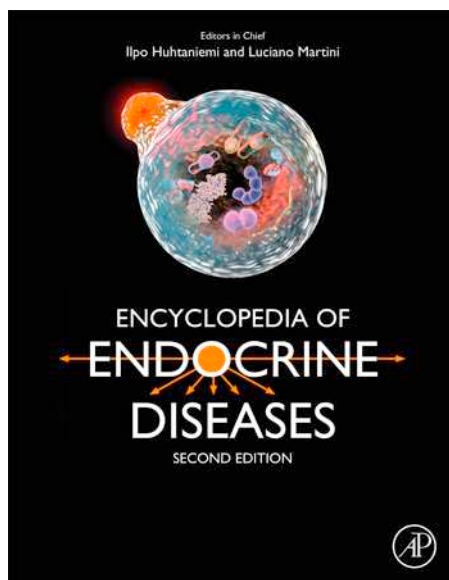


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Lifestyle and Nutrition

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Glossary

ADA diets Dietary approach based on American Diabetes Association recommendations.

AHA/ACC/TOS American Heart Association/American College of Cardiology/The Obesity Society.

AHI Apnea-hypopnea index used to indicate severity of sleep apnea. AHI is calculated by dividing the number of pauses of breathing (apnea) by the number of hours of sleep.

BMI Body Mass Index—a measurement based on height and weight, an indicator of the degree of nutrition.

DASH Dietary approach for regulation of hypertension.

FTO gene Fat mass and obesity-associated gene, associated with reproducibly with human body mass.

HbA1c Glycated hemoglobin, an indicator of the quality of glycoregulation for the last 3 months.

HCLF High-carbohydrate, low-fat dietary regimen.

HOMA IR Homeostatic model assessment, mathematical model for insulin resistance calculation.

HRQOL Health related quality of life.

LDL Low density lipoprotein, proatherogenic cholesterol.

MET Unit equal with energy expenditure at rest.

MUFAs Monounsaturated fat acids.

NIH National Institute for Health.

OSA Obstructive sleep apnea, common disorders in obesity which compromise oxygenation during the sleep.

REM Rapid eye movement, a sleep phase.

Severe obesity as a serious public health concern requires efficacious treatment. Available drugs are not enough efficacious and bariatric surgery is effective but expensive, thus some other treatments are needed. Lifestyle interventions can help severely obese individuals to achieve long-term weight loss and to improve the risk factors for cardiovascular diseases (Unick *et al.*, 2013).

The aim of lifestyle modifications is to reduce the burden of obesity and obesity related comorbidities. Some people consider that small amount of weight loss is disappointing, but even a small amount of weight loss like 5%–10% from baseline is associated with significant benefits. Sedentary behavior is associated with a lot of metabolic and cardiovascular comorbidities like obesity, diabetes, metabolic syndrome, and cardiovascular disease (Chau *et al.*, 2015). Environmental factors such as sitting jobs, access to television and the Internet in households for which people sit for hours in front of the screen cause lower energy expenditure. U.S. population spent sitting approximately 7.7 h/day (Matthews *et al.*, 2012; Liao *et al.*, 2011). Sedentary lifestyle leading to reduction in energy expenditure although overeating of high calorie foods increases energy consumption. Patients with lower educational level and low income have several times greater chance to develop sedentary lifestyle (Konevic *et al.*, 2015). One study on large sample of older adults in United Kingdom with self-reported TV viewing duration demonstrated that increasing in watching TV was associated with higher BMI besides other parameters for example, physical inactivity, lower socioeconomic status depression and being a smoker (Gardner *et al.*, 2014). Study conducted in United Kingdom on 3777 non obese adult participants analyzed association between TV viewing and obesity. Strong association was found between TV watching more than 6 h/day and central obesity but they did not find association between the time spent in front of TV screen and BMI > 30 kg/m². The possible explanation for isolated central but not overall obesity was that older people have predominantly central fat distribution.

Trying to collect the data regarding sedentary behavior a numerous authors used traditional questionnaire as the first-line tool. Disadvantage of this common method is that requiring long periods of recall. Some investigators use MET. 1 MET value is equal with energy expenditure at rest. MET has a disadvantage that cannot distinguish sitting from the standing position as well as a waking state of sleep (Owen *et al.*, 2011).

Different types of activity monitors, like accelerometry-based monitors have been used in order to measure sedentary time, or time spent in physical activity. Those accelerometer fixed to the hip could detect body position (sitting, standing, lying). Inclinometers with higher ability than accelerometer to detect change in posture had been used in another type of devices (Trost *et al.*, 2005; VAN Loo *et al.*, 2017).

In order to develop tool for objective monitoring with ability to correct errors in the self-report method physical activity measurement survey (PAMS) was conducted as NIH-funded project. 24PAR (physical activity recall) RC was acceptable to respondents because they were supposed to provide data regarding physical activity only from the previous day (Dunton *et al.*, 2009).

Specialist in behavioral epidemiology suggests six phases of research in order to advance approach to sedentary behavior. The first phase is identifying associations between sedentary behavior and health conditions, there are also adequate measures of sedentary behavior, defining prevalence of sedentary behavior across different populations, identifying the determinants of sedentary behavior, developing interventions to influence in sedentary behavior and using the relevant evidence for public health guidelines and policy (Owen *et al.*, 2010).

Change in lifestyle is the first step in management of obesity. Term "lifestyle" includes dietary habits and physical activity. In order to help patients to implement new lifestyle recommendations, physicians should be interested in patients' lifestyle history and possible contributors to weight gain. Information about previous weight reductions attempts, medical conditions and therapy and family history of obesity could be very useful in planning strategy for weight management for every patient in order to reach therapeutic goals. Desirable weight loss from baseline is 5%–10% within 6 months according the AHA/ACC/TOS guidelines (Jensen *et al.*, 2014).

The energy deficit of at least 500 kcal/day is necessary for weight loss. This deficit could be provided by calorie restriction or through physical activity. Best results achieving the patients who combine the both approach which are including in group sessions or in individual program with trained interventionist.

Usual components of weight loss program are reduced calorie-intake. At the same time or soon after the start of the dietary regime it is recommended to gradually intensify physical activity. Recommendations for childhood obesity treatment included also multi-disciplinary approach, integrated care model and family-based multicomponent behavioral therapy (Wilfley *et al.*, 2017).

Lifestyle intervention begins during the pregnancy. Pregnant women are the first in line for implementation a lifestyle intervention in order to prevent obesity. It was demonstrated that increased intake of refined-grain during pregnancy was significantly related to a greater BMI among children in 7 years of age (Zhu *et al.*, 2017).

Change in dietary habits and physical activity influences not just on metabolic obesity related disorders but also on obstructive sleep apnea (OSA). One study analyzed OSA severity in REM (rapid eye movement) sleep, in overweight patients with diabetes type 2, during 4 years follow-up under the intensive lifestyle intervention. Lifestyle changes reduced severity of OSA, REM-AHI, and NONREM-AHI as well as HbA1c and other metabolic parameters. Weight loss was a better predictor of improving glycemic control than reductions in AHI Fig. 1 (Shechter *et al.*, 2017).

Despite one meta-analysis from Arabic-speaking countries indicated that lifestyle modifications programs were no more effective than other treatments (Kreidieh *et al.*, 2017) the most of studies demonstrated tight connection between lifestyle intervention and improvement in metabolic and cardiovascular diseases (Shechter *et al.*, 2017; Stavropoulos *et al.*, 2017; Bloch, 2017; Davy and Melby, 2003; Gulati and Misra, 2017).

Dietary Treatment

Dietary treatment was probably the first and main therapeutic approach for obesity in the past. This treatment is based on negative energy balance caused by lower energy intake but also in change in composition of food and proper rhythm of meals. There are a numerous available commercial diets but fad or crash diets published in magazines could damage health and should be avoided. Diets have to be medically confirmed and, if it is possible, patient tailored. Long-term calorie reduction with appropriate ingestion of necessary nutrients reduces the risk for obesity comorbidities (Sofer *et al.*, 2015).

Common dietary recommendations are:

- Reducing fat, carbohydrates with high glycemic index, protein or alcohol consumption
- Smaller portion size
- Distribution of energy intake at various time of day with a largest amount of calorie was taken in the morning
- Low-calorie food
- Combining different foods

After successful diet the main issue is how to maintain the weight loss. Eating habits need to change for a long time.

During the time there were different dietary recommendations. The data indicate that improving in dietary ingredients influence on blood glucose, insulin, serum lipids, and inflammatory markers. In order to prevent vitamin and mineral deficiency

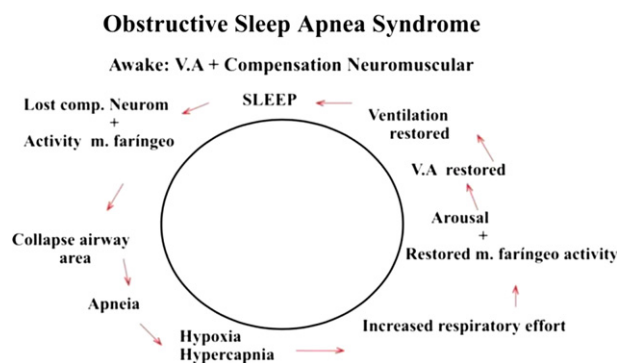


Fig. 1 Obstructive sleep apnea syndrome. From Maciel de Carvalho, T. (2015). Obstructive sleep apnea in Down syndrome children. *EC Dental Science* 2(4), 321–327.

well balanced diet is recommended. Change in food ingredients implies more complex carbohydrates, more monounsaturated fatty acids and increasing in protein intake.

The data show that improving quality of carbohydrates (more complex carbohydrates), improving fat quality (more monounsaturated fatty acids and omega three polyunsaturated fatty acids) and increasing protein intake could improve blood glucose, serum insulin, lipids, inflammatory markers and hepatic fat, but more studies are needed (Stavropoulos *et al.*, 2017).

Traditional dietary recommendations for obesity and obesity related co morbidities include high-carbohydrate, low-fat (HCLF) regimens. Despite the positive experience with HCLF diet and scientific approval this diet for metabolic disease management, the rates of obesity and metabolic syndrome continue to rise. The Women's Health Initiative study demonstrated that the low-fat diet failed to prevent cardiovascular events, cancer and impaired glycemic control in patients with diabetes (Howard *et al.*, 2006). Dietary Guideline Advisory Committee in the United States in 2015 withdrawn recommendation for fat limitation and concluded that limiting total fat intake could not prevent obesity (Mozaffarian and Ludwig, 2015). In some populations, low-carbohydrate diet was accepted as dietary therapeutic approach for some diseases. In Japan, low-carbohydrate diet proves to be effective in patients with type 2 diabetes. NIPPON DATA 80 had shown that low-carbohydrate diet is safe, effective and strongly associated with lower mortality rate in Japanese population.

Ketogenic Diet

Ketogenic diet with extremely low carbohydrate intake, less than 50 g/day are associated with lipid profile impairment. The main concern in a low-carbohydrate diet is increase in lipid levels and cardiovascular risk (Kwiterovich *et al.*, 2003).

There is evidence that a high intake of carbohydrates may influence abnormalities associated with metabolic syndrome. A lot of studies emphasize the importance of dietary fiber intake.

Dietary fibers provide sense of fullness and prolonged satiety. Also fibers rich diet allows gradually degradation of carbohydrates and low serum glucose oscillations. Therefore, high fiber diets could delay further impairment of glucose toleration (Table 1) (Polovina and Micić, 2010). Eating carbohydrates last ("Carbo-last" diet) is based on facts that eating vegetables first (dietary fibers), than meat and staple food caused suppression of gluconeogenesis. Underlying mechanism of delay gastric emptying in this diet is incretin effect (Kuwata *et al.*, 2016).

Mediterranean Diet

Mediterranean diet composed by olive oil, fruits, vegetables, whole grains, nuts, legumes, small amounts of diary (cheese and yogurt) and fish has proven effect in preventing diabetes (Sofer *et al.*, 2015). The same diet was not such effective in glycemic control in patients with diabetes. Possible explanation for unsatisfied glycemic control is greater fruit intake in Mediterranean diet that is recommendable for diabetic patients (Díez-Espino *et al.*, 2011). The main difference between the Mediterranean and ADA diets is in monounsaturated (MUFAs) content. MUFAs has impact on insulin sensitivity, postprandial glucose level, and lipid profile (Esposito *et al.*, 2010).

DASH

DASH trial demonstrated that an HCLF diets with 20–35 g/day dietary fiber intake (regarding recommendations of the American Dietetic Association), may be beneficial for patients with metabolic syndrome (Bloch, 2017). Another, most popular diet is low-carbohydrate, high fat diet regimens well known as Dr. Atkins' new diet revolution. Despite popularity, there is no enough scientific evidence in favor of safety and efficacy of this diet on cardiovascular health (Stevens Ohlson 2006; Davy and Melby, 2003).

Table 1 Metabolic parameters before and 12 weeks after fiber rich diet

Parameter	Group A BD	Group A AD	P	Group B BD	Group B AD	P
Waist circumference	123 ± 28.6	116 ± 23.2	<.001	129 ± 36.2	131 ± 34.6	NS
FPG	6.1 ± 0.7	5.4 ± 0.5	<.05	6.2 ± 1.1	6.2 ± 0.8	NS
Insulin	123 ± 36	86 ± 19.1	<.05	121 ± 24.2	124 ± 22.1	NS
HOMA IR	9.8 ± 3.2	5.03 ± 1.3	<.001	10.3 ± 3.1	10.8 ± 2.8	NS
HDL-c	0.96 ± 0.5	1.1 ± 0.3	<.05	0.92 ± 0.7	0.9 ± 0.1	NS
Triglycerides	2.9 ± 1.1	2.1 ± 0.6	<.001	2.7 ± 0.9	2.5	NS

BD, before diet; AD, after diet; FPG, fasting plasma glucose; HOMA IR, homeostatic model assessment for insulin resistance; HDL-c, high density lipoprotein cholesterol.

From Polovina, S. and Micić, D. (2010). The influence of diet with reduction in calorie intake on metabolic syndrome parameters in obese subjects with impaired glucose tolerance. *Medicinski Pregled*, 63(7–8), 465–469. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21446131> [Accessed January 11, 2017].

Vegetarian Diet

Vegetarian diet is presented in two principles: vegan (do not eat animal products), lacto-vegetarian (consuming dairy products along plants), ovo-vegetarian (using eggs along plants), and lactoovo-vegetarians (eat dairy and eggs besides plants). Previous studies demonstrated that vegan diet is more successful in total cholesterol and LDL-c lowering, HBA1c reduction and reduction in diabetes drugs than standard ADA treatment although weight reduction was similar. The overall conclusion was that vegetarian diets could have positive effect on glycemic control and noninferior effect on weight reduction (Ajala *et al.*, 2013).

A communities should engage their resources in order to address obesity-related behaviors and implementation healthy eating and activity across the lifespan (HEAL) integration model (Berge *et al.*, 2017). Finally, regulatory framework must be tightened to impose taxes on sugar-sweetened beverages, oils such as palmolein, and dietary fats and limit trans fats (Gulati and Misra, 2017).

In order to achieve greater weight loss “meal replacement programs” were developed. The main characteristic of these programs is replacing normal meals with prepared meal supplements like soups, bars or vitamin-rich shakes. The meal replacement formulas provide enough energy that not causes malnutrition. Underlying mechanism of this treatment is mild ketosis induced by limited carbohydrates intake. Ketosis is a consequence of break down fat storage for energy (Proietto and Baur, 2004).

Some authors underlined the importance of time for food intake. One study showed that carbohydrates eaten just at dinner could decrease abdominal obesity and parameters of metabolic syndrome. One animal study demonstrated that time-restricted feeding improved insulin resistance, inflammation, fat content in liver, obesity and obesity related comorbidities. This study also shows that timed high-fat diet provides better satiety and significant lower ghrelin concentrations. Late main meal is associated with less weight reduction despite nutrient composition, energy expenditure, and sleep duration. Greater weight loss and waist circumference reduction was in large breakfast group due to lower ghrelin level and high satiety scores. This group is also characterized with significant improvement in HOMA IR.

The most satiating nutrient is dietary protein. Proteins could increase feeling of fullness and reduce the hunger (Jiwa *et al.*, 2015). Addition amount of protein in breakfast might help to reduce hunger in the middle of the day (Ossolinski *et al.*, 2017). Some studies conducted during Ramadan demonstrated that concentrated carbohydrate intake at dinner time, but no during the day, could be helpful for obese people or for people with metabolic syndrome. One possible underlying mechanism is increase in serum leptin at midday and feeling of satiety and reduced level of ghrelin. Adiponectin, antiinflammatory hormone, which is low in obese people, become elevated after a whole day starvation. This antiinflammatory effect reduced risk factors for metabolic syndrome (Kreidieh *et al.*, 2017).

Physical Activity

Physical inactivity is associated with increased risk for several noncommunicable diseases and one of the main causes of mortality. Increased physical activity play very important role in long-term maintaining weight loss (Catenacci and Wyatt, 2007). Current recommendations are that adults should have at least 150 min of moderate-intensity physical activity during a week (Kohl *et al.*, 2012). The represent of moderate-intensity physical activity is walking. Walking provides psychological and physical benefits, requires minimal equipment, and risk for injury is low (Baker *et al.*, 2010).

Although lifestyle interventions including physical activity and change in dietary habits, weight regain and returning to sedentary behavior are common in high number of patients. Self-monitoring or group support could be very important in maintained the intense of physical activity over a long period of time. Results from SAVE (slow the adverse vascular effects) study demonstrated that, in comparison to patient who did not use any specific strategies to apply lifestyle interventions, patients who used self-monitoring or group support had greater increase in physical activity (Lott *et al.*, 2017).

Study conducted in order to analyze association of sedentary lifestyle and obesity in EU shown that obesity prevalence was greater in those who spent more than 35 h sitting during a leisure time per week in comparison with those people who spent this time in physical activity (Martínez-González *et al.*, 1999).

There was no definitive conclusion that physical activity could facilitate greater improvement in HRQOL than diet alone. Also, there was no existing evidence that an exercise prescription without diet for may improve HRQOL in obese adults (van den Hoek *et al.*, 2017).

One animal study had shown association between that high-intensity interval in Rev-erb α and CPT1 expression and prevention of diet-induced obesity. The authors concluded that increased caloric expenditure achieved with HI interval protocol might be useful to improve lipid metabolism (Shen *et al.*, 2015).

In order to maintain weight loss increased physical activity is essential beside dietary treatment. Exercise program should be gradually built up along with cardio respiratory fitness improvement. About 30 min of walking 3/5 days per week is recommended for as a good start point. The patients could start with walking to nearby places, climbing the stairs rather than choosing escalator or elevator. For extremely obese activities in water such swimming or walking could improve fitness on the beginning. Psychologist could help obese patients to produce a long term adherence to exercise program. Adherence to the diet and physical activity vary depend of age and motivation. One nationwide survey shown that structured program in school campus may help that children accept healthy lifestyle (Proietto and Baur, 2004).

In order to support increased physical activity, self-monitoring using pedometers could be effective. One investigation implemented pedometers as motivational tools to motivated males in maintained of physical activity. This weight management

program for overweight or obese men lasted 12 weeks. The results shown that in majority of participants pedometer provide proof of progress and enabled autonomy in monitoring the program effect. Those participants that accepted pedometer as allied felt increasing competence for change. The minority of men who not achieved the physical activity goals felt pedometer as controlling. Some man continued to use pedometers after the program because they found that pedometer helps them to maintain their physical activity. The men which no longer used the pedometer were less successful in weight loss (Donnachie *et al.*, 2017).

Motivation for Lifestyle Change

During past time, there was a lot attempts to established the best therapeutic approach to motivate obese patients to lose a weight. One approach was multidisciplinary obesity treatment program (MOTP) with the idea to achieving long-term outcome regarding weight reduction and emotional state. The second objectives of this program were to analyze the influence of psychological factors on weight change. The first, intensive treatment part of this program lasted 12 weeks, included dietary counseling, exercise and cognitive behavioral therapy in order to define realistic weight goals and dysfunctional eating habits if they are existed. They were trained in emotion regulation skills. Dietetic counseling included facts about balanced diet, combination of nutrients and reduction of some ingredients. The exercise program consisted of water gymnastics, Nordic walking or weight lifting. The program included session with psychotherapist which analyzed the progress of patients. Patients and psychotherapist also evaluated obstacles to their goals. The patients visited dietician once monthly and trained doctor every 3 months. Results showed that MOTP was associated with improved obesity related psychological factors like attention, emotions, somatization, depression, and shame. These patients also experienced significant weight loss (Pjanic *et al.*, 2017).

Behavioral therapy for obesity, based on behaviorism, was introduced in 1960s. Behavior (sedentary lifestyle and overeating) influenced in occurrence of obesity. Specific educational programs are designed in order to facilitate changes in eating habits and physical activity thru modification of environmental elements and reinforcements of food intake. In next years in behavioral therapy were integrated some procedures derived from cognitive therapy. Those procedures in combination with dietary changes and exercise were recognized as weight-loss style modification (Dalle Grave *et al.*, 2013).

Conscious cognitive processes play important role in weight reduction and maintaining weight. Specific cognitive factors are associated with unhealthy eating habits, dietary treatment discontinuation, and weight loss maintenance. More than half of patients on behavioral therapy experienced weight regain after 5 years. In the first decade of 21st century Cooper developed cognitive behavioral therapy for obesity (CBT-OB) in order to address the fail in behavioral treatments used in weight loss. CBT-OB analyzed factors responsible for failure to achieve desirable weight loss and weight maintained like unrealistic weight goals and unsatisfied training in weight maintained (Dalle Grave *et al.*, 2017).

Multistep cognitive behavioral therapy for obesity may be implemented at three levels of care: outpatient, day hospital, and residential. CBT-OB incorporates the physical activity and dietary recommendations and cognitive behavioral strategies. In study with multistep CBT-OB approach, outpatient CBT-OB was leading by single therapist in group or individually. The first step was to lose weight at least 10%, and the second one was to develop a mind-set conducive to weight maintenance. Each patient was given a low-calorie Mediterranean diet and functional rehabilitation program in order to improve cardio respiratory capacities. Patients were passing thru six modules: monitoring food intake, physical activity and body weight, changing eating with 500–750 kcal deficit per day, active lifestyle, impediments to weight loss, addressing to weight loss and addressing to weight loss maintained. Patients achieved more than 10% weigh loss with no weight regain in further 12 months. Patients with binge eating disorder before hospitalization, after 3 week of residential CBT-OB showed recovering from binge eating disorder (Calugi *et al.*, 2016). Authors concluded that CBT-OB is suitable for extreme obese patients and obesity related comorbidities including the patients referred for bariatric surgery (Dalle Grave *et al.*, 2017).

Visual effect is very important for majority of people. This appearance is also highly important for obese people who wish to reduce weight.

Change in dietary habits and physical activity requires initial motivation of obese person and further, continued effort to maintained new lifestyle. One study demonstrated that computerized future self-image may be useful in weight loss, especially in female population (Jiwa *et al.*, 2015; Ossolinski *et al.*, 2017). This pilot study used application “future me” which included dietary and exercise information in order to predict BMI. One self-image from the future time points has been chosen and was printed as well as current image. Patients were also chosen to receive future self-image on the beginning of the investigation or after 8 weeks after start. Greater weight reduction was in group with delayed self-image. The possible explanation for this unrespectable result was that future self-image stimulates additional effort for further weight loss after a few weeks of weight reduction attempt (Ossolinski *et al.*, 2017).

Barriers to Behavior Change

Poor motivation, social and environmental pressure, socioeconomic status, lack of knowledge or physical limitations could be barriers to lifestyle change. The predictors of behavior compliance are older age, male sex, lower baseline BMI, and weight loss in early phase of treatment. This data suggest that program for lifestyle change should be individualized. Unrealistic expectations regarding weight reduction and negative mood could implicate lack in adherence (Burgess *et al.*, 2017). Large trial Look AHEAD

investigated possible association of degree of weight reduction and fitness with cardiovascular events. This study included 5145 overweight or obese participants with type 2 diabetes in United States who were randomized to lifestyle intervention or to diabetes education and support. Results suggest tight association between degree of weight reduction and incidence of cardiovascular disease in patients with type 2 diabetes (Look AHEAD Research Group *et al.*, 2016). This findings are the challenge for community to incorporate intensive lifestyle intervention into public health programs. One of community-based lifestyle weight loss program adapted from Look AHEAD trial is Lifestyle Interventions for the Treatment of Diabetes study (LIFT Diabetes) with reduction in CVD risk as a primary goal (Katula *et al.*, 2017).

Therapeutic treatment could be slightly difficult in obese adolescents who have an aversion to usual obesity management. Using *E*-health lifestyle intervention might be useful to reach desirable aim in this population. One study demonstrated that adolescents who participated in the *E*-health lifestyle intervention had a greater decrease in BMI than those who did not participated in this program. This program with login on a weekly basis was supported by at least one parent of adolescent. Web-based intervention encouraged healthy eating, reduced screen time and physical activity during 8 months. *E*-health intervention delivered through the internet is cost-effective and acceptable method for adolescents (Tu *et al.*, 2017).

If outpatient treatment failed in initial weight loss, inpatient management could be useful. Study conducted in one inpatient clinic, showed that 4-week inpatient program in closed group, enabled satisfied weight reduction, and maintained further weight loss during the first year after inpatient stay. Program included dietary, exercise and behavior modules. Patients who reduced weight of > 10% were offered to participate in 2-week stabilization program. After dismiss patients and the clinic team maintains contact by phone or by mail. This approach could prevent weight regain (Weinreich *et al.*, 2017).

Fat mass and obesity associated protein (FTO) is one of the most important gene with impact on energy balance and food intake. Single nucleotide polymorphisms in the FTO gene causes desire for intake energy rich foods. The effects of FTO gene on effect of lifestyle intervention are controversial although some study demonstrated that improvement in environmental factors (lifestyle) can reduced effect of FTO polymorphisms on obesity. One study showed that reduced calorie intake could help in patients with FTO risk allele (Kalantari *et al.*, 2016).

In case that lifestyle change failed in weight loss, combination of calorie restriction and some drugs could be useful. Lorcaserin with behavioral weight loss facilitates the maintenance of losses of $\geq 5\%$ of initial weight (Tronieri *et al.*, 2017).

In spite everything that has been said, some authors suggest that simply treating of obesity with the "best diet" should not solve the problem with chronic noncommunicable metabolic diseases. They also warning that weight loss should not be only one problem when low-grade inflammatory processes may be related to serious metabolic disorders (Egger and Dixon, 2014).

Summary

Change in lifestyle is the first step in management of obesity. The term "lifestyle" includes dietary habits and physical activity. Lifestyle interventions can help severely obese individuals to achieve long-term weight loss and decrease risk for cardiovascular diseases. A small amount of weight loss is associated with significant health benefits. The energy deficit of at least 500 kcal/day is necessary for weight loss. This deficit could be provided by calorie restriction or through physical activity. Best results achieving the patients who combine the both approach which are including in group sessions or in individual program with trained interventionist. There are a numerous available commercial diets but fad or crash diets published in magazines could damage health and should be avoided. Diets have to be medically confirmed and, if it is possible, patient tailored. Long-term calorie reduction with appropriate ingestion of necessary nutrients reduces the risk for obesity comorbidities. In order to maintain weight loss increased physical activity is essential beside dietary treatment. Exercise program should be gradually built up along with cardio respiratory fitness improvement. Change in dietary habits and physical activity requires initial motivation of obese person and further, continued effort to maintained new lifestyle.

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