推荐意见 |
|----------------------------------------------------------------------|------|------|
| 1. 轻断食模式有益于体重控制和代谢改善                                                 | 2b   | B    |
| 2. 轻断食模式在体重控制的同时,或可通过代谢和炎性反应改善,间接增加体重控制获益;同时增强糖尿病、心脑血管疾病及其他慢性疾病的治疗获益 | 2a   | B    |

## 五、运动治疗

### (一)背景

运动对减肥的影响取决于运动方式、强度、时间、频率和总量。2013 年美国关于成年人肥胖管理指南推荐<sup>[39]</sup>,增加有氧运动(如快走)至每周 150 min 以上(每天 30 min 以上,每周的大多数天);推荐更高水平的身体活动(每周 200~300 min),以维持体重下降及防止减重后的体重反弹(长期,1 年以上)。

### (二)证据

1. 运动与成年人减肥:一项纳入 35 个随机对照试验的 Meta 分析发现,有氧运动对降低内脏脂肪有显著效果(干预时间 4 周~2 年,每次运动 20~75 min),而渐进性抗阻运动和有氧结合抗阻运动均无显著效果,建议有氧运动作为降低内脏脂肪的核心运动<sup>[40]</sup>。另一项 Meta 分析纳入了 741 例受试者,其 BMI 在 27.8~33.8 kg/m<sup>2</sup>,运动干预时间为 2.5~6.0 个月,结果显示有氧运动的减肥效果更明显:抗阻运动对提高瘦体重更有效,与抗阻运动比较,有氧结合抗阻减肥效果更明显<sup>[41]</sup>。在一项单中心、平行随机对照试验中,比较了 4 种不同的运动量和运动强度,结果显示与对照组相比,各运动组体重和腰围均显著减少,各组间差异无统计学意义<sup>[42]</sup>。这项研究表明不同运动

量和运动强度对腹型肥胖可能均具有减肥效果。

2. 运动结合营养干预与减重: 一项纳入了 3 521 名受试者的 Meta 分析<sup>[43]</sup>, 干预时间 12~72 个月, 营养干预方式为降低能量摄入, 主要为低脂( $\leq$ 总能量的 30%)、低饱和脂肪酸、增加水果蔬菜和膳食纤维的摄入。运动干预主要是在监督下进行有氧运动和抗阻训练, 强度为 50%~85% 最大心率。结果发现与单纯饮食组或运动组相比, 饮食结合运动的减重效果更加显著, 同时可以看到在改善人体测量指标方面, 营养干预优于运动治疗。Stephens 等<sup>[44]</sup>在 2014 年对 60 项 Meta 分析和 23 个系统性综述进行了再评价, 认为多种干预措施都可以帮助受试者达到减重目标, 但其中营养干预研究得出的结论较为一致, 即对于减重效果最为明确。而运动干预研究在不同的作者所做的 Meta 分析中得出的结论则有较大差异。这种结果的异质性与研究者选定的结局评价指标、研究设计存在很大关联。

3. 运动治疗与儿童减肥: 一篇纳入了 2 项 Meta 分析的系统性综述<sup>[45]</sup>, 均显示体脂率有显著性降低。而其他肥胖指标(BMI、体重、中心性肥胖)则没有显著性差异。一篇纳入 40 项研究的系统性综述和 Meta 分析<sup>[46]</sup>, 评价了抗阻训练对肥胖儿童力量、体成分等的影响, 显示抗阻运动对体成分有极小影响, 且亚组分析显示运动量越大、年龄越小、随机对照设计产生更显著效果。一项纳入 15 个随机对照试验的系统性综述和 Meta 分析<sup>[47]</sup>, 比较仅饮食干预与饮食结合运动或仅运动干预对超重儿童减重和降低代谢风险的效果, 结果显示, 短期干预中仅饮食和饮食结合运动均产生了减重和代谢指标改善的效果, 而长期干预显示饮食结合运动干预可以显著改善高密度脂蛋白胆固醇和空腹血糖、空腹胰岛素水平。

4. 运动治疗与孕期体重管理: 一项纳入 910 名产后女性的系统性综述发现, 单纯坚持有氧运动(步行)者与对照组相比体重变化没有显著差异。而饮食干预或饮食结合运动干预者与对照组相比体重显著降低, 干预措施对哺乳行为并无消极影响<sup>[48]</sup>。另一项合并了 11 个随机对照试验的 Meta 分析<sup>[49]</sup>纳入 769 名产后女性, 干预 10~52 周, 结果显示最有效的减重方式是设定客观目标的运动干预, 如心率监测或计步器的使用, 表明生活方式干预对产后女性的减重是有益的, 运动结合强化饮食干预并设定客观目标是最有效的干预方式。

### (三) 推荐意见

具体推荐见表 6。

表 6 运动治疗推荐意见

| 推 荐                                      | 证据级别 | 推荐意见 |
|------------------------------------------|------|------|
| 1. 运动对减肥的影响取决于运动方式、强度、时间、频率和总量           | 3    | C    |
| 2. 推荐采用有氧运动结合抗阻运动的模式预防与治疗超重或肥胖           | 2a   | B    |
| 3. 与单纯饮食或运动相比, 饮食结合运动的减重效果更加显著           | 2a   | B    |
| 4. 针对儿童肥胖, 采用饮食结合运动短期和长期干预均能达到减重和代谢改善的效果 | 2b   | B    |
| 5. 针对孕期体重管理, 饮食或结合运动干预是有效的干预方式           | 2b   | B    |

## 六、认知-行为及心理干预

### (一) 背景

生活方式干预作为基础治疗, 是一种囊括营养、运动、认知-行为及心理多方面的综合干预模式<sup>[50-51]</sup>。认知-行为及心理干预是通过调整超重和肥胖患者的生活环境及心理状态, 帮助患者理解和认识体重管理、肥胖及其危害, 从而做出行为改变。其中包括自我监控、控制进食、刺激控制、认知重建和放松技巧等<sup>[52]</sup>。

### (二) 证据

1. 认知-行为干预: 认知-行为干预配合体力活动和饮食调整, 能够明显降低体重, 且超过 6 个月的行为干预比低于 6 个月的效果更明显<sup>[53]</sup>。美国女性健康研究发现进行 6~54 个月的干预后, 干预组的体重和腰围较对照组明显下降<sup>[54]</sup>。行为干预对减重后体重的维持也有明显作用。研究证明行为干预提升了患者的理论认识, 包括对其激励、支持, 指导自我监控(饮食、运动和情绪管理), 从而更有利于保持减重效果<sup>[55]</sup>。通过小组和面对面个人辅导的干预可以从不同方式进行指导, 以维持远期减重效果<sup>[56-57]</sup>。

2. 精神-心理支持: 肥胖者常见的心理因素如压力、沮丧、抑郁容易导致过度进食, 并引发罪恶感而陷入恶性循环中<sup>[58]</sup>。精神-心理支持中需要医务人员能识别干扰减重管理成功的心理或精神疾患, 并请专科医师进行治疗<sup>[59-60]</sup>。在医疗活动中, 肥胖患者可能会因为各种心理社会原因而拒绝寻求减重帮助。应对患者表达充分尊重, 仔细倾听并建立信任, 通过健康教育提高其对肥胖加重疾病危险性的认识, 不应忽略任何细微进步, 给予及时、适当的奖励和称赞, 这对于肥胖儿童的管理尤其重要<sup>[61]</sup>。

### (三) 推荐意见

具体推荐见表 7。

表 7 认知-行为及心理干预推荐意见

| 推 荐                                                               | 证据级别 | 推荐意见 |
|-------------------------------------------------------------------|------|------|
| 1. 对超重/肥胖者进行认知-行为干预能够达到减重效果,干预时间不少于 6 个月;若同时附加体力活动和饮食行为干预,减重效果更明显 | 2b   | B    |
| 2. 对肥胖患者进行认知-行为干预和心理治疗有助于减重并维持减重效果                                | 4    | D    |

## 七、减重治疗后的维持

### (一)背景

治疗后减重的维持非常重要。机体存在多种机制调控能量平衡以维持自身体重相对稳定,通常减重计划结束后一年,大部分人会恢复已减掉体重(复重)的 30%~35%<sup>[62]</sup>,4 年内基本恢复到减重前水平<sup>[63]</sup>。发表于新英格兰医学杂志和美国医学会杂志的 2 项随机对照试验表明,适当的干预措施可在一定程度上延长减重后体重的维持时间<sup>[56-57]</sup>。世界胃肠病学会对肥胖管理制定的全球指南(WGO)强调,为了维持减重效果,医务人员和营养师应向患者提供面对面或电话随访的减重维持计划,保持与患者的规律接触(每月或更加频繁),帮助其进行高强度体力活动(如 200~300 min/周),规律监测体重变化(如每周或更加频繁),并保持低能量饮食(维持更低体重所必需)<sup>[64]</sup>。

### (二)证据

英国国家卫生与临床优化研究所(NICE)指南认为肥胖管理包括节食、运动、行为改变,且需要长期随访并推荐低脂、高纤维饮食,增加体力活动,避免久坐,规律监测体重和腰围变化<sup>[61]</sup>。

1. 饮食控制和体育锻炼:一篇纳入了从 1984 年至 2007 年间 42 项随机对照试验的系统性综述认为,生活方式和行为干预措施[包括饮食控制和(或)代餐、体育锻炼、保持减重小组间人员交流等]配合一定的药物治疗,对减少减重后复重有效<sup>[65]</sup>。Dombrowski 等<sup>[66]</sup>对非手术干预成人肥胖者减重后的长期维持进行了系统回顾和 Meta 分析,包含 45 项研究的 7 788 例患者,结果显示包括食物摄取和体力活动在内的行为干预可以使患者较对照组复重减少 1.56 kg。

2. 心理因素:减重所引起的能量负平衡和能量储备的降低会促使关键中枢和外周调节因素发生改变,从而导致减重者食欲的增加和能

量消耗的减少,而导致减重成功后的复重。这种调节作用不会在新的体重稳态形成后消退,这会促使减重成功者在心理和身体诱因的驱动下恢复减掉的体重<sup>[67]</sup>。

3. 网络干预:随着互联网时代对健康产生的深远影响,越来越多的研究表明网络干预对维持减重(尤其在 2 年以内)有效。2 项设计良好的大样本随机对照试验结果均显示,在短期随访(24 个月内)利用相互帮扶技术干预组的体重回升明显低于自我控制组<sup>[56-57]</sup>。一个纳入 5 项研究的 Meta 分析发现,网络干预与面对面干预效果相同,高网站利用率与减重维持正相关<sup>[68]</sup>。

### (三)推荐意见

具体推荐见表 8。

表 8 减重治疗后的维持推荐意见

| 推 荐                                                             | 证据级别 | 推荐意见 |
|-----------------------------------------------------------------|------|------|
| 1. 医务人员应向减重者提供细致的减重后维持计划                                        | 3    | C    |
| 2. 生活方式和行为干预措施(包括饮食控制和/或代餐、体育锻炼、保持减重小组间人员交流等)配合药物治疗,对减轻减重后的复重有效 | 2a   | B    |
| 3. 应适当进行减重者的心理辅导                                                | 4    | D    |
| 4. 网络干预对维持 2 年内减重效果有效                                           | 2b   | B    |

## 分 论

### 一、儿童/青少年肥胖体重管理

#### (一)背景

儿童期肥胖容易伴随焦虑、自卑等心理问题<sup>[69]</sup>,同时也是成人肥胖、糖尿病、心血管疾病及其他代谢性疾病和肿瘤的潜在危险因素<sup>[70]</sup>。医学营养治疗主要通过培养良好的生活习惯而达到控制体重的目的。

#### (二)证据

1. 母乳喂养与肥胖:一篇纳入 25 项研究的 Meta 分析<sup>[72]</sup>发现,相对于未母乳喂养过的新生儿,母乳喂养者发生儿童期肥胖的比率降低 22%,且母乳喂养时间与肥胖发生率有剂量-效应关系。这与配方喂养提供了较高的脂肪和蛋白质,以及缺乏母乳中含有较多的活性物质可能有关<sup>[72-73]</sup>。

2. 规律早餐与 BMI:横断面研究表明,不爱吃早餐的群体发生超重和肥胖的比例更大<sup>[74-75]</sup>。芬兰一项出生队列研究发现,相对于规律进食早餐的青少

年,很少吃早餐的群体更容易吸烟、喝酒、咖啡以及含有咖啡因的碳酸饮料,并且很少锻炼,BMI 值更高<sup>[76]</sup>。

3. 零食摄入与肥胖:一项队列研究表明,高能量零食的摄入频率及进食时间与青少年肥胖有紧密联系。每日 2 次以上零食的青少年其肥胖风险比(risk ratio, *RR*)高于很少吃零食的青少年;以在早晨吃高能量零食的青少年为对照组,夜间进食零食的受试者发生肥胖和超重的 *RR* 为 3.12<sup>[77]</sup>。一项长达 19 个月的队列研究表明,每天多喝 12 盎司(ounce, 1 盎司=28.4 ml, 12 盎司约合 340 ml)的含糖饮料,将会导致 BMI 升高 0.24 kg/m<sup>2</sup><sup>[78]</sup>。横断面研究发现,碳酸饮料与儿童期的肥胖有着密切关系,每周多摄入碳酸饮料 240 ml 的青少年发生肥胖的危险增加 29%<sup>[79]</sup>。

4. 碳水化合物与肥胖:一项队列研究表明,青少年女性膳食中血糖指数(glycemic-index)每升高 1 SD, BMI 和腰围分别增加 0.77 kg/m<sup>2</sup> 和 1.45 cm;而膳食纤维摄入量每增加 1 SD,会导致青少年女性 BMI 值降低 0.44 kg/m<sup>2</sup> 和青少年男性腰围降低 1.45 cm<sup>[80]</sup>。

5. 微量营养素摄入与肥胖:研究表明血清维生素 B<sub>12</sub> 和叶酸的浓度与青少年 BMI 值、躯干脂肪面积以及总脂肪面积呈负相关<sup>[81]</sup>。一项病例对照研究表明,肥胖儿童血清中维生素 B<sub>12</sub> 水平为 400 ng/L,明显低于正常体重的儿童血清中维生素 B<sub>12</sub> 的水平(530 ng/L);相对于正常体重儿童,在调整性别和年龄等混杂因素的影响后,肥胖儿童血清中维生素 B<sub>12</sub> 偏低的风险比(odds ratio, *OR*)高达 4.33<sup>[82]</sup>。也有研究发现,肥胖儿童血清中含有更低水平的 Zn、Se 和 Fe,但血清 Cu 的水平较高;血清 Zn 的水平和血清中总胆固醇水平有呈明显负相关,而与血清中 HDL-C 水平正相关<sup>[83]</sup>。维生素 D 的水平与儿童肥胖的负相关也得到了进一步的证实<sup>[84]</sup>。

### (三)推荐意见

具体推荐见表 9。

表 9 儿童/青少年肥胖体重管理推荐意见

| 推 荐                                                      | 证据级别 | 推荐意见 |
|----------------------------------------------------------|------|------|
| 1. 新生儿期应尽可能采用母乳喂养,并适当延长母乳喂养时间以减少儿童期肥胖发生风险                | 1    | A    |
| 2. 严格控制零食摄入,尤其是含糖类较高的零食以及碳酸饮料;应控制碳水化合物中高血糖指数食物的摄入        | 1    | A    |
| 3. 适量增加膳食纤维的摄入量                                          | 3    | C    |
| 4. 青少年肥胖与血 B 族维生素、维生素 D、Zn、Se 和 Fe 水平呈负相关,而与血清 Cu 水平呈正相关 | 2b   | B    |

## 二、围孕期体重管理

### (一)背景

大量研究显示,母体孕前及孕期的肥胖均与孕期合并症及不良妊娠结局相关,包括妊娠期糖尿病、妊娠高血压、子痫、早产、死胎、巨大儿、过期产、剖宫产、先天畸形等<sup>[85-90]</sup>;远期不良影响包括产后母体及子代肥胖<sup>[91-92]</sup>,增加母婴罹患 2 型糖尿病、高血压及其他代谢综合征的风险<sup>[93-94]</sup>。

### (二)证据

1. 肥胖与生育能力:一项前瞻性研究发现,超重女性生育能力下降 8%,肥胖者下降达 18%<sup>[95]</sup>。肥胖不仅影响自然受孕,同样影响辅助生殖的成功,增加自然流产及孕期并发症的风险<sup>[96-97]</sup>。应强调在辅助生殖实施前进行减重<sup>[98]</sup>。同时也有研究证实减重 5%~10%就可以成功减掉 30%的内脏脂肪<sup>[99]</sup>,更有利于排卵发生<sup>[100]</sup>。

2. 肥胖女性孕期体重:2009 年美国医学研究所推荐建议孕早期增重 0.5~2.0 kg,超重女性孕期增重 7.0~11.5 kg,肥胖女性孕期增重 5.0~9.0 kg<sup>[101]</sup>。相对于孕期增重超过 7.0 kg 的肥胖女性,孕期增重低于 7.0 kg 的肥胖女性发生子痫前期、剖宫产及巨大儿的几率明显降低<sup>[102]</sup>。美国一项涉及 113 019 例新生儿研究中,肥胖孕妇过低的体重增加加重孕妇早产的风险<sup>[103]</sup>。

3. 肥胖女性妊娠期体重管理:在一项 1 777 例妊娠妇女队列研究中,用替代健康饮食指数(the alternative healthy eating index, AHEI)进行膳食评价,发现肥胖孕妇 AHEI 分数更低<sup>[104]</sup>。另一项 2 247 例妊娠妇女队列研究也发现,高能量、低营养素含量的食物(如碳酸饮料、果汁饮料、精制面粉)也是过高能量摄入的主要贡献者,同时此类膳食富含饱和脂肪酸<sup>[105]</sup>。小样本研究显示:当肥胖合并妊娠期糖尿病的孕妇能量限制在 1 800 kcal 左右时,孕妇体重能够得到控制且不出现酮症,也能够改善孕妇血糖水平并对新生儿出生体重无不良影响<sup>[106]</sup>。建议根据肥胖孕妇的身高、体重、年龄、活动水平等因素制定个体化的膳食能量计划。相对于 BMI 正常的孕妇,肥胖孕妇的新生儿神经管畸形发病率更高<sup>[90]</sup>。

4. 超重/肥胖女性产后体重的恢复:相对于正常 BMI 的女性,孕期增重过多的肥胖女性产后可能储备更多的体重。哺乳期进行膳食及运动干预可以帮助其产后恢复到孕前体重,产后哺乳至少 6 个月后可以降低产后体重。有研究显示,产后哺乳更有利于体重恢复<sup>[107-108]</sup>。

## (三)推荐意见

具体推荐见表 10。

表 10 围孕期体重管理推荐意见

| 推 荐                                                            | 证据级别 | 推荐意见 |
|----------------------------------------------------------------|------|------|
| 1. 计划怀孕的肥胖女性应减重以提高自然受孕或辅助生殖的成功率,且可以减低不良妊娠结局                    | 1    | A    |
| 2. 孕前叶酸建议摄入量为 400 μg/d                                         | 2b   | B    |
| 3. 肥胖孕妇应依据身高、体重、年龄、活动水平等进行个体化的膳食能量计划,以使体重适度增长                  | 2b   | B    |
| 4. 建议孕早期增重 0.5~2.0 kg,超重女性孕期增重 7.0~11.5 kg,肥胖女性孕期增重 5.0~9.0 kg | 3    | C    |
| 5. 肥胖女性产后哺乳至少 6 个月有利于产后体重恢复                                    | 3    | C    |
| 6. 膳食及运动干预可以帮助孕妇产后恢复到孕前体重                                      | 4    | D    |

### 三、多囊卵巢综合征 (polycystic ovary syndrome, PCOS) 的体重管理

#### (一)背景

在我国 19~45 岁的女性中 PCOS 的发病率约为 5.6%<sup>[109]</sup>。不同国家的研究显示 PCOS 患者肥胖的发生率在 30%~70%<sup>[110-111]</sup>。系统性综述表明,与正常体重的 PCOS 女性相比,肥胖 PCOS 患者所有代谢和生殖的指标(除多毛症外),包括性激素结合球蛋白 (sex hormone-binding globulin) 下降,总睾酮、空腹血糖、空腹胰岛素增加和血脂升高<sup>[112]</sup>。

#### (二)证据

1. 生活方式干预与 PCOS: 临床研究显示, PCOS 患者对富含碳水化合物、高血糖指数食物以及高饱和脂肪的食物摄入均显著增加;同时具有总能量摄入过高以及久坐的特点<sup>[113]</sup>。一项系统性综述表明,对于 PCOS 患者,在减轻体重、改善胰岛素抵抗及高雄激素血症等方面,生活方式干预(饮食、运动和/或行为干预)比药物治疗更有效<sup>[114]</sup>。研究表明,超重或肥胖的 PCOS 患者轻度体重减轻(减少 5%~10%)即可使血清睾酮浓度下降,也可恢复正常的排卵周期,并提高妊娠成功率<sup>[115-116]</sup>。因此,对于超重和肥胖的 PCOS 患者,建议首先进行生活方式干预(饮食和运动)以减轻体重。

2. 饮食干预与 PCOS: (1)限制总能量摄入: 超重和肥胖的 PCOS 患者在减重时应以 CRD 为首选治疗。随机对照试验表明,CRD 可改善肥胖 PCOS 女性的代谢及激素水平,每日饮食总能量中减少 500~1 000 kcal,即在 6~12 个月减少 7%~10%的原体重<sup>[117-118]</sup>。(2)宏量营养素和血糖指数的选择: 国内外研究显示,在限制总能量的基础上,高蛋白/低碳

水化合物饮食(蛋白质 30%、碳水化合物 40%、脂肪 30%, MHCD)和低蛋白/高碳水化合物饮食(蛋白质 15%、碳水化合物 55%、脂肪 30%, CHCD)相比,均可降低体重和雄激素水平, MHCD 明显增加胰岛素敏感性、减轻高胰岛素血症继而减轻胰岛素抵抗;低血糖指数饮食亦可通过降低 PCOS 患者(无论是否肥胖)胰岛素、睾酮水平,改善多毛和痤疮<sup>[119-121]</sup>。因此,在限制总能量基础上,无论宏量营养素如何配比,均可实现体重减轻及改善临床结局的目的。

在限制总能量、减轻体重的前提下,宏量营养素比例和质量选择对 PCOS 患者的生育、代谢、心理的影响存在着细微差别。低碳水化合物或低血糖指数饮食可更明显降低胰岛素抵抗、纤维蛋白原、总胆固醇和高密度脂蛋白胆固醇,低血糖指数饮食明显改善月经周期和生活质量,高蛋白膳食可明显改善抑郁和增强自尊;反之,高碳水化合物饮食明显增加游离睾酮指数<sup>[122]</sup>。有研究显示,肥胖 PCOS 患者使用限能量代餐可降低患者 BMI,改善代谢及激素指标,增加受孕几率<sup>[117,123]</sup>。

3. 综合管理: 超重/肥胖 PCOS 的综合管理应包括持续的社会、家庭支持和教育,个体化方案、密切随访、医师监督以及医师、家庭、配偶和同事的支持都会促进体重达标与维持<sup>[118,124]</sup>。PCOS 患者记录饮食运动日记有利于长期坚持,以减轻体重并维持长期疗效<sup>[125]</sup>。强化运动管理可降低并维持体重、改善心血管危险因素<sup>[126]</sup>,且可改善排卵及胰岛素敏感性<sup>[127]</sup>。国内研究显示,超重及肥胖的 PCOS 患者采用饮食联合运动治疗,可改善其内分泌激素及糖脂代谢紊乱<sup>[128]</sup>。

#### (三)推荐意见

PCOS 体重管理推荐见表 11。

### 四、超重/肥胖者合并代谢综合征的体重管理

#### (一)背景

代谢综合征是以超重/肥胖为中心并伴有一系列代谢紊乱的病症。随着社会生活水平的提高,以及国人膳食模式的变化,代谢综合征的流行呈现快速上升趋势,2000 年至 2001 年的全国性横断面调查显示,男性和女性代谢综合征的患病率分别为 10.0% 和 23.3%<sup>[129]</sup>。2011 年美国 Joslin 糖尿病中心发布了合并糖尿病的肥胖患者临床营养指南,整部指南的目标人群实际是代谢综合征患者,其将体重管理置于营养管理的首要目标<sup>[3]</sup>。与此同时,该指南还提出将膳食管理与胰岛素治疗相配合,同时需要考虑与营养有关的代谢并发症的控制。

表 11 多囊卵巢综合征(PCOS)体重管理推荐意见

| 推 荐                                                       | 证据级别 | 推荐意见 |
|-----------------------------------------------------------|------|------|
| 1. 超重/肥胖的 PCOS 患者减轻体重,可改善其生殖功能和代谢紊乱。对于有妊娠要求者,首先推荐其减轻体重    | 2a   | B    |
| 2. 在减重时应以限制能量饮食为首选方案                                      | 2b   | B    |
| 3. 限能量摄入基础上的高蛋白/低碳水化合物饮食和低蛋白/高碳水化合物饮食均能获得代谢改善,前者可增加胰岛素敏感性 | 2a   | B    |
| 4. 个体化方案、密切随访、医师监督以及社会支持都能促进体重达标与维持                       | 4    | D    |

## (二)证据

对于合并代谢综合征的肥胖患者,临床证据中较为一致的将生活行为方式干预作为减重和改善代谢紊乱的基础治疗措施。同时,对于各种膳食模式的比较发现,在控制总能量摄入的前提下,它们的总体效果相似。需要指出的是,目前的研究样本量均不大,且干预时间较短(12~24周)<sup>[130-136]</sup>,尚欠缺长时间干预的研究证据。2015年,澳大利亚启动了一项针对中老年(50~69岁)MS患者的大样本(500例)减重干预研究,旨在检验综合性行为、营养和心理干预的影响,或将在未来几年得出一些有指导意义的结论<sup>[137]</sup>。

## (三)推荐意见

具体推荐见表 12。

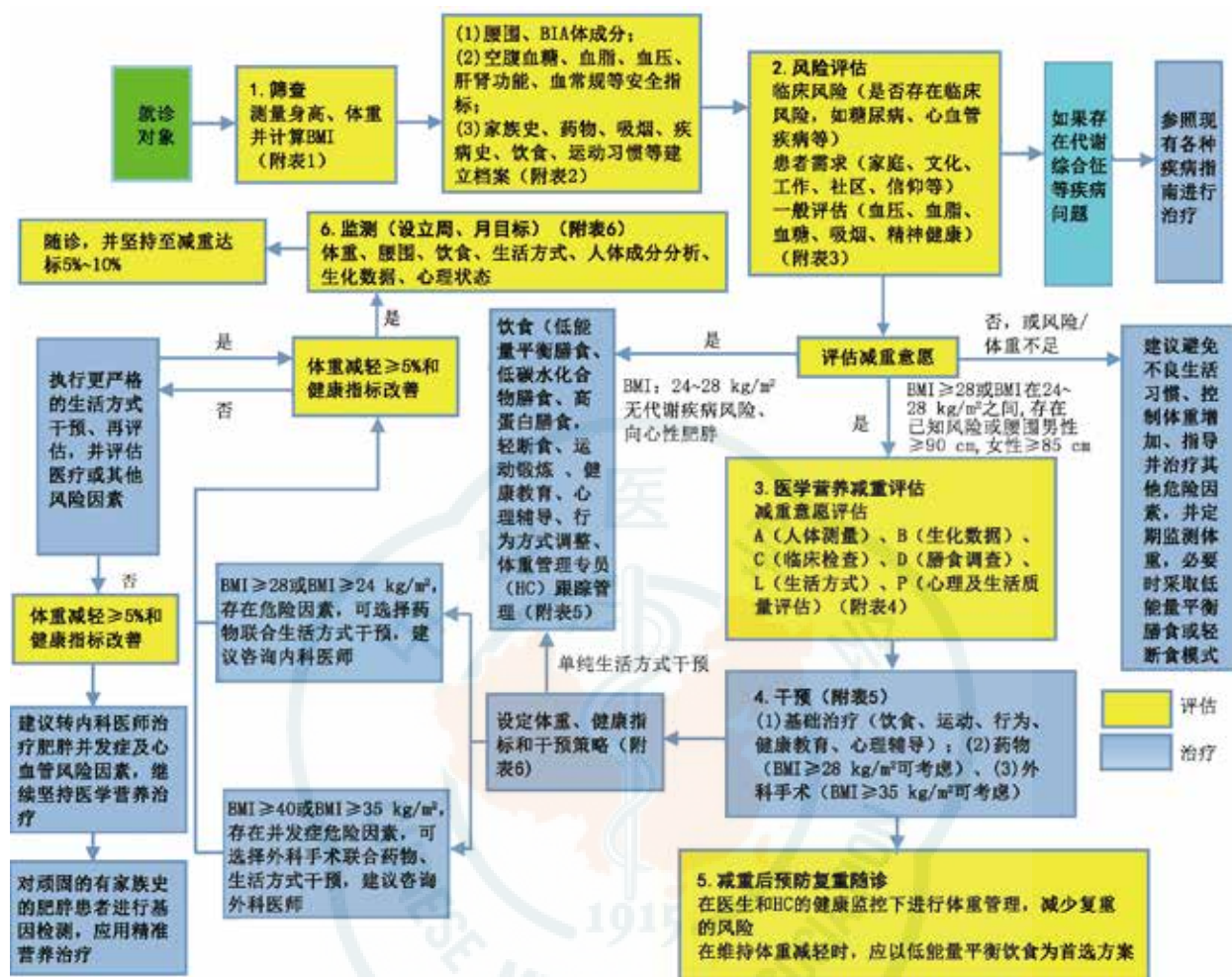
表 12 超重/肥胖者合并代谢综合征的体重管理

| 推 荐                                                             | 证据级别 | 推荐意见 |
|-----------------------------------------------------------------|------|------|
| 1. 生活方式干预是代谢综合征患者减重的基础治疗,干预内容应包括:加强体育锻炼、强化营养咨询、行为教育、心理疏导与小组支持   | 2b   | B    |
| 2. 有效实现生活方式干预应该建立包括医师、营养师、心理咨询师、健身教练等在内的多学科干预指导小组               | 4    | D    |
| 3. 控制总能量摄入条件下,各种旨在减重的干预性膳食模式均可能有效,目前证据尚不支持哪一种膳食模式对于代谢综合征的改善特别有效 | 3    | C    |
| 4. 在控制总能量前提下,在膳食中添加核桃、亚麻籽或鳄梨可能有助于代谢改善                           | 3    | C    |

**本共识制定委员会成员名单(按姓氏拼音排序):**常翠青(北京大学第三医院运动医学研究所)、陈洁文(上海交通大学医学院附属第九人民医院营养科)、陈伟(中国医学科学院北京协和医院肠外肠内营养科)、陈怡(成都军区总医院营养科)、窦攀(北京大学第一医院营养科)、冯颖(复旦大学附属华山医院营养科)、葛声(上海交通大学附属第六人民医院临床营养科)、顾萍(青岛市中心医院营养科)、韩磊

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注: BMI: 体质指数; BIA: 生物电阻测量法; HC: 体重管理专员

附图1 超重/肥胖者医学减重流程

附表1~6 超重/肥胖医学营养减重流程对应表格

附表1 BMI(kg/m<sup>2</sup>)的分级

正常: 18.5~23.9, 超重 24.0~27.9, 肥胖 $\geq 28$

附表2 测量危险因素

腰围、血压、血脂、空腹血糖、胰岛素、肝、肾功能、家族史、用药史、人体成分分析、体力活动情况(轻、中、重)

附表3 风险因素评估

BMI $\geq 24$ +腰围男性 $\geq 90$  cm或女性 $\geq 85$  cm以下任何危险因素(高血压、高血糖、高血脂、睡眠呼吸暂停综合征), 或BIA结果显示肥胖(体脂 $> 25\%$ 男性; $> 30\%$ 女性)

附表4 医学营养减重评估

就诊时身高、体重、腰围、BIA体成分、24 h饮食回顾(食物频度表)、生活方式调查表(运动习惯)、心理测量表、血压、血糖、血脂谱、胰岛素、C肽、C反应蛋白等

附表5 减重方式选择

减肥阶梯治疗图(附图2)、饮食方法[限能量平衡(代餐)膳食、高蛋白膳食、轻断食治疗]

附表6 减重目标: 按减现体重5%、10%、15%划分, 减肥周期为3~6个月

初级目标: 体重下降 $\geq 5\%$

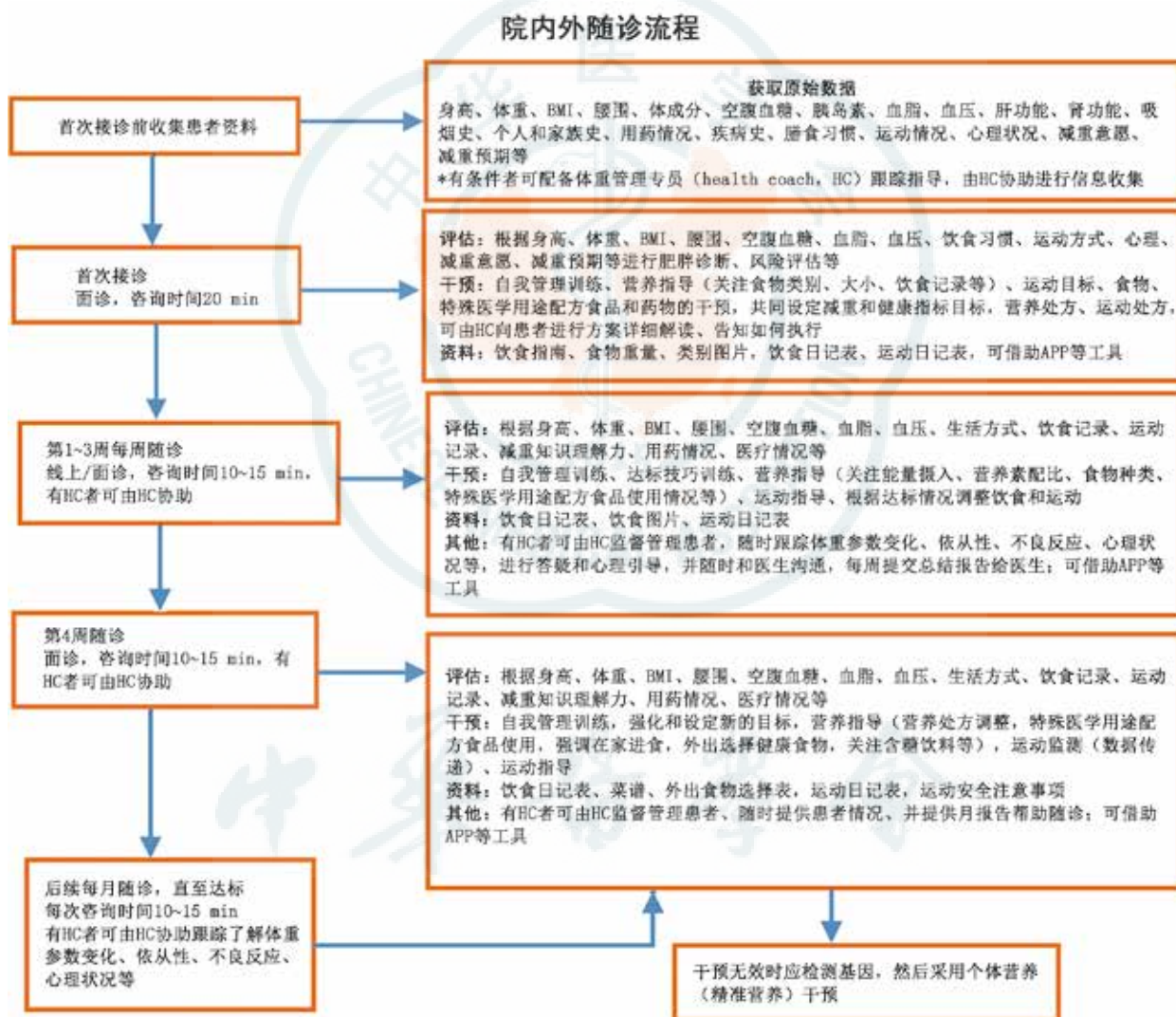
中级目标: 体重下降 $\geq 10\%$

高级目标: 体重下降 $\geq 15\%$



注: BMI: 体质指数; HC: 体重管理专员

附图2 肥胖/超重者医学营养治疗的阶梯疗法



注: BMI: 体质指数; HC: 体重管理专员; APP: 应用程序

附图3 超重/肥胖者院内外随诊流程

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·读者·作者·编者·

## 欢迎国内外广大糖尿病相关医务工作者踊跃向本刊投稿

《中华糖尿病杂志》(ISSN 1674-5809, CN 11-5791/R)由中华医学会主办并编辑出版,是中国科技论文统计源期刊、中国科学引文数据库(CSCD)来源期刊。月刊,每期64面,国内外公开发行。20元/期,全年共240元。主要栏目包括:述评、专题笔谈、专家共识、论著、短篇论著、指南解读、综述、病例报告,现向广大医务工作者及科研人员征集文稿,内容涉及:糖尿病人群流行病学调查及危险因素评估,糖尿病新型诊断技术和综合治疗的新理论、新策略与预防措施,糖尿病急、慢性并发症及重症监护,糖尿病发病机制的病理生理及免疫学、分子遗传学研究,患者教育与护理,社区管理和卫生经济学分析,糖尿病与其他疾病的关系等。

投稿要求:(1)文稿应具有先进性、科学性、实用性。资料真实,数据准确,论点鲜明,结构严谨,文字精炼,书写规范。论著一般不超过8000字(包括摘要、图表及参考文献);其他文稿视具体情况而定。(2)来稿需经作者单位审核,并附单位推荐信。推荐信应注明对稿件的审评意见以及无一稿两投、不涉及保密、署名无争议等,并加盖公章。如涉及保密问题,需附有关部门审查同意发表的证明。(3)稿件须包含:题名、作者姓名、作者单位、第一作者简介、基金资助详情、通信作者地址、Email、电话及传真、投稿日期;论著应含中、英文摘要。(4)本刊需电子版投稿,请通过<http://zhtnbzz.yiigle.com>进行网上投稿,点击首页上方“投稿”后,先注册,然后进入期刊编审系统。该远程投稿系统可供作者随时查阅稿件状态。(5)投稿时无需交纳审稿费。

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## 限能量膳食营养干预规范

Nutritional intervention specification of calorie-restricted diet

2022-12-30发布

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中国营养学会 发布

## 前 言

本文件按照 GB/T1.1—2020《标准化工作导则 第1部分：标准化文件的结构和起草规则》的规定起草。

请注意本文件的某些内容可能涉及专利。本文件的发布机构不承担识别专利的责任。

本文件由中国营养学会提出并归口。

本文件主要起草单位：中营惠营养健康研究院、解放军总医院第一医学中心、中国疾病预防控制中心营养与健康所、浙江大学医学院附属第二医院、北京协和医院、北京大学第三医院、河北医科大学第一医院、清华大学附属北京清华长庚医院、北京医院、华中科技大学同济医学院附属同济医院、武汉大学、康宝莱（上海）生物科技有限公司、湖北良品控多卡食品有限公司、青岛纽特舒玛健康科技有限公司、浙江诺特健康科技股份有限公司、广东壹健康产业集团股份有限公司。

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# 限能量膳食营养干预规范

## 1 范围

本文件规定了需要减重或控制体重的成年人群不同程度限制能量的膳食营养干预技术要求，包括干预流程、膳食模式适用人群、食谱制定、烹饪要求、随访等相关要求。

本文件适用于为减重或控制体重的成年人提供餐食或减重指导的机构或单位，也适用于需要减重或控制体重的成年人群日常膳食搭配。

## 2 规范性引用文件

下列文件中的内容通过文中的规范性引用而构成本文件必不可少的条款。其中，注日期的引用文件，仅注日期的版本适用于本文件。不注日期的引用文件，其最新版本（包括所有的修改单）适用于本文件。

WS/T 578.2 中国居民膳食营养素参考摄入量 第 2 部分：常量元素

WS/T 578.3 中国居民膳食营养素参考摄入量 第 3 部分：微量元素

WS/T 578.4 中国居民膳食营养素参考摄入量 第 4 部分：脂溶性维生素

WS/T 578.5 中国居民膳食营养素参考摄入量 第 5 部分：水溶性维生素

## 3 术语和定义

下列术语和定义适用于本文件。

### 3.1

**平衡膳食** balanced diet

在一段时间内，膳食组成中的食物种类和比例可以最大限度地满足不同年龄、不同能量水平的健康人群的营养和健康需求的膳食模式。

### 3.2

**限能量平衡膳食** calorie-restricted balanced diet;

在满足维生素、矿物质、膳食纤维、水的基础上，限制能量摄入的同时日总能量不低于4200kJ（1000kcal）的膳食模式。其宏量营养素的供能比例符合平衡膳食的要求。

### 3.3

**限能量高蛋白膳食** calorie-restricted high protein diet

在满足维生素、矿物质、膳食纤维、水的基础上，限制能量摄入的同时日总能量不低于4200kJ（1000kcal），适当提高蛋白质摄入量（占总能量的20%~30%）的膳食模式。

### 3.4

**限能量低脂膳食** calorie-restricted low fat diet

在满足维生素、矿物质、膳食纤维、水的基础上，限制能量摄入的同时日总能量不低于4200kJ（1000kcal），适当减少脂肪摄入量（占总能量的10%~20%）的膳食模式。

## 3.5

**低能量膳食** low calorie diet

在满足蛋白质、必需脂肪酸、维生素、矿物质、膳食纤维和水的基础上，将全天总能量控制在3360kJ~4200kJ（800kcal~1000kcal），适量减少脂肪和碳水化合物摄取的膳食模式。

注：在专业营养师（临床营养）或医师指导下使用。

## 3.6

**极低能量膳食** very-low calorie diet

全天总能量低于3360kJ（800kcal）的一种膳食模式。

注：在专业医疗机构由专业营养师（临床营养）或医师指导下使用。

## 3.7

**血糖生成指数** glycemic index; GI

进食含50g碳水化合物的食物后，2h内血糖曲线下面积相比空腹时的增幅除以进食50g葡萄糖后的相应增幅，乘以100。公式表示如下：

$$GI = \frac{\text{含有50g可利用碳水化合物的食物的餐后血糖应答}}{\text{50g葡萄糖的餐后血糖应答}} \times 100$$

注：通常定义GI≤55为低GI食物，55<GI≤70为中GI食物，GI>70为高GI食物。

## 3.8

**带量食谱** quantified recipe

以餐次为单位提供的含有食物名称、原料种类及数量等的一组食物搭配组合的食谱。

注：可以是一餐、一天或一周等不同的组合。

## 3.9

**体质指数** body mass index; BMI

一种计算身高别体重的指标，计算方法是体重（kg）与身高（m）的平方的比值。

## 3.10

**体脂率** body fat rate

人体内脂肪重量在人体总体重中所占的比例，又称体脂百分数。

注：反映人体内脂肪含量的多少。体脂率=（身体脂肪总重量÷体重）×100%。

## 3.11

**理想体重** ideal body weight; IBW

不同身高的人的最佳体重。

注：成年人的理想体重（kg）常用计算方法为身高（cm）—105。

**4 营养干预总则**

4.1 营养干预应包括评估、膳食模式及目标能量的确定、食谱制定、随访等规范流程。

4.2 评估过程应先进行病史询问和膳食调查，有条件的进行人体测量及/或体成分分析。

4.3 膳食模式及目标能量的确定应根据调查及检查结果，结合患者减重或控制体重意愿。

4.4 流程图见附录 A 图1。

**5 干预流程主要内容****5.1 评估****5.1.1 病史及膳食调查**

应详细询问超重或肥胖史，以及超重或肥胖相关疾病史和特殊用药史；调查膳食摄入情况、膳食结构及饮食行为习惯；了解减重或控制体重目的、意愿等。

### 5.1.2 人体测量及实验室检验

应测量身高、体重、腰围、臀围，有条件的进行体成分分析（体脂率、体脂肪量、内脏脂肪、肌肉量等）及/或实验室检查（血压、血糖、血脂、肝功能、肾功能等）。

符合以下任意一项标准的人，可被纳为减重或控制体重营养干预对象：

- （1）应根据 BMI 对成人超重或肥胖进行判定，当 $24.0\text{kg/m}^2 \leq \text{BMI} < 28.0\text{kg/m}^2$ 时判定为超重， $\text{BMI} \geq 28.0\text{kg/m}^2$ 时判定为肥胖。
- （2）根据腰围判定，男性腰围 $\geq 90\text{cm}$ ，女性腰围 $\geq 85\text{cm}$ 时判定为成人中心型肥胖； $85\text{cm} \leq$ 男性腰围 $< 90\text{cm}$ 时， $80\text{cm} \leq$ 女性腰围 $< 85\text{cm}$ 时判定为成人中心型肥胖前期。
- （3）根据人体成分检测结果判定，男性体脂率 $\geq 20\%$ 时，女性体脂率 $\geq 30\%$ 时可判定为肥胖。
- （4）根据人体成分检测结果提示内脏脂肪面积 $> 100\text{cm}^2$ 可判定为内脏型肥胖。

### 5.2 膳食模式适用人群

- 5.2.1 限能量平衡膳食适用于所有超重或肥胖人群。
- 5.2.2 限能量高蛋白膳食适用于可接受高蛋白质摄入且肝肾功能正常者，具有强烈减重愿望的成年超重/肥胖人群；尤其适用于肝肾功能正常而血糖和（或）血脂异常的成年超重/肥胖人群。对中心型肥胖及内脏型肥胖而肝肾功能正常的人群同样适用。
- 5.2.3 限能量低脂膳食适用于不接受或不适合高蛋白膳食或血脂严重异常的具有需要强烈减重愿望的成年超重/肥胖人群。
- 5.2.4 低能量膳食适用于肝肾功能正常需要短期快速减重的成年超重/肥胖人群；不适合长期应用；需在专业营养师（临床营养）或医师指导下进行。
- 5.2.5 极低能量膳食适用于反复减重无效、肝肾功能正常、需要短期快速减重的成年超重/肥胖人群；不适合长期应用；需在专业医疗机构由专业营养师（临床营养）或医师指导下进行。

### 5.3 推荐的能量摄入量

5.3.1 目标能量的估算：如果有间接能量测定仪，可以使用间接能量测定仪检测患者的静息代谢率，而后根据活动量来估算每日目标能量需求。低身体活动系数推荐为1.2，中/高身体活动系数推荐为1.3。如果没有间接能量测定仪，可采用估算法，一般用理想体重乘以能量系数，不同活动量的能量系数见表1。

表1 不能活动量的能量系数

| 活动量   | 能量系数                                                                                |
|-------|-------------------------------------------------------------------------------------|
| 卧床    | $63\text{kJ/kg} \sim 84\text{kJ/kg}$ ( $15\text{kcal/kg} \sim 20\text{kcal/kg}$ )   |
| 低身体活动 | $84\text{kJ/kg} \sim 105\text{kJ/kg}$ ( $20\text{kcal/kg} \sim 25\text{kcal/kg}$ )  |
| 中身体活动 | $105\text{kJ/kg} \sim 126\text{kJ/kg}$ ( $25\text{kcal/kg} \sim 30\text{kcal/kg}$ ) |
| 高身体活动 | $126\text{kJ/kg} \sim 147\text{kJ/kg}$ ( $30\text{kcal/kg} \sim 35\text{kcal/kg}$ ) |

5.3.2 限能量平衡膳食、限能量高蛋白膳食及限能量低脂膳食每天总能量可以在目标能量基础上减少30%~50%或在目标能量基础上减少2100kJ~4200kJ（500kcal~1000kcal），或总能量限制在男性5040kJ~5880kJ（1200kcal~1400kcal），女性4200kJ~5040kJ（1000kcal~1200kcal），见表2。无论男性女性，全天总能量摄入不得低于4200kJ（1000kcal）。

表2 全天总能量计算

|      |                                                                              |
|------|------------------------------------------------------------------------------|
| 方法 1 | 目标能量×(1-30%~50%)                                                             |
| 方法 2 | 目标能量-2100kJ~4200kJ (500kcal~1000kcal)                                        |
| 方法 3 | 男性 5040kJ~5880kJ (1200kcal~1400kcal)<br>女性 4200kJ~5040kJ (1000kcal~1200kcal) |

- 5.3.3 低能量膳食每天总能量应限制在3340~4200kJ (800~1000kcal)。
- 5.3.4 极低能量膳食每天总能量应低于3340kJ (800kcal)。通常每天总能量应限制在1890~3340kJ (450~800kcal)。
- 5.4 推荐的营养素摄入量

各膳食模式推荐的营养素摄入量见表3。

表3 各膳食模式推荐的每日营养素摄入量

| 膳食模式                      |     | 限能量平衡膳食                                                                     | 限能量高蛋白膳食 | 限能量低脂膳食 | 低能量膳食   | 极低能量膳食   |
|---------------------------|-----|-----------------------------------------------------------------------------|----------|---------|---------|----------|
| 蛋白质                       | 供能比 | 15%~20%                                                                     | 20%~30%  | 15%~20% | 30%~40% | 35%~50%  |
|                           | 摄入量 | ≥1g/kg                                                                      | ≥1.5g/kg | ≥1g/kg  | ≥1g/kg  | ≥50g     |
| 脂肪供能比                     |     | 20%~30%                                                                     | 20%~30%  | 10%~20% | 10%~20% | 10%~20%  |
| 碳水化合物供能比                  |     | 50%~65%                                                                     | 40%~60%  | 60%~75% | 40%~60% | 20%~55%* |
| 膳食纤维                      |     | 25g~30g                                                                     |          |         |         |          |
| 水                         |     | ≥2000mL                                                                     |          |         |         |          |
| 维生素和矿物质                   |     | 需在一段时间内（2 周）每人每天维生素及矿物质的平均供给量符合WS/T 578. 2、WS/T578. 3、WS/T578. 4、WS/T578. 5 |          |         |         |          |
| *极低能量膳食碳水化合物摄入量不低于 50g/d。 |     |                                                                             |          |         |         |          |

## 6 食谱制定

### 6.1 食物种类及食物量要求

限能量平衡膳食、限能量高蛋白膳食、限能量低脂膳食及低能量膳食每日食物应摄入12种以上,且每周25种以上,包括谷薯类、低脂肉类(鱼虾贝、禽类瘦肉、畜类瘦肉)、蛋类、奶类、豆制品类、蔬菜类、水果类、坚果类等多类食物,推荐的同类食物之间可以进行互换,见表4。不同能量水平全天各类食物供给量的建议见附录B表B.1~表B.3。

### 6.2 三餐搭配

早餐、午餐、晚餐的能量及营养素应分别占全天总量的25%~30%、30%~40%、30%~35%。每餐需要包括谷薯类、蔬菜类和水果类、鱼禽肉蛋类、奶类、豆制品类及坚果类等4类食物中的3类以上的食物,每天及每周的食物种类标准见表4。

表4 每天及每周建议的食物的种类数

| 食物类别                     | 平均每天种数 | 每周至少种数 |
|--------------------------|--------|--------|
| 谷薯类                      | 3      | 5      |
| 蔬菜类和水果类                  | 4      | 10     |
| 低脂肉类(鱼虾水产肉、禽类瘦肉、畜类瘦肉)及蛋类 | 3      | 5      |
| 奶类、豆制品类及坚果类              | 2      | 5      |
| 合计                       | 12     | 25     |

### 6.3 优选主副食

主食应粗细搭配，可适当选用全谷物和杂粮，应用低 GI 的薯类如山药、芋头、紫薯等替代部分主食；蔬菜以叶菜及深绿色蔬菜为主，如油菜、西兰花等，可适量提供菌藻类；肉类以鱼肉、虾肉、去皮的禽肉为主，适当增加富含 n-3 多不饱和脂肪酸的深海鱼，推荐每周至少 2 次深海鱼的摄入；奶类以低脂或脱脂奶为宜；水果以低 GI 的为主（如苹果、桃、梨、柚子、李子、樱桃等）；限制含糖饮料（如可乐、果汁等）和高糖食品（如糖果、巧克力、蜜饯等），并注意烹调时尽量少添加糖。食物品种选择上提倡按时令及当地常见食物为主。

### 6.4 带量食谱的编制

确定全天的能量摄入水平后，参考附录 B 及附录 C 制定相应的带量食谱。

若减重对象由于食物不耐受或饮食习惯的原因不能按照推荐的食物品种摄入或需要推荐低能量膳食模式，为确保减重效果及有效防止并发症或营养不良的发生，可在专业营养师（临床营养）或医师指导下选择代餐食品、营养素补充剂等。

## 7 烹饪要求

7.1 烹调用盐全天不应超过 5g，注意减少酱油、酱类、鸡精、味精及咸菜的摄入。

7.2 烹调用油应选择植物油，优先选择富含单不饱和脂肪酸的橄榄油、茶籽油以及含多不饱和脂肪酸的大豆油、亚麻籽油、菜籽油、花生油等。不宜选用动物油、椰子油、棕榈油。推荐交替使用不同种类的植物油，每天摄入的烹调用油量按不同模式的膳食脂肪搭配比例计算，原则上不宜超过 25mL。

7.3 烹调方法应多采用蒸、煮、烩、炖、拌、氽、焯等，避免或少用油炸、油煎以及糖炒等，炒肉丝、肉片均水焯后用少量烹调用油翻炒。建议每周炒菜频次不宜超过 7 次。

7.4 烹调用香料改善色、香、味时，可添加天然香料，如八角、花椒、香叶、紫苏、薄荷、柠檬等。

## 8 减重随访及注意事项

### 8.1 评估随访

减重或控制体重期间每 2 周应进行体重评估，每月应进行代谢指标评估及体成分测定，根据结果随时调整。至少坚持 3~6 个月，最终实现减重或控制体重目标。

### 8.2 预防缺乏

每 2 周开展膳食调查，评估营养素摄入情况，必要时可补充营养补充剂或代餐食品等，防止并发症或营养不良的发生。

8.3 低能量膳食需在医师或专业营养师（临床营养）指导下实施。低能量膳食连续使用不宜超过 1 个月，可与限能量平衡膳食、限能量高蛋白膳食或限能量低脂膳食交替使用。

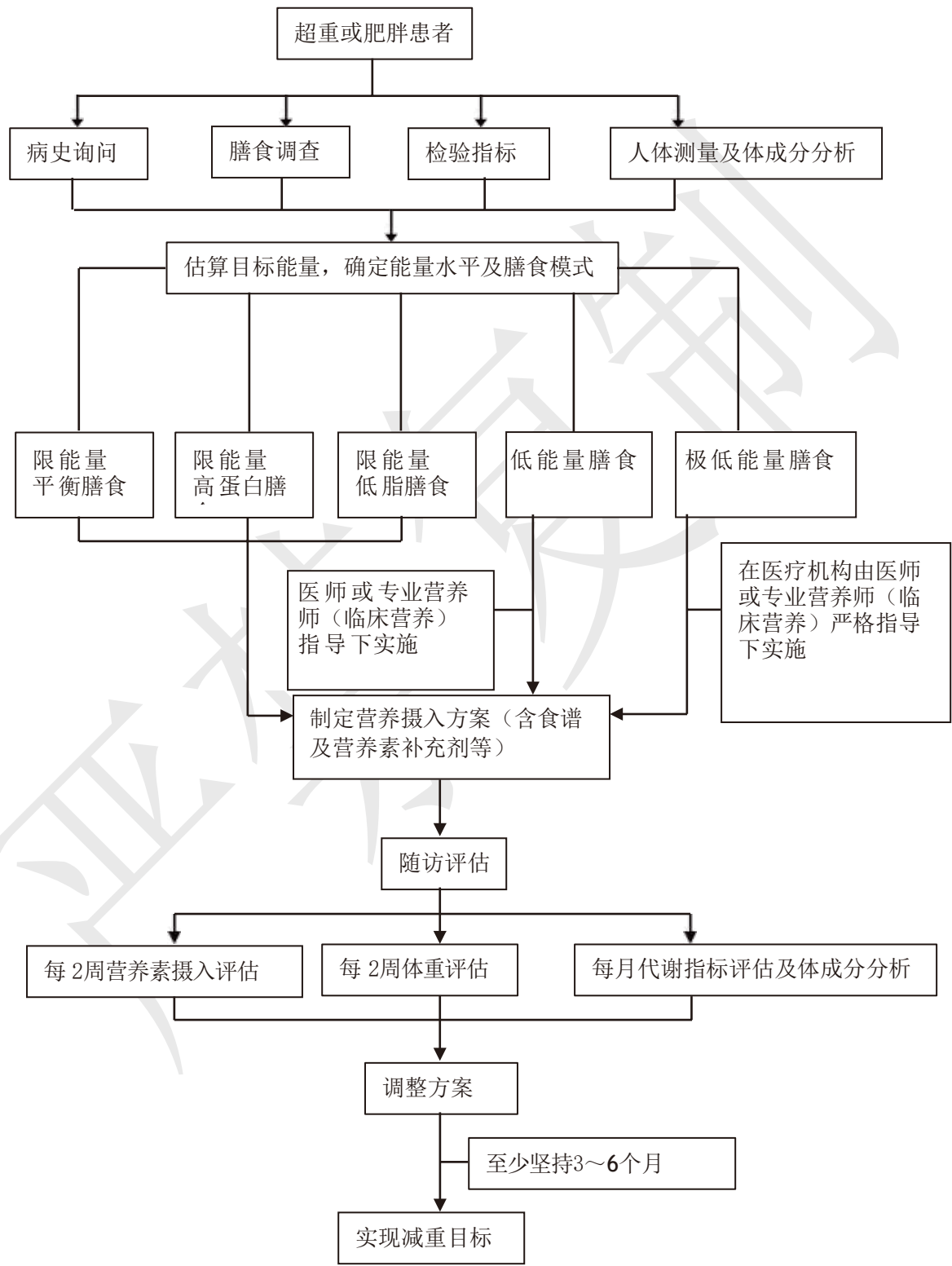
8.4 极低能量膳食需在专业医疗机构由医师或专业营养师（临床营养）严格指导下进行，预防并发症的发生。极低能量膳食连续使用不宜超过 2 周，可与限能量平衡膳食、限能量高蛋白膳食或限能量低脂膳食交替使用。

8.5 体重低于理想体重的 10% 时，不宜进一步减重。

8.6 减重或控制体重期间如出现代谢指标异常波动，应及时就医。

附录 A  
资料性附录

图 A.1 给出了限能量膳食营养干预流程。



图A.1 限能量膳食营养干预流程

附录 B  
资料性附录

表 B. 1给出了限能量平衡膳食、低能量膳食及极低能量膳食不同能量水平每日摄入食物种类和数量举例。表 B. 2给出了限能量高蛋白膳食不同能量水平每日摄入食物种类和数量举例。表 B. 3给出了限能量低脂膳食不同能量水平每日摄入食物种类和数量举例。

表 B. 1 限能量平衡膳食、低能量膳食及极低能量膳食不同能量水平每日摄入食物种类和数量举例

| 能量<br><br>kJ (kcal)                                                     | 食物种类和质量<br>g <sup>a</sup> |     |       |      |      |    |     |     |       |                  |     |     |     |     |    | 宏量营养素含量 <sup>b</sup> 及产热百分比 |             |                |
|-------------------------------------------------------------------------|---------------------------|-----|-------|------|------|----|-----|-----|-------|------------------|-----|-----|-----|-----|----|-----------------------------|-------------|----------------|
|                                                                         | 谷薯类                       |     | 低脂肉类  |      |      | 蛋类 |     | 奶类  |       | 豆制品 <sup>c</sup> | 蔬菜类 | 水果类 | 坚果类 | 植物油 | 盐  | 蛋白质<br><br>g                | 脂肪<br><br>g | 碳水化合物<br><br>g |
|                                                                         | 谷类                        | 薯芋类 | 鱼虾水产肉 | 禽类瘦肉 | 畜类瘦肉 | 全蛋 | 蛋清  | 全脂奶 | 低脂脱脂奶 |                  |     |     |     |     |    |                             |             |                |
| 7980 (1900)                                                             | 200                       | 200 | 75    | 50   | 50   | 50 | 0   | 250 | 0     | 25               | 600 | 200 | 15  | 25  | <5 | 90.9 (19%)                  | 56.6 (27%)  | 247.3 (54%)    |
| 7140 (1700)                                                             | 175                       | 175 | 50    | 50   | 50   | 50 | 0   | 250 | 0     | 25               | 500 | 200 | 15  | 20  | <5 | 82.7 (19%)                  | 50.8 (27%)  | 220.3 (54%)    |
| 6300 (1500)                                                             | 150                       | 150 | 50    | 25   | 25   | 50 | 0   | 250 | 0     | 25               | 500 | 200 | 15  | 15  | <5 | 70.4 (19%)                  | 43.8 (26%)  | 196.7 (55%)    |
| 5460 (1300)                                                             | 125                       | 125 | 25    | 25   | 25   | 50 | 0   | 250 | 0     | 25               | 500 | 200 | 10  | 12  | <5 | 61.8 (19%)                  | 37.6 (26%)  | 172.5 (55%)    |
| 4620 (1100)                                                             | 100                       | 125 | 25    | 15   | 15   | 50 | 0   | 250 | 0     | 25               | 500 | 200 | 5   | 5   | <5 | 54.3 (20%)                  | 27.7 (23%)  | 153.5 (57%)    |
| 3780 (900)                                                              | 75                        | 50  | 50    | 50   | 50   | 50 | 30  | 0   | 250   | 15               | 500 | 200 | 5   | 2   | <5 | 68.5 (30%)                  | 17.7 (18%)  | 118.0 (52%)    |
| 2940 (700)                                                              | 35                        | 50  | 50    | 50   | 50   | 50 | 50  | 0   | 250   | 10               | 500 | 200 | 0   | 2   | <5 | 63.0 (36%)                  | 12.6 (16%)  | 82.2 (48%)     |
| 2100 (500)                                                              | 0                         | 50  | 50    | 0    | 0    | 50 | 200 | 0   | 250   | 0                | 400 | 200 | 0   | 0   | <5 | 53.1 (42%)                  | 6.6 (12%)   | 57.1 (46%)     |
| =食物重量均指食材生重。                                                            |                           |     |       |      |      |    |     |     |       |                  |     |     |     |     |    |                             |             |                |
| <sup>b</sup> 宏量营养素含量按同类食物的平均值估算。                                        |                           |     |       |      |      |    |     |     |       |                  |     |     |     |     |    |                             |             |                |
| <sup>c</sup> 以大豆计, 25g豆制品=20g, 腐竹=50g, 豆腐干=100g, 北豆腐=150g, 南豆腐=400mL豆浆。 |                           |     |       |      |      |    |     |     |       |                  |     |     |     |     |    |                             |             |                |

表 B.2 限能量高蛋白膳食不同能量水平每日摄入食物种类和数量举例

| 能量<br><br>kJ<br><br>(kcal) | 食物种类和质量<br>g |     |       |      |      |    |    |     |       |     |     |     |    |     |    | 宏量营养素含量及产热百分比 |             |                |
|----------------------------|--------------|-----|-------|------|------|----|----|-----|-------|-----|-----|-----|----|-----|----|---------------|-------------|----------------|
|                            | 谷薯类          |     | 低脂肉类  |      |      | 蛋类 |    | 奶类  |       | 豆制品 | 蔬菜  | 水果  | 坚果 | 植物油 | 盐  | 蛋白质<br><br>g  | 脂肪<br><br>g | 碳水化合物<br><br>g |
|                            | 谷类           | 薯芋类 | 鱼虾水产肉 | 禽类瘦肉 | 畜类瘦肉 | 全蛋 | 蛋清 | 全脂奶 | 低脂脱脂奶 |     |     |     |    |     |    |               |             |                |
| 7980 (1900)                | 200          | 100 | 200   | 75   | 50   | 50 | 0  | 250 | 0     | 25  | 500 | 200 | 10 | 20  | <5 | 113.3 (24%)   | 53.4 (26%)  | 232.9 (50%)    |
| 7140 (1700)                | 175          | 80  | 175   | 50   | 50   | 50 | 0  | 250 | 0     | 25  | 500 | 200 | 10 | 20  | <5 | 101.4 (24%)   | 51.2 (28%)  | 199.8 (48%)    |
| 6300 (1500)                | 150          | 75  | 125   | 50   | 50   | 50 | 0  | 250 | 0     | 25  | 500 | 200 | 10 | 15  | <5 | 90.1 (24%)    | 44.9 (27%)  | 180.4 (49%)    |
| 5460 (1300)                | 125          | 75  | 100   | 50   | 50   | 50 | 0  | 0   | 250   | 25  | 500 | 200 | 10 | 12  | <5 | 83.8 (26%)    | 32.7 (23%)  | 161.8 (51%)    |
| 4620 (1100)                | 100          | 75  | 75    | 50   | 50   | 50 | 0  | 0   | 250   | 20  | 500 | 200 | 8  | 5   | <5 | 75.8 (27%)    | 24 (20%)    | 142.8 (53%)    |

表 B.3 限能量低脂膳食不同能量水平每日摄入食物种类和数量举例

| 能量<br>kJ<br><br>(kcal) | 食物种类和重量 (g) |     |           |                  |          |    |    |         |           |             |     |     |    |             |    | 宏量营养素含量及产热百分比 |             |                |
|------------------------|-------------|-----|-----------|------------------|----------|----|----|---------|-----------|-------------|-----|-----|----|-------------|----|---------------|-------------|----------------|
|                        | 谷薯类         |     | 低脂肉类      |                  |          | 蛋类 |    | 奶类      |           | 豆<br>制<br>品 | 蔬菜  | 水果  | 坚果 | 植<br>物<br>油 | 盐  | 蛋白质<br><br>g  | 脂肪<br><br>g | 碳水化合物<br><br>g |
|                        | 谷类          | 薯芋类 | 鱼虾水<br>产肉 | 禽<br>类<br>瘦<br>肉 | 畜类<br>瘦肉 | 全蛋 | 蛋清 | 全脂<br>奶 | 低脂脱<br>脂奶 |             |     |     |    |             |    |               |             |                |
| 7980 (1900)            | 200         | 350 | 150       | 20               | 20       | 50 | 0  | 0       | 250       | 25          | 750 | 250 | 10 | 15          | <5 | 96.3 (20%)    | 37.2 (18%)  | 288.1 (62%)    |
| 7140 (1700)            | 175         | 300 | 125       | 25               | 0        | 50 | 0  | 0       | 250       | 25          | 500 | 200 | 10 | 15          | <5 | 83.5 (20%)    | 35.4 (19%)  | 256.0 (61%)    |
| 6300 (1500)            | 150         | 300 | 100       | 25               | 0        | 50 | 0  | 0       | 250       | 25          | 500 | 200 | 10 | 10          | <5 | 75.8 (20%)    | 29.5 (18%)  | 227.2 (62%)    |
| 5460 (1300)            | 125         | 250 | 100       | 0                | 0        | 50 | 0  | 0       | 250       | 25          | 500 | 200 | 5  | 10          | <5 | 66.8 (20%)    | 25.7 (18%)  | 197.7 (62%)    |
| 4620 (1100)            | 100         | 200 | 75        | 0                | 0        | 50 | 0  | 150     | 100       | 15          | 500 | 200 | 0  | 5           | <5 | 53.6 (20%)    | 21.4 (18%)  | 167.2 (62%)    |

## 附录 C

### 资料性附录

全天能量 6300kJ (1500kcal) 带量食谱举例见表 C.1, 单餐能量2100kJ (500kcal) 带量食谱举例见表C.2, 全天能量 2310kJ (550kcal) 带量食谱举例见表 C.3。

**表C.1全天能量6300kJ (1500kcal) 带量食谱举例**

| 餐次               | 菜肴名称   | 食材及用量                                     |
|------------------|--------|-------------------------------------------|
| 早餐               | 牛奶     | 牛奶250mL                                   |
|                  | 玉米面发糕  | 玉米面25g, 白面粉25g                            |
|                  | 水煮鸡蛋   | 鸡蛋50g                                     |
|                  | 酱牛肉    | 牛瘦肉50g                                    |
|                  | 热拌菠菜   | 菠菜100g, 食用油1g, 食盐0.5g                     |
| 加餐               | 西柚     | 西柚200g                                    |
| 午餐               | 二米饭    | 大米25g, 小米25g                              |
|                  | 蒸山药    | 山药75g                                     |
|                  | 清蒸柠檬鲑鱼 | 鲑鱼125g, 鲜柠檬3片, 橄榄油2g, 食盐0.5g              |
|                  | 西红柿烩花菜 | 西红柿100g, 菜花50g, 食用油3g, 食盐1g               |
|                  | 东北大拌菜  | 生菜50g, 苦菊30g, 黄椒30g, 紫甘蓝30g, 芝麻油2g, 食盐1g  |
| 加餐               | 核桃     | 核桃仁10g                                    |
| 晚餐               | 鸡丝荞麦面  | 鸡胸脯50g, 荞麦面条(干) 50g, 食用油1g, 食盐0.5g        |
|                  | 香菇油菜   | 油菜80g, 香菇25g, 食用油2g, 食盐0.5g               |
|                  | 芹菜拌胡萝卜 | 芹菜80g, 胡萝卜15g, 干木耳3g, 食用油2g, 食盐0.5g       |
|                  | 拌豆腐丝   | 豆腐皮40g, 黄瓜50g, 甜椒15g, 香菜2g, 食用油2g, 食盐0.5g |
| 注: 食物质量为可食部生重质量。 |        |                                           |

**表C.2单餐能量2100kJ (500kcal) 带量食谱举例**

| 餐次               | 菜肴名称  | 食材及用量                               |
|------------------|-------|-------------------------------------|
| 午餐               | 紫薯馒头  | 紫薯80g, 白面粉50g                       |
|                  | 鸡丁黄瓜  | 鸡胸肉50g, 黄瓜100g, 食用油2g, 食盐0.5g       |
|                  | 蒜蓉娃娃菜 | 娃娃菜100g, 蒜10g, 食用油2g, 食盐0.5g        |
|                  | 热拌腐竹  | 干腐竹25g, 甜椒15g, 青椒15g, 食用油1g, 食盐0.5g |
| 注: 食物质量为可食部生重质量。 |       |                                     |

**表C.3全天能量2310kJ (550kcal) 带量食谱举例**

| 餐次 | 菜肴名称   | 食材及用量                        |
|----|--------|------------------------------|
| 早餐 | 牛奶     | 脱脂牛奶250mL                    |
|    | 蒸芋头    | 芋头50g                        |
|    | 水煮鸡蛋   | 鸡蛋50g                        |
|    | 鸡蛋白拌生菜 | 鸡蛋白100g, 生菜250g, 芝麻油1g, 食盐1g |

|                 |        |                              |
|-----------------|--------|------------------------------|
| 晚餐              | 白灼虾    | 海虾50g                        |
|                 | 鸡蛋白拌黄瓜 | 鸡蛋白100g, 黄瓜250g, 芝麻油1g, 食盐1g |
|                 | 苹果     | 苹果200g                       |
| 注：食物质量为可食部生重质量。 |        |                              |

# 团 体 标 准

T/CNSS 015—2022

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## 孕期体重增长异常妇女膳食指导

Dietary guideline for women with abnormal weight gain during pregnancy

2022-12-30 发布

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## 前 言

本文件按照 GB/T 1.1—2020《标准化工作导则 第1部分：标准化文件的结构和起草规则》的规定起草。

本文件由中国营养学会归口。

本文件负责起草单位：南京医科大学、中国营养学会妇幼营养分会。

本文件参与起草单位：南京市妇幼保健院、上海交通大学医学院附属新华医院、昆明医科大学、北京大学第一医院、四川省妇幼保健院、郑州市中医院、武汉市妇幼保健院、首都医科大学附属北京妇产医院、南京医科大学第一附属医院。

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# 孕期体重增长异常妇女膳食指导

## 1 范围

本文件规定了孕期体重增长异常妇女膳食指导的原则，包括能量、营养素推荐摄入量，食物选择、体重监控、身体活动、膳食评估及营养教育。

本文件适用于因为生活方式不当导致的孕期体重增长异常妇女的膳食指导，不包括由于疾病原因导致的体重增长异常的妇女。

## 2 规范性引用文件

下列文件中的内容通过文中的规范性引用而构成本文件必不可少的条款。其中，注日期的引用文件，仅该日期对应的版本适用于本文件；不注日期的引用文件，其最新版本（包括所有的修改单）适用于本文件。

T/CNSS 009-2021 中国妇女妊娠期体重监测与评价

WS/T801-2022 妊娠期妇女体重增长推荐值标准

WS/T587.1-2017 中国居民膳食营养素参考摄入量第1部分：宏量营养素

WS/T587.2-2018 中国居民膳食营养素参考摄入量第2部分：常量元素

WS/T587.3-2017 中国居民膳食营养素参考摄入量第3部分：微量元素

WS/T587.4-2018 中国居民膳食营养素参考摄入量第4部分：脂溶性维生素

WS/T587.5-2018 中国居民膳食营养素参考摄入量第5部分：水溶性维生素

## 3 术语和定义

下列术语和定义适用于本文件。

### 3.1

**孕期 pregnancy**

妊娠期

从末次月经的第一日开始计算，约为280日（40周）。

注1：临床上将妊娠期分为妊娠早期、妊娠中期、妊娠晚期3个时期。妊娠早期指妊娠未达14周；妊娠中期指14~27<sup>+</sup><sub>6</sub>周；妊娠晚期指妊娠第28周及其后。

注2：此定义引自《中国妇女妊娠期体重检测与评价》。

### 3.2

**孕期体重增长异常 abnormal weight gain during pregnancy**

孕期体重变化量和变化速率不符合推荐值。

注：单胎孕期妇女体重增长推荐值数据采用 WS/T801-2022 妊娠期妇女体重增长推荐值标准

T/CNSS 009-2021《中国妇女妊娠期体重监测与评价》团体标准。

双胎孕期妇女体重增长推荐值数据参考美国医学研究院（Institute of Medicine, IOM）推荐值。

#### 4 膳食干预目标

通过增减相应食物量，调整膳食结构，改变饮食行为，同时配合体力活动调整，在获得良好的营养素摄入的前提下，使孕期体重增长异常者，一定时间内体重增长状态达到推荐范围。孕期体重增长值及增长速率数据见表 1、表 2：

表 1 孕期适宜体重增长值及增长速率

| 妊娠前体质指数 $BMI$ / ( $\text{kg}/\text{m}^2$ ) | 总增长值范围/ kg | 妊娠早期增长值/kg | 妊娠中晚期每周体重增重 /kg  |
|--------------------------------------------|------------|------------|------------------|
| 低体重 ( $BMI < 18.5$ )                       | 11.0~16.0  | 0~2.0      | 0.46 (0.37~0.56) |
| 正常体重 ( $18.5 \leq BMI < 24.0$ )            | 8.0~14.0   | 0~2.0      | 0.37 (0.26~0.48) |
| 超重 ( $24.0 \leq BMI < 28.0$ )              | 7.0~11.0   | 0~2.0      | 0.30 (0.22~0.37) |
| 肥胖 ( $BMI \geq 28.0$ )                     | 5.0~9.0    | 0~2.0      | $\leq 3.0$       |
| 注：表中数据源自 WST801-2022 妊娠期妇女体重增长推荐值标准。       |            |            |                  |

表 2 双胎孕妇孕期体重增长值

| 孕前体重状况                                      | 总增重范围/kg  |
|---------------------------------------------|-----------|
| 消瘦者 ( $BMI < 18.5$ )                        | 证据不足，暂无推荐 |
| 正常者 ( $18.5 \leq BMI \leq 24.9$ )           | 16.7~24.3 |
| 超重者 ( $25 \leq BMI \leq 29.9$ )             | 13.9~22.5 |
| 肥胖者 ( $BMI \geq 30$ )                       | 11.3~18.9 |
| 注：表中数据参考美国医学研究院（Institute of Medicine, IOM） |           |

注：孕期体重增长异常的情况分为：体重总增长不足或过量；体重增长速率过慢或过快；单胎妊娠体重增长对照表 1，双胎妊娠体重增长对照表 2 中总增长值范围，若未达到增重下限值则为不足，超过增重上限值则为过量。单胎妊娠体重增长速率对照表 1 中每周推荐增长速率数据，低于推荐速率下限值为增长速率慢，超过推荐增长速率上限值则为速率快。孕期每周体重增长上下限参见附录 A 中数据。

#### 5 膳食指导主要原则

##### 5.1 能量及营养素推荐摄入量

##### 5.1.1 能量

对于孕期体重增长异常妇女首先按照中国居民膳食营养素参考摄入量第 1 部分：宏量营养素

(WS/T587.1-2017)，能量推荐量（见表3）水平安排和监督膳食，观察体重变化，持续1~2周。如体重变化效果不理想，则在能量推荐量基础上增加或减少10%~20%（见表4）进一步调整膳食，继续观察体重变化。如果饮食量不能满足推荐要求，通过食材选择、烹调方式、增减活动量等方式进行弥补。

表3 孕期妇女不同身体活动水平能量推荐 单位：kJ/d(kcal/d)

| 身体活动水平 | 孕早期能量推荐     | 孕中期能量推荐      | 孕晚期能量推荐      |
|--------|-------------|--------------|--------------|
| 轻度     | 7524 (1800) | 8778 (2100)  | 9405 (2250)  |
| 中度     | 8778(2100)  | 10032 (2400) | 10659 (2550) |

表4 孕期妇女不同身体活动水平、不同体重增长异常情况下能量调整推荐 单位：kJ/d (kcal/d)

| 身体活动水平 | 体重增长情况 | 孕早期                    | 孕中期                    | 孕晚期                     |
|--------|--------|------------------------|------------------------|-------------------------|
| 轻度     | 不足、速率慢 | +752 (180)~+1504 (360) | +877 (210)~+1755 (420) | +940 (225)~+1881 (450)  |
|        | 过量、速率快 | -752 (180)~-1504 (360) | -877 (210)~-1755 (420) | -940 (225)~-1881 (450)  |
| 中度     | 不足、速率慢 | +836 (200)~+1672 (400) | +961 (230)~+1922 (460) | +1024 (245)~+2048 (490) |
|        | 过量、速率快 | -836 (200)~-1672 (400) | -961 (230)~-1922 (460) | -1024 (245)~-2048 (490) |

### 5.1.2 碳水化合物

碳水化合物提供的能量占总能量的50%~65%。每日碳水化合物不低于130g，全天膳食纤维摄入量应达到25g~30g。

### 5.1.3 蛋白质

孕期妇女蛋白质推荐摄入量见表5。

表5 孕期妇女蛋白质推荐摄入量（RNI）

| 孕期  | 蛋白质/（g/d） |
|-----|-----------|
| 备孕期 | 55        |
| 孕早期 | 55        |
| 孕中期 | 70        |
| 孕晚期 | 85        |

蛋白质提供的能量占总能量的15%~20%。孕早期蛋白质摄入量较孕前无变化，孕中期和孕晚期分别增加15g/d和30g/d。优质蛋白占一半及以上。

### 5.1.4 脂肪

脂肪提供能量占总能量的20%~30%。饱和脂肪酸占总能量不超过8%，单不饱和脂肪酸应占脂肪总量的1/3以上。反式脂肪酸应小于总能量的1%。二十二碳六烯酸(DHA)应至少达到200mg/d。

### 5.1.5 维生素、矿物质

依据中国居民膳食营养素参考摄入量第2部分：常量元素（WS/T587.2-2018），中国居民膳食营养素参考摄入量第3部分：微量元素（WST 578.3-2017），中国居民膳食营养素参考摄入量第4部分：脂

溶性维生素（WST 578.4-2018），中国居民膳食营养素参考摄入量第 5 部分：水溶性维生素（WST 578.5-2018），对孕妇的参考摄入量见表 6~表 7。

表 6 孕期妇女矿物质推荐摄入量（RNI/AI）

| 孕期  | 钙/<br>(mg/d) | 磷/<br>(mg/d) | 镁/<br>(mg/d) | 铁/<br>(mg/d) | 碘/<br>(μg/d) | 锌/<br>(mg/d) | 硒/<br>(μg/d) | 铜/<br>(mg/d) | 钼/<br>(μg/d) |
|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 孕早期 | 800          | 720          | 370          | 20           | 230          | 9.5          | 65           | 0.9          | 110          |
| 孕中期 | 1000         | 720          | 370          | 24           | 230          | 9.5          | 65           | 0.9          | 110          |
| 孕晚期 | 1000         | 720          | 370          | 29           | 230          | 9.5          | 65           | 0.9          | 110          |

表 7 孕期妇女维生素推荐摄入量（RNI/AI）

| 孕期  | 维生素<br>A/(μgRAE/<br>d) | 维生素<br>D/(<br>μg/d) | 维生素E/<br>(mgα-<br>TE/d) | 维生素<br>K/(<br>μg/d) | 维生素<br>B <sub>1</sub> /<br>(mg/d) | 维生素<br>B <sub>2</sub> /<br>(mg/d) | 维生素<br>B <sub>6</sub> /<br>(mg/d) | 维生素<br>B <sub>12</sub> /<br>(μg/d) | 叶酸<br>(μg/d) | 维生素<br>C<br>(mg/d) |
|-----|------------------------|---------------------|-------------------------|---------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|--------------|--------------------|
| 孕早期 | 700                    | 10                  | 14                      | 80                  | 1.2                               | 1.2                               | 2.2                               | 2.9                                | 600          | 100                |
| 孕中期 | 770                    | 10                  | 14                      | 80                  | 1.4                               | 1.4                               | 2.2                               | 2.9                                | 600          | 115                |
| 孕晚期 | 770                    | 10                  | 14                      | 80                  | 1.5                               | 1.5                               | 2.2                               | 2.9                                | 600          | 115                |

5.2 食物选择

5.2.1 膳食模式

依据《中国居民膳食指南(2022)》平衡膳食模式，提倡食物多样化，每日应摄入谷薯类、蔬果类、畜禽鱼类、乳蛋豆类和油脂类食物，每天摄入的具体食物品种平均应达到 15 种及以上，每周应达到 30 种及以上。尽量选择清蒸、炖、白灼、清炒等烹调方式，减少油炸、油煎、烧烤等。

5.2.2 食物选择

对于体重增加过多过快者，建议在控制摄食量的前提下适当多选择高营养素密度食物，优先选择高膳食纤维食物，如杂粮、菌类、坚果、豆类，增加饱腹感。选择新鲜食物。体重增加过多过快者食物选择举例见表 8。

表 8 体重增加过多过快者食物选择举例

| 食物类别 | 高营养素密度食物举例                                         |
|------|----------------------------------------------------|
| 主食类  | 糙米、黑米和燕麦米优于大米；全麦面包优于白面包；土豆、红薯、山药优于大米；鹰嘴豆、红豆、绿豆优于大米 |
| 蔬菜类  | 深色蔬菜优于浅色蔬菜，若选择含淀粉丰富的蔬菜（比如芋艿、芋头、莲藕、菱角、南瓜等）可适量减少主食摄入 |
| 水果   | 低糖水果（比如柚子、梨）优于高糖水果（比如香蕉、榴莲）                        |
| 肉类   | 去皮鸡肉、虾、鱼、扇贝这类低脂高蛋白的肉类要优于五花肉、排骨，新鲜肉类优于加工肉制品         |

对于体重增加不足、需要增加能量摄入量者，选择促进食欲的食物，改善烹调方式，多食用清淡、酸甜口味饮食，如水果、适当甜品、发酵乳饮料等。可适量选择风味好、高能量密度的食物，如

坚果、酸奶等。必要时可适量服用含维生素 B 族、锌等营养素的复合补充剂。

## 6 体重监测

建议每 3 日测量一次体重，并定期监测胎儿生长发育情况。采用正确的体重测量方法（参考 WS/T428，每日起床后排空大小便，穿最少内衣，测量体重两次，取平均值。

## 7 身体活动

在无医学禁忌的情况下，利用家务、交通等日常活动，保证膳食指南推荐的基本运动量基础上，根据孕前运动习惯循序渐进适当增加运动量，运动方式日常活动配合体育运动，促进能量消耗，增加胃肠蠕动，配合膳食管理，尽快达成增重目标。

## 8 膳食评估

收集孕妇膳食中食物类别、品种、摄入频率及相应摄入量进行数据，评估膳食结构与各类食物消费量符合膳食指南相应推荐量的程度；计算膳食中各类食物提供的能量及营养素，比较实际摄入量符合膳食营养素参考摄入量推荐水平的情况。分析体重增长异常的原因，有针对性的调整膳食结构及摄入量，同时考虑孕妇的饮食喜好、风俗习惯。

## 9 营养教育

尽早开始营养教育，通过面对面或网络通讯方式，定期有针对性对孕妇进行个体或群体营养健康教育，提高孕妇对平衡膳食、合理营养的认识，掌握食物量的概念，同时使其了解体重增长与饮食、体力活动之间的平衡关系，帮助做好孕期的合理营养和体重管理。

## 附录 A

(资料性)

## 各孕期体重增长规律表(单胎妊娠)

各孕期体重增长规律见表 A.1~表 A.3。

表 A.1 孕早期妇女每周体重增长上下限

| 孕周    | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 上限/kg | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.9 | 1.3 | 1.7 | 2.0 |
| 下限/kg | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |

注:无论孕前体重如何,孕早期体重增长 0kg 为下限,增长上限为 2kg,但是对于孕前体重超重、肥胖的孕妇可不增长。

表 A.2 孕中期每周体重增长上下限

| 孕前     | 孕周 | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  | 26  | 27  |
|--------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 低体重/kg | 上限 | 2.0 | 2.0 | 2.0 | 2.6 | 3.1 | 3.7 | 4.2 | 4.8 | 5.4 | 5.9 | 6.5 | 7.0 | 7.6 | 8.2 | 8.7 |
|        | 下限 | 1.0 | 1.4 | 1.8 | 2.1 | 2.5 | 2.9 | 3.2 | 3.6 | 4.0 | 4.3 | 4.7 | 5.0 | 5.5 | 5.8 | 6.2 |
| 正常/kg  | 上限 | 2.0 | 2.0 | 2.0 | 2.9 | 3.0 | 3.4 | 3.9 | 4.4 | 4.9 | 5.4 | 5.8 | 6.3 | 6.8 | 7.3 | 7.8 |
|        | 下限 | 1.0 | 1.2 | 1.5 | 1.8 | 2.0 | 2.3 | 2.5 | 2.8 | 3.1 | 3.3 | 3.9 | 3.8 | 4.1 | 4.4 | 4.6 |
| 超重/kg  | 上限 | 1.4 | 1.8 | 2.1 | 2.5 | 2.9 | 3.2 | 3.6 | 4.0 | 4.3 | 4.7 | 5.1 | 5.5 | 5.8 | 6.2 | 6.6 |
|        | 下限 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.3 | 3.5 | 3.7 | 3.9 | 4.1 |
| 肥胖/kg  | 上限 | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.2 | 4.5 | 4.8 | 5.1 |
|        | 下限 | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0.2 | 0.5 | 0.8 | 1.1 |

表 A.3 孕晚期每周体重增长上下限

| 孕前     | 孕周 | 28  | 29  | 30   | 31   | 32   | 33   | 34   | 35   | 36   | 37   | 38   | 39   | 40   |
|--------|----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
| 低体重/kg | 上限 | 9.3 | 9.8 | 10.4 | 11.0 | 11.5 | 12.1 | 12.6 | 13.2 | 13.8 | 14.3 | 14.9 | 15.4 | 16.0 |
|        | 下限 | 6.6 | 6.9 | 7.3  | 7.7  | 8.0  | 8.4  | 8.8  | 9.2  | 9.5  | 9.9  | 10.3 | 10.6 | 11.0 |
| 正常/kg  | 上限 | 8.2 | 8.7 | 9.2  | 9.7  | 10.2 | 10.6 | 11.1 | 11.6 | 12.1 | 12.6 | 13.0 | 13.5 | 14.0 |
|        | 下限 | 4.9 | 5.1 | 5.4  | 5.7  | 5.9  | 6.2  | 6.4  | 6.7  | 7.0  | 7.2  | 7.5  | 7.7  | 8.0  |
| 超重/kg  | 上限 | 6.9 | 7.3 | 7.7  | 8.0  | 8.4  | 8.8  | 9.2  | 9.5  | 9.9  | 10.3 | 10.9 | 10.6 | 11.0 |
|        | 下限 | 4.4 | 4.6 | 4.8  | 5.0  | 5.2  | 5.5  | 5.7  | 5.9  | 6.1  | 6.3  | 6.6  | 6.8  | 7.0  |
| 肥胖/kg  | 上限 | 5.4 | 5.7 | 6.0  | 6.3  | 6.6  | 6.9  | 7.2  | 7.5  | 7.8  | 8.1  | 8.4  | 8.7  | 9.0  |
|        | 下限 | 1.4 | 1.7 | 2.0  | 2.3  | 2.6  | 2.9  | 3.2  | 3.5  | 3.8  | 4.1  | 4.4  | 4.7  | 5.0? |

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# 团体标准

T/CNSS 011-2021

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## 学龄儿童体重管理营养指导规范

Nutritional guidelines for weight management of  
school-age children

2021-06-04 发布

2021-07-01 实施

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中国营养学会 发布

1. 2. 3. 4.

1. 2. 3. 4.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

## 前言

本文件按照 GB/T 1.1-2020《标准化工作导则 第1部分：标准化文件的结构和起草规则》的规定起草。

本文件由中国营养学会归口。

本文件起草单位：西安交通大学全球健康研究院、西安交通大学公共卫生学院、中国疾病预防控制中心营养与健康所、中国营养学会肥胖防控分会、四川大学华西公共卫生学院（华西第四医院）、四川大学华西第二医院（华西妇产儿童医院）、复旦大学公共卫生学院、北京大学儿童青少年卫生研究所、江西财经大学、首都体育学院体医融合创新研究中心。

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# 学龄儿童体重管理营养指导规范

## 1 范围

本文件规定了对6~17岁中国学龄儿童体重管理的营养指导,包括体重状况评价、营养摄入推荐和不同场所体重管理的营养指导。

本文件适用于为6~17岁中国学龄儿童提供体重管理营养指导的家庭、学校、公共卫生机构和医疗机构。

## 2 规范性引用文件

下列文件中的内容通过文中的规范性引用而构成本文件必不可少的条款。其中,对于本文件的应用是必不可少的。注日期的引用文件,仅该日期对应的版本适用于本文件。不注日期的引用文件,其最新版本(包括所有的修改单)适用于本文件。

WS/T 456-2014 学龄儿童青少年营养不良筛查  
WS/T 586-2018 学龄儿童青少年超重与肥胖筛查  
WS/T 554-2017 学生餐营养指南  
儿童喂养与营养指导技术规范(卫办妇社发[2012]49号)

## 3 术语和定义

下列术语和定义适用于本文件。

### 3.1

**体重管理** weight management

通过一些适宜的方式将体重调节或控制在正常范围内。

### 3.2

**腰围** waist circumference

腰部腋中线肋弓下缘和髂嵴连线中点的水平位置处的体围周长。

### 3.3

**腰围身高比** waist-to-height ratio; WHtR

一种计算腰围别身高的指数,是衡量腹型肥胖的指标之一。计算公式见式(1):

$$\text{WHtR} = \frac{\text{WC}}{\text{H}} \dots\dots\dots (1)$$

式中,WC--腰围,单位为厘米(cm);

H--身高,单位为厘米(cm)。

### 3.4

**营养不良** malnutrition

由能量、蛋白质及其他营养素摄入不足或过剩造成的组织、形体和功能改变及相应的临床表现。

### 3.5

**健康体重** healthy weight

处于正常范围内的体重。

注:健康体重者患各种疾病的风险要小于消瘦、超重及肥胖者。

### 3.6

**腹型肥胖 abdominal obesity**

脂肪主要积聚在腹腔内，内脏脂肪增加。

注：腹型肥胖者成年期发生各种并发症的危险性较高，更易患心脑血管疾病、糖尿病等疾病。

3.7

**零食 snack**

非正餐时间食用的少量食物和饮料。

3.8

**身体活动 physical activity**

由于骨骼肌收缩导致的能量消耗的各种活动。

3.9

**普遍性预防 general prevention**

制定政策和创建支持环境，成员积极参与，以健康教育为措施，提供健康咨询和指导，培养儿童健康的行为和生活方式。

3.10

**针对性预防 targeted prevention**

针对处于导致肥胖环境中的儿童，给予更直接的教育和指导，增加其健康和营养知识，培养儿童健康膳食的技能。

**4 学龄儿童健康体重标准**

**4.1 学龄儿童体重状况评定标准**

以 WS/T456-2014 中“消瘦”的 BMI 界值和 WS/T586-2018 中“超重”和“肥胖”的体质指数 (Body Mass Index, BMI) 界值并结合 WHtR 的 0.46、0.48、0.50 (分别对应预警、诊断、诊断严重腹型肥胖) 的判定界点作为 6~18 岁学龄儿童体重状况的评定标准，见附录 A 的表 A.1。

**4.2 学龄儿童体重监测**

定期 (如每半年) 评价儿童体重状况，测量身高、体重和腰围，形成每个儿童的生长曲线，监测其变化情况。

**5 学龄儿童体重管理膳食原则**

**5.1 学龄儿童管理体重的总原则**

**5.1.1 设定合理的膳食能量摄入水平**

正常体重学龄儿童平均每天能量需要量见表 1。超重及肥胖儿童控制体重时，要结合身体活动水平等综合状况，能量摄入量在正常儿童的需要量的基础上每天减少 1256~2093kJ (等于 300~500 kcal)。消瘦儿童所需能量摄入需由临床医生帮助制定适当的增重速度及能量增量。

**表 1 不同年龄、性别、身体活动水平的正常体重学龄儿童的能量需要量 单位: kJ/d (kcal/d)**

| 身体活动水平 | 男              |                |                |                 | 女              |                |                |                |
|--------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|
|        | 6~8 岁          | 9~11 岁         | 12~14 岁        | 15~17 岁         | 6~8 岁          | 9~11 岁         | 12~14 岁        | 15~17 岁        |
| 轻      | 6279<br>(1500) | 7744<br>(1850) | 9209<br>(2200) | 10883<br>(2600) | 5651<br>(1350) | 6907<br>(1650) | 7744<br>(1850) | 8581<br>(2050) |

|   |                |                |                 |                 |                |                |                |                 |
|---|----------------|----------------|-----------------|-----------------|----------------|----------------|----------------|-----------------|
| 中 | 7116<br>(1700) | 8790<br>(2100) | 10255<br>(2450) | 12139<br>(2900) | 6488<br>(1550) | 7953<br>(1900) | 8790<br>(2100) | 9837<br>(2350)  |
| 重 | 7953<br>(1900) | 9837<br>(2350) | 11511<br>(2750) | 13604<br>(3250) | 7325<br>(1750) | 9000<br>(2150) | 9837<br>(2350) | 10883<br>(2600) |

### 5.1.2 适量性

每日摄入的食物要适量，其所提供的能量应达到能量需要量标准值的 90%~110%，可根据生长发育及身体活动水平进行调整。不同年龄段儿童每天所需的食物种类及数量推荐标准参照 WS/T 554-2017，见表 2。

表 2 不同年龄的正常体重学龄儿童每天食物种类及数量 单位：g

| 分组                                                        | 食物类别       | 6 岁~8 岁 | 9 岁~11 岁 | 12 岁~14 岁 | 15 岁~17 岁 |
|-----------------------------------------------------------|------------|---------|----------|-----------|-----------|
| 谷薯类                                                       | 谷薯类        | 250~300 | 300~350  | 350~400   | 350~400   |
| 蔬菜水果类                                                     | 蔬菜类        | 300~350 | 350~400  | 400~450   | 450~500   |
|                                                           | 水果类        | 150~200 | 200~250  | 250~300   | 300~350   |
| 鱼禽肉蛋类                                                     | 畜禽肉类       | 30~40   | 40~50    | 50~60     | 60~70     |
|                                                           | 鱼虾类        | 30~40   | 40~50    | 50~60     | 50~60     |
|                                                           | 蛋类         | 50      | 50       | 75        | 75        |
| 奶、大豆类及坚果                                                  | 奶及奶制品      | 200     | 200      | 250       | 250       |
|                                                           | 大豆类及其制品和坚果 | 30      | 35       | 40        | 50        |
| 食用油                                                       |            | 25      | 25       | 30        | 30        |
| 盐                                                         |            | 5       | 5        | 5         | <6        |
| 注：表中均为可食部分生重；谷薯类包括各种米、面、杂粮、杂豆及薯类等；大豆包括黄豆、青豆和黑豆，大豆制品以干黄豆计。 |            |         |          |           |           |
| 儿童早餐、午餐、晚餐的能量或营养素应该分别占每天总量的 30%、40%、30%。                  |            |         |          |           |           |

### 5.1.3 均衡性

配制营养素齐全、比例适当的膳食（见表 2 和表 A.2~A.4）。做到粗细搭配、荤素搭配、干稀搭配、色香味搭配，避免儿童挑食和偏食。

### 5.1.4 多样性

建议每人每天摄入 12 种以上食物，每周 25 种以上，包括谷薯类、蔬菜、水果、禽畜鱼蛋奶、大豆坚果等多类食物，推荐的同类食物之间可以进行互换，见表 3。

表 3 建议食用的主要食物的种类数

| 食物类别         | 平均每天种数 | 每周至少种数 |
|--------------|--------|--------|
| 谷薯类          | 3      | 5      |
| 蔬菜水果类        | 4      | 10     |
| 鱼禽肉蛋类        | 3      | 5      |
| 奶及奶制品、大豆类及坚果 | 2      | 5      |
| 合计           | 12     | 25     |

### 5.1.5 平衡性

坚持每天运动,维持能量摄入与消耗的平衡,保持健康体重。控制总能量摄入(见表1),同时保证每天至少60min中高强度的身体活动(可通过体育课、课间操和课后体育活动的方式实现)。超重肥胖儿童青少年每周至少应进行3~4次,每次25~50min中等至较大强度有氧运动,每周进行3~4次抗阻运动,两种运动方式相结合的效果更好。

#### 5.1.6 可及性

确保食材新鲜和容易获得。在同类食物中,可以选择更新鲜、更经济的食物种类。

#### 5.2 选择适宜的食物

每种食物类别中,推荐低能量、高营养密度的食物,限制高能量、低营养密度的食物,见表4。

表4 各类食物中推荐及减少摄入的食物举例

| 食物类别         | 推荐摄入                                | 减少摄入                                     |
|--------------|-------------------------------------|------------------------------------------|
| 谷薯类          | 全谷物、粗粮                              | 精白米面、油炸食品、含反式脂肪酸的甜点                      |
| 蔬菜水果类        | 新鲜蔬菜和水果                             | 果脯、果汁、果干、水果罐头                            |
| 鱼禽肉蛋类        | 鲜肉鱼制品、鸡蛋                            | 咸鱼、香肠、腊肉、鱼肉罐头等加工肉制品;炸鸡、炸鱼等油炸类动物性食物;烧烤类食物 |
| 奶及奶制品、大豆类及坚果 | 奶制品(液态奶、酸奶、奶酪等)、豆制品(豆腐干、豆腐、豆浆)、原味坚果 | 乳饮料、冷冻甜品(冰淇淋、雪糕等)、奶油、高盐/糖浸坚果             |
| 饮料类          | 白开水、矿泉水、纯净水                         | 含糖饮料(即添加糖含量>5%的饮品)                       |

#### 5.3 烹饪方法

科学合理加工各种食物原料,在确保色香味的同时,降低烹饪食物中营养素的损失。选择煮、炖、蒸、炒等方式进行烹饪,尽量避免煎、炸、烤、熏制等方式。

#### 5.4 进餐方法及注意事项

5.4.1 三餐定时定量,能量分配合理。

5.4.2 按需取餐,不浪费食物。

5.4.3 专心就餐,保持安静愉悦就餐氛围,不看电视或电子产品。

5.4.4 细嚼慢咽,不挑食偏食,不暴饮暴食。

5.4.5 餐饮完毕,整理和放置好餐具桌椅。

5.4.6 多在家就餐,少在外就餐或点外卖。

### 6 不同年龄段正常体重学龄儿童宏量营养素、能量需求以及各类食物的推荐摄入量

#### 6.1 能量

不同年龄段儿童每人每天能量供给量应达到标准值的90%~110%,见表1。

#### 6.2 宏量营养素

6~8岁、9~11岁学龄儿童推荐蛋白质供给量标准值分别为40g、50g;12~14岁男生、女生推荐蛋白质供给量标准值分别为65g、60g;15~17岁男生、女生推荐蛋白质供给量标准值分别为75g、60g。蛋白质应达到推荐标准值的85%以上。

脂肪供能比占总能量的20%~30%,碳水化合物供能比占总能量的50%~65%。

### 6.3 食物种类和数量

儿童每餐需要包含谷薯类、蔬菜水果类、鱼禽肉蛋类、奶类及大豆类等四类食物中的三类以上的食物，每天的食物种类及数量标准见表2。

## 7 不同年龄段超重/肥胖学龄儿童宏量营养素、能量需求以及各类食物的推荐摄入量

### 7.1 能量

6~12岁超重/肥胖儿童的推荐摄入能量应由执业医师或营养师来协助判断。6~12岁的超重儿童，应在保证儿童正常生长、发育的同时维持体重，保持能量摄入接近于当前总能量消耗，并适量增加体育锻炼；肥胖儿童需要适量减少能量的摄入，推荐减重速度不超过每周0.45kg。

13~17岁儿童生长发育将会达到顶峰，身高将达到最大值，因此，需由临床医生来判断儿童的发育阶段是否已经达到或接近身高的最大值。对于青春期早期的超重/肥胖儿童，应保证生长发育、维持体重；而对于已经达到或接近身高最大值的超重/肥胖儿童，需要适量减少能量的摄入，且减重速度不超过每周0.9kg。

### 7.2 宏量营养素

碳水化合物占总能量的45%~65%，脂肪占总能量的25%~35%，蛋白质占总能量的10%~25%。

### 7.3 食物种类和数量

控制总能量摄入，限制高能量食物，例如油炸食品、含糖类较高的食物。保证蛋白质、维生素、矿物质的充足摄入，提高水产品、蔬菜、水果的摄入量。控制精白米面的摄入，适量增加粗杂粮及全谷物的摄入量。控制高脂肪、高糖、高钠食物的摄入。

参考《中国居民膳食指南（2016）》，考虑到肥胖儿童减重时期，需要减少饥饿感、增加饱腹感的同时，提高营养素密度较高食物的比例，按照其能量需要量应在正常儿童需要量的基础上每天减少1256~2093kJ（等于300~500kcal）的标准，不同年龄段肥胖儿童全天各类食物供给量的建议标准见表5。

表5 肥胖儿童减重期不同膳食能量水平时选择各类食物的参考量

| 能量<br>/kJ<br>(kcal) | 食物类别 单位: g/d |        |     |     |           |         |           |    |    |       |    |
|---------------------|--------------|--------|-----|-----|-----------|---------|-----------|----|----|-------|----|
|                     | 谷类           | 薯类     | 蔬菜  | 水果  | 畜禽肉<br>蛋类 | 水产<br>品 | 奶及奶<br>制品 | 大豆 | 坚果 | 食用油   | 盐  |
| 5023<br>(1200)      | 90           | 适量     | 300 | 200 | 50        | 40      | 500       | 15 | 适量 | 20~25 | <3 |
| 5860<br>(1400)      | 135          | 适量     | 400 | 200 | 65        | 50      | 350       | 15 | 适量 | 20~25 | <4 |
| 6697<br>(1600)      | 180          | 50~100 | 450 | 300 | 80        | 50      | 300       | 15 | 10 | 20~25 | <5 |
| 7535<br>(1800)      | 200          | 50~100 | 450 | 300 | 90        | 75      | 300       | 15 | 10 | 25    | <5 |
| 8372<br>(2000)      | 225          | 50~100 | 500 | 350 | 100       | 75      | 300       | 15 | 10 | 25    | <5 |
| 9209<br>(2200)      | 250          | 50~100 | 500 | 350 | 130       | 75      | 300       | 25 | 10 | 25    | <5 |
| 10046<br>(2400)     | 270          | 50~100 | 500 | 400 | 135       | 100     | 300       | 25 | 10 | 30    | <5 |

|                                                |     |     |     |     |     |     |     |    |    |    |    |
|------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| 10883<br>(2600)                                | 315 | 125 | 600 | 400 | 135 | 125 | 300 | 25 | 10 | 30 | <5 |
| 11720<br>(2800)                                | 340 | 125 | 600 | 450 | 160 | 130 | 300 | 25 | 10 | 30 | <5 |
| 注：谷物中全谷物及杂豆为 50~150g；蔬菜中深色蔬菜应占所有蔬菜的二分之一。薯类为生重。 |     |     |     |     |     |     |     |    |    |    |    |

## 8 不同年龄段消瘦学龄儿童宏量营养素、能量需求以及各类食物的推荐摄入量

### 8.1 能量

所需能量摄入需要由临床营养师/营养师及专业人员指导。需由临床医生帮助制定适当的增重速度及能量增量。

### 8.2 宏量营养素

需由临床营养师/营养师及专业人员制定适宜的宏量营养素摄入量，主要原则是提高蛋白质的摄入。例如，对于期望增重速度为每天 10g/kg 体重（包含 40%体脂和 60%瘦体重）的儿童，每天可额外增加 2.2g/kg 体重的蛋白质。另外也可以根据实际情况，通过增加碳水化合物的摄入量以提高能量的摄入。

### 8.3 食物种类和数量

要在保证能量摄入充足的基础上，增加鱼、禽、蛋、瘦肉、豆制品等富含优质蛋白质食物的摄入，经常食用奶及奶制品，每天吃新鲜的蔬菜和水果。保证一日三餐，纠正偏食和过度节食等不健康的饮食行为，避免餐前吃零食。

## 9 不同场所学龄儿童体重管理的营养指导

### 9.1 家庭

#### 9.1.1 生长发育监测

家长应监测儿童生长发育，建议至少每月测量一次身高、体重和腰围，并做好记录，计算 BMI 与 WHtR 并与生长发育标准比较。如果发现儿童身高、BMI 或者 WHtR 有明显的异常变化，应主动向儿科医生咨询。对超重/肥胖儿童，建议医生测定其体成分，进一步明确肥胖特点。

#### 9.1.2 膳食获得

按需购买食物，选择新鲜、卫生的食物，合理储存。选购食品时注意看标签，为儿童选择高营养且低能量的食物。

#### 9.1.3 膳食使用

为儿童提供小份量、多样化的食物。保证规律的进餐时间、固定的进餐地点、适宜的进餐或分餐食具。监督帮助儿童进餐时做到细嚼慢咽，不挑食，不偏食。

#### 9.1.4 行为干预

建议家长采用“52110”行为。“5”，学龄儿童每天应吃 5 份成年人拳头大小的蔬菜和水果，300g~500g 煮熟或切碎的生菜叶，200g~400g 的水果；“2”，看电视或使用屏幕电子产品时间每天不超过 2h；“1”，每天应该进行 1h 以上中高强度的身体活动；“1”，每天吃 1 份肉，相当于 1 个成年人手掌大小及厚度，80g~110g；“0”，不喝含糖饮料。

#### 9.1.5 身体活动

家长应为儿童创造身体活动的家庭氛围，每天校外身体活动时间达到 1h。

### 9.2 学校

#### 9.2.1 定期体检

学校定期（每年至少一次）监测学生身高、体重和腰围，并计算 BMI 和 WHtR，将学生营养状况

及时反馈家长，对于异常的儿童建议采取针对性措施，按照体重管理流程进行干预。

### 9.2.2 体重管理流程

学龄儿童体重管理流程见图 1。

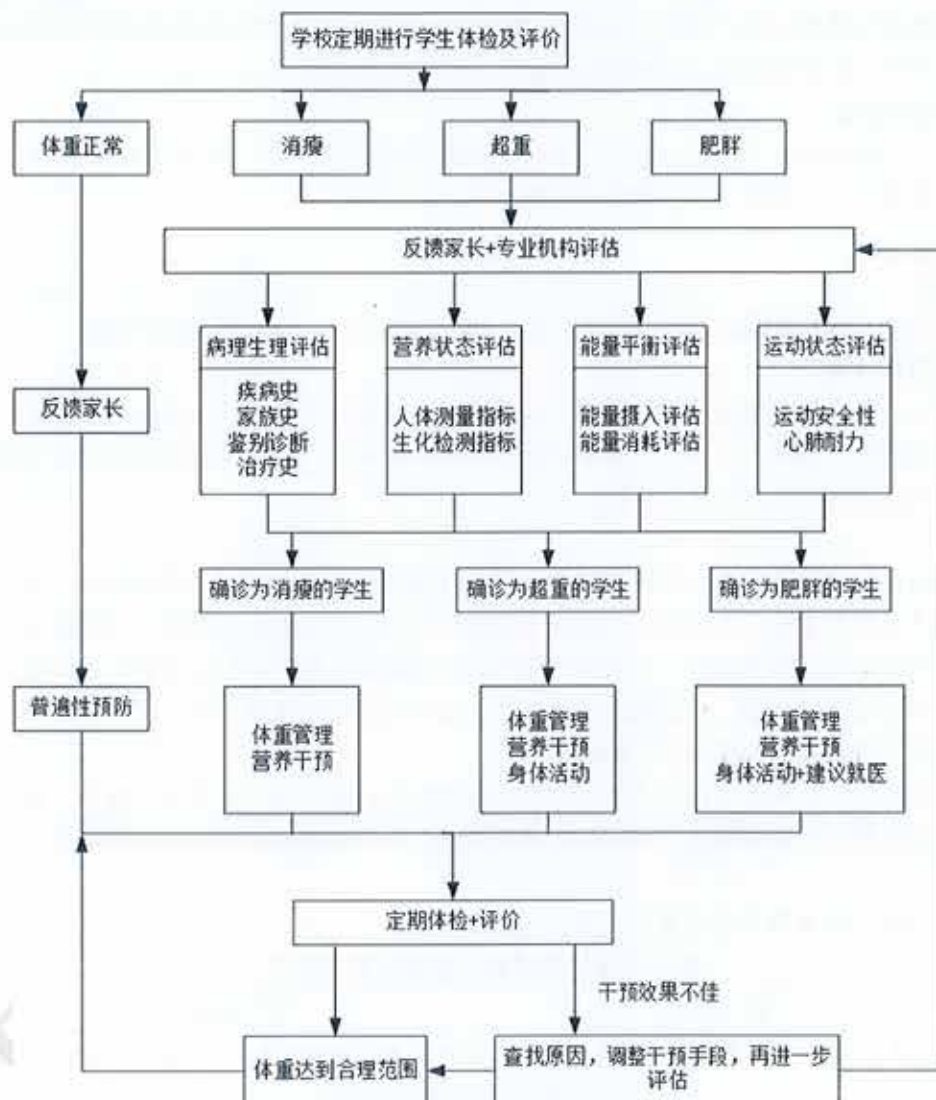


图 1 学龄儿童体重管理流程

### 9.2.3 健康教育

学校要开展健康体重与营养健康教育，培训师资，将相关内容融入中小学常规教育、学生活动、学校氛围创设等政策和日常工作中。

### 9.2.4 身体活动

学校要严格落实国家体育与健康课程标准，强化体育课和课外锻炼。没有体育课的当天，学校要在课后组织学生进行集体体育锻炼并将其列入教学计划。学校全面实行大课间体育活动制度，每天上午统一安排 25~30min 的大课间体育活动，组织学生广播体操、开展集体体育活动。寄宿制学校要坚持每天出早操。中小学生每天在校内中等或以上强度身体活动时间达到 1h 以上，掌握至少 1~2 项基本运动技能。

### 9.2.5 营养干预

学校食品安全实行校长负责制，学校应配备专（兼）职食品安全管理人員和营养健康管理人員，学校和供餐单位餐饮从业人員要定期接受培训，为学生提供营养均衡、烹调合理、符合地方饮食特点的食物，并为餐饮食品提供营养标识。学校应建立集中用餐信息公开制度，利用公共信息平台等方式及时向师生家长公开食品进货来源、供餐单位、带量食谱和营养素供给量等信息，组织师生家长代表参与食品安全与营养健康的管理和监督。学校应当根据卫生健康主管部门发布的学生餐营养指南等标准，针对不同年龄段在校学生营养健康需求，因地制宜引导学生科学营养用餐。

#### 9.2.6 创造支持性环境

中小学不应在校内设置小卖部、超市、自动售卖机等食品经营场所。确有需要设置的，应依法取得许可，并避免售卖高盐、高糖、高脂食品及含糖饮料。

### 9.3 社区

#### 9.3.1 健康教育

社区应定期为儿童和家庭提供营养健康教育，利用好广告栏、电子告示牌等设施。

#### 9.3.2 创造支持性环境

社区应为儿童青少年营造健康饮食环境，对学校周边的不健康食品商店及流动摊位进行管理。营造社区全民运动的社会氛围，提高运动场所和运动设施的可及性，协助构筑儿童体育社会组织管理和支持体系，形成鼓励体育运动的社区氛围。

### 9.4 医院

儿童就诊时，应测量其身高、体重和腰围，计算 BMI 和 WHtR，并评价营养状况。对于营养状况异常者，告知本人及其家长，并提供相应综合防治建议，帮助改善其营养状况。各级医院对于消瘦或超重肥胖儿童青少年的干预及治疗，应以身体活动和合理膳食为基础、以行为矫正为关键、在家庭、学校等儿童日常生活场所实施。根据肥胖严重程度慎重采用药物治疗或手术疗法。

### 9.5 中小学卫生保健机构和疾病预防控制机构

中小学卫生保健机构和各级疾病预防控制机构应根据职责或者相关主管部门要求，执行相应的国家政策和倡导创建健康的饮食环境，组织开展区域内学校营养健康的监测、技术培训和业务指导等工作。

不同场所学龄儿童体重管理指导见表 6。

表 6 不同场所学龄儿童体重管理指导

| 场所                 | 指导方式        | 重点措施                                     |
|--------------------|-------------|------------------------------------------|
| 家庭（个体主导）           | 个体化控制       | 儿童生长发育监测+平衡膳食+“52110”行为干预+配合专业指导+支持性家庭环境 |
| 学校（集体主导）           | 普遍性预防+针对性预防 | 定期体检+健康教育+身体活动+营养干预+支持性学校环境              |
| 社区                 | 普遍性预防       | 健康教育+支持性社区环境                             |
| 医院                 | 综合防治        | 身体活动+营养干预+行为干预+药物治疗+手术治疗                 |
| 中小学卫生保健机构和疾病预防控制机构 | 普遍性预防       | 政策制定+健康教育+营养指导+健康饮食环境倡导                  |

## 附录A

### (资料性)

#### 学龄儿童体重状况评定标准及不同体重状况儿童食谱举例

学龄儿童体重状况(消瘦、正常、超重、肥胖)评定标准见表A.1。不同体重状况儿童食谱举例见表A.2~表A.4。

表 A.1 学龄儿童体重状况(消瘦、正常、超重、肥胖)评定标准 单位: kg/m<sup>2</sup>

| 年龄(岁) | 男     |           |           |      |      | 女     |           |           |      |      |
|-------|-------|-----------|-----------|------|------|-------|-----------|-----------|------|------|
|       | 中重度消瘦 | 轻度消瘦      | 正常        | 超重   | 肥胖   | 中重度消瘦 | 轻度消瘦      | 正常        | 超重   | 肥胖   |
| 6.0~  | ≤13.2 | 13.3~13.4 | 13.4~16.4 | 16.4 | 17.7 | ≤12.8 | 12.9~13.1 | 13.1~16.2 | 16.2 | 17.5 |
| 6.5~  | ≤13.4 | 13.5~13.8 | 13.8~16.7 | 16.7 | 18.1 | ≤12.9 | 13.0~13.3 | 13.3~16.5 | 16.5 | 18.0 |
| 7.0~  | ≤13.5 | 13.6~13.9 | 13.9~17.0 | 17.0 | 18.7 | ≤13.0 | 13.1~13.4 | 13.4~16.8 | 16.8 | 18.5 |
| 7.5~  | ≤13.5 | 13.6~13.9 | 13.9~17.4 | 17.4 | 19.2 | ≤13.0 | 13.1~13.5 | 13.5~17.2 | 17.2 | 19.0 |
| 8.0~  | ≤13.6 | 13.7~14.0 | 14.0~17.8 | 17.8 | 19.7 | ≤13.1 | 13.2~13.6 | 13.6~17.6 | 17.6 | 19.4 |
| 8.5~  | ≤13.6 | 13.7~14.0 | 14.0~18.1 | 18.1 | 20.3 | ≤13.1 | 13.2~13.7 | 13.7~18.1 | 18.1 | 19.9 |
| 9.0~  | ≤13.7 | 13.8~14.1 | 14.1~18.5 | 18.5 | 20.8 | ≤13.2 | 13.3~13.8 | 13.8~18.5 | 18.5 | 20.4 |
| 9.5~  | ≤13.8 | 13.9~14.2 | 14.2~18.9 | 18.9 | 21.4 | ≤13.2 | 13.3~13.9 | 13.9~19.0 | 19.0 | 21.0 |
| 10.0~ | ≤13.9 | 14.0~14.4 | 14.4~19.2 | 19.2 | 21.9 | ≤13.3 | 13.4~14.0 | 14.0~19.5 | 19.5 | 21.5 |
| 10.5~ | ≤14.0 | 14.1~14.6 | 14.6~19.6 | 19.6 | 22.5 | ≤13.4 | 13.5~14.1 | 14.1~20.0 | 20.0 | 22.1 |
| 11.0~ | ≤14.2 | 14.3~14.9 | 14.9~19.9 | 19.9 | 23.0 | ≤13.7 | 13.8~14.3 | 14.3~20.5 | 20.5 | 22.7 |
| 11.5~ | ≤14.3 | 14.4~15.1 | 15.1~20.3 | 20.3 | 23.6 | ≤13.9 | 14.0~14.5 | 14.5~21.1 | 21.1 | 23.3 |
| 12.0~ | ≤14.4 | 14.5~15.4 | 15.4~20.7 | 20.7 | 24.1 | ≤14.1 | 14.2~14.7 | 14.7~21.5 | 21.5 | 23.9 |
| 12.5~ | ≤14.5 | 14.6~15.6 | 15.6~21.0 | 21.0 | 24.7 | ≤14.3 | 14.4~14.9 | 14.9~21.9 | 21.9 | 24.5 |
| 13.0~ | ≤14.8 | 14.9~15.9 | 15.9~21.4 | 21.4 | 25.2 | ≤14.6 | 14.7~15.3 | 15.3~22.2 | 22.2 | 25.0 |
| 13.5~ | ≤15.0 | 15.1~16.1 | 16.1~21.9 | 21.9 | 25.7 | ≤14.9 | 15.0~15.6 | 15.6~22.6 | 22.6 | 25.6 |
| 14.0~ | ≤15.3 | 15.4~16.4 | 16.4~22.3 | 22.3 | 26.1 | ≤15.3 | 15.4~16.0 | 16.0~22.8 | 22.8 | 25.9 |
| 14.5~ | ≤15.5 | 15.6~16.7 | 16.7~22.6 | 22.6 | 26.4 | ≤15.7 | 15.8~16.3 | 16.3~23.0 | 23.0 | 26.3 |
| 15.0~ | ≤15.8 | 15.9~16.9 | 16.9~22.9 | 22.9 | 26.6 | ≤16.0 | 16.1~16.6 | 16.6~23.2 | 23.2 | 26.6 |
| 15.5~ | ≤16.0 | 16.1~17.0 | 17.0~23.1 | 23.1 | 26.9 | ≤16.2 | 16.3~16.8 | 16.8~23.4 | 23.4 | 26.9 |
| 16.0~ | ≤16.2 | 16.3~17.3 | 17.3~23.3 | 23.3 | 27.1 | ≤16.4 | 16.5~17.0 | 17.0~23.6 | 23.6 | 27.1 |
| 16.5~ | ≤16.4 | 16.5~17.5 | 17.5~23.5 | 23.5 | 27.4 | ≤16.5 | 16.6~17.1 | 17.1~23.7 | 23.7 | 27.4 |
| 17.0~ | ≤16.6 | 16.7~17.7 | 17.7~23.7 | 23.7 | 27.6 | ≤16.6 | 16.7~17.2 | 17.2~23.8 | 23.8 | 27.6 |
| 17.5~ | ≤16.8 | 16.9~17.9 | 17.9~23.8 | 23.8 | 27.8 | ≤16.7 | 16.8~17.3 | 17.3~23.9 | 23.9 | 27.8 |
| ~18.0 |       |           |           | 24.0 | 28.0 |       |           |           | 24.0 | 28.0 |

表A.2 9~11岁体重正常儿童食谱举例

| 餐食                                                                     | 食物名称   | 食物及质量                                       |
|------------------------------------------------------------------------|--------|---------------------------------------------|
| 早餐                                                                     | 面包     | 切片小麦粉面包 40g                                 |
|                                                                        | 牛奶燕麦粥  | 鲜牛奶 200g, 燕麦片 20g                           |
|                                                                        | 煮鸡蛋    | 鸡蛋 60g (带壳重)                                |
|                                                                        | 芹菜豆腐干  | 芹菜 (杆/叶柄) 90g, 豆腐干 10g, 植物油 1g              |
| 午餐                                                                     | 红豆大米饭  | 稻米 (特级粳米) 120g, 红小豆 5g                      |
|                                                                        | 鱼香肉丝   | 瘦猪肉 50g, 柿子椒 75g, 胡萝卜 20g, 水发木耳 10g, 植物油 6g |
|                                                                        | 炒菠菜山药  | 菠菜 100g, 山药 15g, 植物油 3g                     |
|                                                                        | 虾皮紫菜汤  | 紫菜 2g, 虾皮 1g                                |
| 晚餐                                                                     | 面条     | 小麦标准粉 125g                                  |
|                                                                        | 西红柿鸡蛋卤 | 西红柿 125g, 鸡蛋 20g (约三分之一的整蛋), 植物油 3g         |
|                                                                        | 红烧带鱼   | 带鱼 90g, 鲜香菇 10g, 鲜冬笋 10g, 植物油 6g            |
|                                                                        | 清炒菜花   | 菜花 100g, 植物油 3g                             |
| 加餐                                                                     | 苹果     | 苹果 150g                                     |
|                                                                        | 酸奶     | 酸奶 (全脂含糖) 125g                              |
| 注: 除非特殊注明, 否则所有食物质量均为烹调前食物的净重。<br>提供能量 8380kJ (约等于 2002kcal), 蛋白质 85g。 |        |                                             |

表A.3 9~11岁超重肥胖儿童食谱举例

| 餐食                                                                     | 食物名称   | 食物及质量                                       |
|------------------------------------------------------------------------|--------|---------------------------------------------|
| 早餐                                                                     | 牛奶燕麦粥  | 牛奶 200g, 燕麦片 40g                            |
|                                                                        | 煮鸡蛋    | 鸡蛋 60g (带壳重)                                |
|                                                                        | 芹菜豆腐干  | 芹菜 (杆/叶柄) 90g, 豆腐干 10g, 植物油 1g              |
|                                                                        | 玉米大米饭  | 稻米 (特级粳米) 80g, 玉米糝 10g                      |
| 午餐                                                                     | 鱼香肉丝   | 鸡胸肉 50g, 柿子椒 75g, 胡萝卜 20g, 水发木耳 10g, 植物油 5g |
|                                                                        | 鲜虾仁炒菠菜 | 菠菜 100g, 鲜虾仁 25g, 植物油 3g                    |
|                                                                        | 虾皮紫菜汤  | 紫菜 2g, 虾皮 1g                                |
|                                                                        | 杂粮面条   | 小麦标准粉 70g, 绿豆面 10g                          |
| 晚餐                                                                     | 西红柿鸡蛋卤 | 西红柿 100g, 鸡蛋 25g (约三分之一的整蛋), 植物油 3g         |
|                                                                        | 红烧带鱼   | 带鱼 70g, 鲜香菇 10g, 鲜冬笋 10g, 植物油 5g            |
|                                                                        | 清炒菜花   | 菜花 100g, 植物油 3g                             |
|                                                                        | 酸奶     | 酸奶 (全脂含糖) 120g                              |
| 加餐                                                                     | 橘子     | 橘子 100g                                     |
| 注: 除非特殊注明, 否则所有食物质量均为烹调前食物的净重。<br>提供能量 6990kJ (约等于 1670kcal), 蛋白质 81g。 |        |                                             |

表 A.4 9~11 岁消瘦儿童食谱举例

| 餐食                                                                     | 食物名称    | 食物及质量                                       |
|------------------------------------------------------------------------|---------|---------------------------------------------|
| 早餐                                                                     | 面包      | 切片小麦粉面包 90g                                 |
|                                                                        | 牛奶      | 鲜牛奶 200g                                    |
|                                                                        | 煮鸡蛋     | 鸡蛋 60g (带壳重)                                |
|                                                                        | 芹菜花生豆腐干 | 芹菜(杆/叶柄) 90g, 豆腐干 20g, 花生米(五香) 10g, 植物油 1g  |
| 午餐                                                                     | 大米饭     | 稻米(特级粳米) 130g, 红小豆 5g                       |
|                                                                        | 鱼香肉丝    | 瘦猪肉 60g, 柿子椒 75g, 胡萝卜 20g, 水发木耳 10g, 植物油 6g |
|                                                                        | 炒菠菜山药   | 菠菜 100g, 山药 15g, 植物油 3g                     |
|                                                                        | 虾皮紫菜汤   | 紫菜 2g, 虾皮 1g                                |
| 晚餐                                                                     | 面条      | 小麦标准粉 125g                                  |
|                                                                        | 西红柿鸡蛋卤  | 西红柿 125g, 鸡蛋 25g, 植物油 4g                    |
|                                                                        | 红烧带鱼    | 带鱼 100g, 鲜香菇 10g, 鲜冬笋 10g, 植物油 6g           |
|                                                                        | 清炒菜花    | 菜花 100g, 植物油 3g                             |
| 加餐                                                                     | 酸奶      | 酸奶(全脂含糖) 120g                               |
| 注: 除非特殊注明, 否则所有食物质量均为烹调前食物的净重。<br>提供能量 9083kJ (约等于 2170kcal), 蛋白质 91g。 |         |                                             |

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# 团体标准

T/CNSS 002-2019

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## 代餐食品

Meal Replacement

2019-11-22 发布

2020-01-01 实施

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中国营养学会发布

## 前言

本标准按照 GB/T 1.1-2009、GB/T 20001.10-2014 规则起草。

本标准由中国营养学会提出并归口。

本标准主要起草单位：中国营养学会营养健康研究院、中国疾病预防控制中心营养与健康所、北京营养源研究所、青岛大学、哈尔滨医科大学、北京大学第三医院、北京协和医院、上海交通大学附属第六人民医院、解放军总医院、国珍健康科技（北京）有限公司、烟台新时代健康产业有限公司、康宝莱（上海）管理有限公司、浙江诺特健康科技股份有限公司、内蒙古蒙牛乳业（集团）股份有限公司、上海巅峰体育管理股份有限公司、平安健康互联网股份有限公司。

本标准主要起草人：周瑾、杨月欣、韩军花、何梅、杨晓光、马爱国、孙长颢、常翠青、陈伟、葛声、刘英华。

# 中国营养学会团体标准

## 代餐食品

### 1 范围

本标准适用于需要控制体重的成年人群的代餐食品。

本标准适用于预包装食品，不适用于保健食品。

### 2 术语和定义

#### 2.1 代餐食品

为了满足成年人控制体重期间一餐或两餐的营养需要，代替一餐或两餐，专门加工配制而成的一种控制能量食品。

#### 2.2 部分代餐食品

为了满足成年人控制体重期间的一餐或两餐部分营养需要，代替一餐或两餐中部分膳食，专门加工配制而成的一种控制能量食品。

#### 2.3 份

指用于代餐食品营养标签，标示“份”的部分代餐食品以每餐计的摄入单位。

#### 2.4 能量

食品中的蛋白质、脂肪和碳水化合物等营养素在人体代谢中产生的能量。

食品中能量的计算根据主要供能成分含量乘以相应的换算系数加和而成。

#### 2.5 体质指数

体质指数(BMI)是一种计算身高别体重的指数，计算方法是体重(kg)与身高(m)的平方的比值。

#### 2.6 健康体重

健康体重是指体质指数在18.5-23.9之间的成年人(18-64岁)体重。

#### 2.7 超重

体重超过正常范围者。以体质指数(BMI)为判断指标。中国判断成年人超重的界限值：BMI24-27.9为超重。

#### 2.8 肥胖

体重超过正常范围者。以体质指数(BMI)为判断标准。中国判断成年人肥胖的界限值：体质指数(BMI)≥28。

### 3 技术要求

#### 3.1 基本要求

代餐食品形式包括固态、半固态和液态等。

代餐食品的生产条件应符合国家有关规定。

#### 3.2 原料要求

代餐食品中所使用的原料应符合相应的食品标准和/或相关规定，禁止使用非食品原料和禁用的物质。

3.3 感官要求

代餐食品的色泽、滋味、气味、组织状态应符合相应产品的特性。

3.4 技术指标

3.4.1 代餐食品

3.4.1.1 能量

代餐食品，每餐代餐食品所提供的能量应大于等于 835kJ(200kcal)，不高于 1670kJ (400kcal)。能量的计算按每餐代餐食品中蛋白质、脂肪、碳水化合物的含量乘以各自相应的能量系数 17kJ/g、37kJ/g、17kJ/g（膳食纤维的能量系数 8 kJ/g），所得之和为 kJ，再除以 4.184 为 kcal。

3.4.1.2 蛋白质

代餐食品中蛋白质提供的能量占总能量的 25-50%。蛋白质质量要求应符合以牛奶蛋白或鸡蛋蛋白为参考蛋白，PDCAAS 或 DIAAS 不低于 80%。蛋白质的检验方法参照 GB 5009.5。

3.4.1.3 脂肪

代餐食品中来源于脂肪的能量不应超过总能量的 30%；来源于饱和脂肪的能量不应超过总能量的 10%，不得使用氢化油脂。亚油酸供能比不低于 3.0%。脂肪酸的检验方法参照 GB 5009.168。

3.4.1.4 必须成分

代餐食品中必须成分的含量应符合表 1 的规定。

表 1 代餐食品必须成分指标

| 种类           | 每餐食品（以每餐提供量计） |      | 检验方法        |
|--------------|---------------|------|-------------|
|              | 最小值           | 最大值  |             |
| 膳食纤维/g       | 5             | 12   | GB 5009.88  |
| 维生素 A/ μg RE | 260           | 580  | GB 5009.82  |
| 维生素 B1/mg    | 0.4           | N.S. | GB 5009.84  |
| 维生素 B2/mg    | 0.4           | N.S. | GB 5009.85  |
| 维生素 C/mg     | 30            | N.S. | GB 5009.86  |
| 烟酸/mg        | 4.6           | N.S. | GB 5009.89  |
| 叶酸/ μg DFE   | 110           | N.S. | GB 5009.211 |
| 钙/mg         | 260           | N.S. | GB 5009.92  |
| 镁/mg         | 50            | N.S. | GB 5009.241 |
| 铁/mg         | 5             | 9    | GB 5009.90  |
| 锌/mg         | 3             | 7    | GB 5009.14  |

<sup>a</sup> N.S. 为没有特别说明。

3.4.1.5 可选择性成分

除表 1 规定的必须成分外，如果在代餐食品中选择性添加或标签标示含有表 2 中一种或多种成分，其含量应符合表 2 的规定。

表 2 代餐食品可选择性成分指标

| 种类                      | 代餐食品（以每餐提供量计） |       | 检验方法        |
|-------------------------|---------------|-------|-------------|
|                         | 最低含量          | 最高含量  |             |
| 维生素 D/ $\mu\text{g}$    | 0.5           | N. S. | GB 5009.82  |
| 维生素 E/（mg $\alpha$ -TE） | 4.5           | N. S. | GB 5009.82  |
| 维生素 B6/mg               | 0.4           | N. S. | GB 5009.154 |
| 维生素 B12/ $\mu\text{g}$  | 0.8           | N. S. | GB 5413.14  |
| 钾/mg                    | 100           | 1200  | GB 5009.91  |
| 磷/mg                    | N. S.         | 420   | GB 5009.87  |
| 钠/mg                    | N. S.         | 1000  | GB 5009.91  |

<sup>a</sup> N. S. 为没有特别说明。

#### 3.4.1.6 其他成分

如果在代餐食品中添加其他成分，应符合相应标准和/或有关规定。

#### 3.4.2 部分代餐食品

##### 3.4.2.1 能量

部分代餐食品，每份所提供的能量应大于等于 334kJ（80kcal），小于 835kJ（200kcal）。能量的计算按每份代餐食品中蛋白质、脂肪、碳水化合物的含量乘以各自相应的能量系数 17kJ/g、37kJ/g、17kJ/g（膳食纤维的能量系数 8 kJ/g），所得之和为 kJ/份值，再除以 4.184 为 kcal/份值。搭配其他膳食，每餐所提供的能量应大于等于 835kJ（200kcal），不高于 1670kJ（400kcal）。

##### 3.4.2.2 蛋白质

部分代餐食品，每份所含的蛋白质提供的能量占总能量的 25-50%且不低于 8 克。蛋白质质量要求应符合以牛奶蛋白或鸡蛋蛋白为参考蛋白，PDCAAS 或 DIAAS 不低于 80%。蛋白质的检验方法参照 GB 5009.5。

##### 3.4.2.3 脂肪

部分代餐食品，每份来源于脂肪的能量不应超过总能量的 30%；来源于饱和脂肪的能量不应超过总能量的 10%，不得使用氢化油脂。脂肪酸的检验方法参照 GB 5009.168。

##### 3.4.2.4 必须成分

部分代餐食品中必须成分的含量应符合表 3 的规定。

表 3 部分代餐食品必须成分指标

| 种类        | 部分代餐食品（以每份提供量计） |       | 检验方法       |
|-----------|-----------------|-------|------------|
|           | 最小值             | 最大值   |            |
| 膳食纤维/g    | 2.0             | 12.0  | GB 5009.88 |
| 维生素 B1/mg | 0.2             | N. S. | GB 5009.84 |
| 维生素 B2/mg | 0.2             | N. S. | GB 5009.85 |
| 钙/mg      | 80              | N. S. | GB 5009.92 |
| 铁/mg      | 2.5             | N. S. | GB 5009.90 |
| 锌/mg      | 1.5             | N. S. | GB 5009.14 |

<sup>a</sup> N. S. 为没有特别说明。

##### 3.4.2.5 可选择性成分

除表 3 规定的必须成分外，如果在部分代餐食品中选择性添加或标签标示含有表 4 中一种或多种成分，其含量应符合表 4 的规定。

表 4 部分代餐食品可选择性成分指标

| 种类                                      | 部分代餐食品（以每份提供量计） |      | 检验方法        |
|-----------------------------------------|-----------------|------|-------------|
|                                         | 最低含量            | 最高含量 |             |
| 维生素 A/ $\mu\text{g RE}$                 | 120             | 400  | GB 5009.82  |
| 维生素 D/ $\mu\text{g}$                    | 0.25            | N.S. | GB 5009.82  |
| 维生素 E/（ $\text{mg } \alpha\text{-TE}$ ） | 2               | N.S. | GB 5009.82  |
| 叶酸/ $\mu\text{g DFE}$                   | 50              | N.S. | GB 5009.211 |
| 维生素 B6/ $\text{mg}$                     | 0.2             | N.S. | GB 5009.154 |
| 维生素 B12/ $\mu\text{g}$                  | 0.4             | N.S. | GB 5413.14  |
| 维生素 C/ $\text{mg}$                      | 15              | N.S. | GB 5009.86  |
| 烟酸/ $\text{mg}$                         | 2.3             | N.S. | GB 5009.89  |
| 镁/ $\text{mg}$                          | 20              | N.S. | GB 5009.241 |
| 钾/ $\text{mg}$                          | 40              | 1200 | GB 5009.91  |
| 磷/ $\text{mg}$                          | N.S.            | 420  | GB 5009.87  |
| 钠/ $\text{mg}$                          | N.S.            | 1000 | GB 5009.91  |

<sup>a</sup> N.S. 为没有特别说明。

#### 3.4.2.6 其他成分

如果在部分代餐食品中添加其他成分，应符合相应标准和/或有关规定。

#### 3.4.3 产品类型

产品类型应符合相应产品属性。

#### 3.5 污染物限量

污染物限量应符合 GB 2762 中相同或相近产品类别的要求。

#### 3.6 真菌毒素限量

真菌限量应符合 GB 2761 中相同或相近产品类别的要求。

#### 3.7 致病菌限量

致病菌限量应符合 GB 29921 中相同或相近产品类别的要求。

#### 3.8 食品添加剂和营养强化剂

3.8.1 产品中食品添加剂的使用可参照 GB 2760 中相同或相近食品类别中允许使用的添加剂种类和使用量。

3.8.2 产品中添加的营养素，其所使用的营养强化剂化合物来源应符合 GB 14880 的要求。

3.8.3 食品添加剂和营养强化剂的质量规格应符合相应的标准和/或有关规定。

### 4 标签

4.1 产品标签应符合 GB 7718 的规定，营养标签应符合 GB 28050 的规定。

4.2 代餐食品能量、蛋白质、脂肪、必须成分和可选择成分含量标识应增加“每份”含

量的标识。

#### 4.3 食品的名称

标签中应在主要展示面标示“代餐食品”及产品所属分类。禁止使用减肥等相关名词。

4.4 应在标签中标示“孕妇、哺乳期妇女、婴幼儿、儿童、病人及老人不适宜食用”。

4.5 部分代餐食品，应在标签中标示“替代一餐中部分膳食，不宜单独替代一餐食用，应与牛奶、蔬果等其他食物搭配食用，合理饮食，均衡营养”。

#### 5 其他

5.1 使用超过两个月建议寻求营养师指导。

5.2 有关产品使用方法应在标签上明确说明。

5.3 必要时应标示食物禁忌或其他注意事项。

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## 附录 A

长期使用代餐食品和部分代餐食品营养素每日最低摄入量，如表 A. 1。

表 A. 1 长期使用代餐食品和部分代餐食品营养素每日最低摄入量

| 名称      | 最低摄入量             |
|---------|-------------------|
| 能量      | 3350 kJ (800kcal) |
| 蛋白质     | 50 g              |
| 维生素 A   | 600 $\mu$ g RE    |
| 维生素 D   | 2.5 $\mu$ g       |
| 维生素 E   | 10 mg             |
| 维生素 C   | 30 mg             |
| 维生素 B1  | 0.8 mg            |
| 维生素 B2  | 1.2 mg            |
| 烟酸      | 11 mg             |
| 维生素 B6  | 2 mg              |
| 维生素 B12 | 1 $\mu$ g         |
| 叶酸      | 200 $\mu$ g       |
| 钙       | 500 mg            |
| 磷       | 500 mg            |
| 铁       | 16 mg             |
| 碘       | 140 $\mu$ g       |
| 镁       | 350 mg            |
| 铜       | 1.5 mg            |
| 锌       | 6 mg              |
| 钾       | 1.6 g             |
| 钠       | 1.0 g             |