

## Review Article

## Lifestyles and Their Relationship with Obesity

Shashi K. Agarwal, MD\* 

Center for Contemporary and Complementary Cardiology, 2227 US Highway 1, Suite 309, North Brunswick, NJ 08902, USA

ORCID: 0000-0003-0007-5582

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**Abstract:** Five lifestyles appear to play a major role in morbidity and mortality with major diseases. These include smoking, alcohol consumption, exercise, diet, and body weight. Li *et al.* using data from the Nurses' Health Study and the Health Professionals Follow-up Study estimated that adherence to all five healthy lifestyles increases the lifespan at age 50 by 14 years in females and 12.2 years in males when compared with those with zero low-risk factors. Excess body weight with a BMI of  $>30$  is classified as obesity. Obesity is recognized by the World Health Organization (WHO), along with several National and International medical and scientific societies as a disease. It has become a worldwide epidemic and has deleterious effects on most major health disorders, such as cardiovascular diseases, diabetes mellitus, and cancer. Obesity is also interlinked with other health lifestyles. This relationship is discussed in this manuscript.

**Keywords:** Smoking, lifestyles, exercise, alcohol, diet, obesity.

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## INTRODUCTION

Obesity has become a global epidemic [1]. Globally, obesity rates have tripled since 1975 resulting in 1 out of 3 people being currently classified as overweight or obese [2]. Within the United States, 72% of adults are overweight, while 40% are characterized as obese based upon a body mass index greater than or equal to  $30 \text{ kg/m}^2$  [3]. Europe has the second-highest proportion of overweight or obese people, with obesity rates over 30% in most countries [4]. Several low- and middle-income countries, like China, India, and Brazil have also seen a major rise in the prevalence of obesity [5]. It has also been increasing at an alarming rate among African countries [6]. The excessive weight gain is not limited to adults; it is also affecting children and adolescents [7]. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 and 39 million children under the age of 5 were overweight or obese in 2020 [8]. UNICEF estimates that in the pediatric and adolescent population, the prevalence rate of obesity has reached 21.4% [9]. According to UNICEF, WHO, and the World Bank, Southern Africa has the highest prevalence of overweight among children less than 5 years (14.6%), followed by Central Asia (11.6%) and Northern Africa (11.0%) [10]. It is estimated that globally, the prevalence of overweight and obesity will reach 1.35 billion and 573 million respectively by 2030 [11].

Obesity is commonly defined by the body mass index (BMI) [12]. BMI ( $\text{BMI} = \text{kg/m}^2$ ) is calculated by calculating the weight in kilograms divided by the height in meters squared or the weight in pounds divided by the height in inches squared and multiplying this value 703 ( $\text{BMI} = (\text{lbs/in}^2) \times 703$ ) [13]. In adults (age over 18 years) BMI is categorized into several groups:  $< 19.9 \text{ kg/m}^2$  (underweight),  $20.0\text{--}24.9 \text{ kg/m}^2$  (normal weight), and  $25$  to  $29.9 \text{ kg/m}^2$  (overweight) [14]. Obesity is defined as a BMI exceeding  $30 \text{ kg/m}^2$  and is subclassified into class 1 ( $30\text{--}34.9$ ), class 2 ( $35\text{--}39.9$ ), and class 3 or severe obesity ( $\geq 40$ ) [15]. A BMI  $>50 \text{ kg/m}^2$  represents morbid obesity. The International Obesity Task Force has recommended different BMI categories for Asians, due to their physical structure and increased abnormal fat accumulation [16]. These were as follows: underweight ( $<18.5 \text{ kg/m}^2$ ), normal (between  $18.5$  and  $23 \text{ kg/m}^2$ ), overweight (between  $23$  and  $25 \text{ kg/m}^2$ ), obese (between  $25$  and  $30 \text{ kg/m}^2$ ), severe obese ( $\geq 30 \text{ kg/m}^2$ ). BMI is not used for children and adolescents aged 2 to 18 years; instead, a percentile scale based on the child's sex and age is used. In this population, overweight is defined as a BMI in the 85th to 94th percentile, and obesity is a BMI at or above the 95th percentile [17].

BMI is only related to total body weight, and it does not indicate fat distribution or weight composition

[18]. Excessive fat deposition in and around the viscera in the abdomen is more harmful and may exist despite a normal BMI [19]. This visceral or central obesity can be objectively ascertained by several anthropometric measurements [20]. The commonest used is the waist circumference (WC). WC should ideally be <102 cm in males and <88 cm in females when measured to the nearest 0.1 cm at the umbilical level in a standing position [21]. In the Asian populations, these numbers are <85 cm for males and, <80 cm for females. Higher values indicate central obesity. Many researchers have also used another anthropometric measurement, waist to hip ratio. This is normally 0.85 or less for women and 0.9 or less for men. And higher values are abnormal [22]. The waist-height ratio is calculated by dividing the WC by height. A ratio < 0.5 indicates no central obesity and  $\geq 0.5$  is consistent with central obesity [23].

Obesity increases the risk of developing several chronic diseases [24]. These include cardiovascular diseases, diabetes mellitus, obstructive sleep apnea, asthma, depression, chronic kidney disease, non-alcoholic fatty liver disease (NAFLD), arthritis, dementia, gastroesophageal reflux disease, psychiatric disorders, and infertility [24-38]. Obesity can increase complications related to pregnancy [39]. It is also harmful to the psyche and may lead to psychosocial distress, low self-esteem, and feelings of rejection [40]. Obese patients often have heightened anxiety, body image dissatisfaction and may face weight bias and stigma [41]. Obesity also increases the risk of several acute conditions such as nonallergic rhinitis, increased risk of nosocomial and urinary tract infections, and cellulitis [42, 43]. Obesity has also been recognized as an independent risk factor for COVID-19 infection [44]. Obesity also causes several health problems in children, including early puberty, menstruation irregularities, sleep disorders, hypertension, diabetes, and NAFLD [45]. Childhood obesity may be associated with reduced self-esteem, low body image, anxiety, depression, poor peer relationships, academic underachievement, and discrimination [46]. These psychological effects can negatively modify a child's future. Further, childhood obesity also predicts adult obesity and increases the risk for adult-onset obesity-related ailments [47]. Overall, obesity in children and adults is associated with increased mortality [48] and higher economic costs to society [49].

Obesity leads to increased expression of pro-inflammatory adipokines and diminished expression of anti-inflammatory adipokines, resulting in the development of a chronic, low-grade inflammatory state [50]. It induces insulin resistance, hyperinsulinemia, and an abnormally increased blood level of insulin-like growth factor [51]. Androgens and androgenic precursors are converted to estradiol by the enzyme aromatase, the activity of which is increased in obese patients [52]. This leads to higher levels of estrogens

and estrogens promote tumorigenesis, especially in the breasts of post-menopausal women [53]. Obesity is associated with reactive oxygen species production, which contributes to tumor promotion via mitochondrial and DNA damage [54]. Obesity may also induce harm via many other physio-pathological and mechanical effects [55].

## DISCUSSION

Healthy lifestyles reduce the risk and progression of several major diseases (such as cardiovascular disorders, diabetes, chronic respiratory diseases, and cancer) [56]. They are associated with a decrease in the number of emergency department visits and hospitalizations [57]. They also help improve the overall health quality of life [58] and decrease mortality [59]. Li et al using data from the Nurses' Health Study and the Health Professionals Follow-up Study (total of 123,219 participants) estimated that adherence to all five healthy lifestyles – not smoking, alcohol intake in moderation, maintaining a normal BMI, and exercising regularly, increases the lifespan at age 50 by 14 years in females and 12.2 years in males when compared with those with zero low-risk factors [60]. The maintenance of normal body weight is a major lifestyle factor. Obesity is influenced by other lifestyle behaviors.

### Smoking

The relation between smoking and obesity is complex. Acutely, nicotine increases energy expenditure [61] and reduces appetite, resulting in weight loss [62]. However, smokers have higher WC and a higher waist-to-hip ratio than non-smokers, due to an unfavorable fat distribution [63]. Clair *et al.*, in a population-based survey, reported that abdominal obesity in smokers increased with an increase in the number of cigarettes smoked [64]. The Odds Ratio (OR) in men who were moderate smokers was 1.28) and in heavy smokers was 1.94) [64]. In women, the OR was 1.07 in moderate smokers and 2.15 in heavy smokers [64]. CAT scans have also confirmed that smokers have a higher visceral to subcutaneous adipose ratio [65].

Quitting smoking is associated with weight gain [66]. A meta-analysis of 62 studies reported that after 12 months of abstinence, quitters gained an average of 4.67 kg [6]. Nicotine withdrawal slows the metabolic rate and resets appetite, increasing the calorie intake by 250–300 kcals per day [68-70]. Although the weight gain may temporarily increase cardiometabolic risk [71, 72] and there are no long-term deleterious effects [73, 74]. Smoking cessation reduces the risk of atherosclerosis, hypertension, and dyslipidemia [74]. It also reduces cardiovascular morbidity and mortality [75]. All-cause mortality is also decreased, despite the post-cessation weight gain. Liu *et al.* reported that all-cause mortality among long-term quitters >6 years since smoking cessation was reduced among those with weight gain of 0.1–5.0 kg (Hazard Ratio or HR=0.57)

and those with a weight gain of  $> 5.0$  kg (HR-0.51) [76]. Overall, data is clear that the benefit of smoking cessation outweighs any harm due to smoking cessation-related weight gain [77].

Co-occurring obesity and smoking increase the risk of many types of cancer, insulin resistance, and cardiovascular morbidity, and mortality [78]. Combining obesity with current smoking increases the risk of premature death more than 5-fold [79]. Maternal smoking leads to a higher risk for children being overweight/obese [80]. Obesity in smokers is also associated with substantial mental and physical health burden [81].

### Alcohol

The relationship between alcohol intake and body weight is also complex. As has been repeatedly noted in the medical literature, light to moderate drinking (alcohol intake of  $<40$  gm a day in women and  $<60$  gm a day for men) [82] is beneficial for a wide array of medical conditions [83-85] and does not result in weight gain or an increase in WC [86]. Moderate alcohol intake is considered as two standard drinks a day for men and one standard drink a day for women [87]. Moderate drinkers tend to follow healthier lifestyles, such as eating more fruits and vegetables, and exercising regularly which helps prevent weight gain [88, 89]. An alcohol intake of  $>60$  g/day in men and  $>40$  g/day in women is considered heavy drinking [90]. This may occur in binge drinkers [91] or those with alcohol use disorder [92]. Heavy drinking habits have been more consistently linked with higher adiposity [93].

Alcohol provides additional energy, which becomes additive to that derived from other dietary sources [94]. There is 7.1 kcal (29 kJ) in one gram of alcohol [95]. One 12-ounce standard beer contains about 160 calories while a glass of white wine can have as much as 300 calories. One gin and tonic can have as much as 300 calories. A heavy drinker may be consuming an extra 1000 to 3000 calories per day on top of their diet. Alcohol has been reported to account for 16% of adult drinkers' total energy intake in the United States [94]. Men consume about three times the amount of alcohol consumed by women [94]. Men also tend to drink more beer which is rich in carbohydrates and may provide more calories [96]. Several studies suggest that consuming alcohol before or during a meal does not influence the amount of food eaten in that meal, despite increasing the total caloric intake [95]. This increased caloric intake promotes a positive energy balance and often leads to weight gain. Heavy drinking and binge drinking have been consistently linked with adiposity [8].

Besides providing additional calories to a meal, alcohol also stimulates food intake<sup>95</sup>. Several mechanisms have been implicated. Alcohol can

increase appetite by influencing opioid, serotonergic, and GABA pathways in the brain [97-99]. Alcohol may also inhibit the effects of leptin, or glucagon-like peptide-1 (GLP-1), thereby influencing satiety [100]. Mechanisms related to alcohol-induced reduction in fat oxidation may also lead to higher body fat in the long term [101]. Fischer *et al.* suggest that traits that predispose individuals to binge drinking may also predispose to binge eating [102]. Heavy drinkers also have an amplified perception of appetite, when stimulated to eat [95]. Many other factors like socioeconomic status, behavioral changes, metabolic effects, etc. may also play a role in alcohol related obesity [103].

### Exercise

One MET equals an energy expenditure of 1 kcal/kg/hour or an oxygen uptake of 3.5 ml/kg/min [104]. Sedentary behavior is defined as any waking behavior characterized by an energy expenditure  $\leq 1.5$  metabolic equivalents while in a sitting, reclining, or lying posture [105]. Common sedentary behaviors include cell phone use, TV viewing, video game playing, and computer use, driving or riding in a car, and reading/studying while sitting [106]. Excessive sedentary time is widespread among children and adolescents around the world [10]. Sedentary behavior is also common in adults. Accelerometer-based estimates from a recent review, derived from large or population-representative studies, indicate that adults spend approximately 8.2 h/day (range 4.9–11.9 h/day) sedentary [108]. This behavior is associated with obesity [109] and a higher incidence of cardiovascular disease, type 2 diabetes, and cancer [110-112]. Mortality also goes up. Paterson *et al.* did a comprehensive dose-response meta-analysis of over a million participants also found positive associations (non-linear) for total sedentary behavior with all-cause mortality (RR per 1 h/day: were  $1.01 \leq 8$  h/day and  $1.04 > 8$  h/day of exposure) [113].

Exercise is a physical activity that is planned, repetitive, and purposive [114]. Lack of regular exercise is also associated with obesity. Light-intensity activities expend less than 3 METs, moderate-intensity activities expend 3 to 6 METs, and vigorous activities expend 6 or more METs. Exercises may be aerobic or resistance, but also include stretching, balance and gait workouts, and non-traditional activities such as tai chi and yoga. Activities such as walking, cycling, jogging, and swimming are primarily aerobic exercises. They increase mitochondrial density, insulin sensitivity, oxidative enzymes, blood vessel compliance and reactivity, lung function, immune function, and cardiovascular function [115]. Resistance exercises include workouts with free weights, weight machines, bodyweight, or elastic resistance bands. They result in improvements in muscle mass, body composition, strength, physical function, bone mineral density, insulin sensitivity, blood pressure, lipid profiles, and

cardiovascular health [116]. Regular exercise helps prevent obesity, maintain weight, or even lose weight [117]. There is a significant body of evidence supporting the effect of physical activity in both short-term and long-term weight loss in adults.

The current guidelines for children aged 5–18 recommend 60 min of daily physical activity (PA), and minimizing the time spent sitting each day [118, 119]. In a study involving 49 LMICs, it was found that less than 30% of adolescents met the physical activity guideline [120]. However, obesity in children and adolescents is rising all over the world [121], and lack of physical exercise may play a role in this. In children and adolescents (5-17), exercise, besides preventing and reducing obesity, also confers benefits for the following health outcomes: physical fitness (cardiorespiratory and muscular fitness), cardiometabolic health (blood pressure, dyslipidemia, glucose, and insulin resistance), bone health, cognitive outcomes (academic performance, executive function) and mental health (reduced symptoms of depression) [122]. Most international institutions recommend that adults engage in moderate-intensity physical activity for at least 30 minutes a day for five days a week, or exercise at a high intensity for at least 20–30 minutes, three or more days a week and at least 2 days a week of resistance exercises to strengthen muscles [123]. In adults, (18-64) physical activity improves measures of obesity. It also confers benefits for the following health outcomes: all-cause mortality, cardiovascular disease mortality, incident hypertension, incident type 2 diabetes, incident site-specific cancers, mental health (reduced symptoms of anxiety and depression), and cognitive health and sleep [124].

Regular exercises help prevent obesity, maintain weight, or even lose weight. Several researchers have recognized that (moderate to vigorous intensity) exercise is associated with a lower BMI [125]. There is a significant body of evidence supporting the effect of physical activity in both short-term and long-term weight loss in adults. Current recommendations from the American College of Sports Medicine state that PA between 150- and 250-min week (-1) helps prevent weight gain, PA between 150- and 250-min week (-1) provides modest weight loss while PA (>250 min week (-1)) helps lose clinically significant weight loss [126]. In a report published by the Institute of Medicine, the US National Research Council concluded that an exercise regimen of 60 minutes of moderate-intensity physical activity per day, or a total of 300 minutes per week, is necessary to prevent unhealthy weight gain [127]. The 2005 US Department of Agriculture dietary guidelines also suggest that a regimen of 60 minutes or more of daily activity is required to prevent weight gain [128]. Jakicic *et al.* reported that moderate to vigorous PA accumulated in bouts that were  $\geq 10$  min in duration was effective in weight loss at 18 months. These bouts also

helped maintain  $\geq 10\%$  weight loss from 6 to 18 months. Bouts of exercise of  $< 10$  min in duration were not effective [129]. A study found that combining 5% to 7% (intentional) weight loss with regular physical activities, such as lifestyle activities or resistance training, resulted in improved mobility and lower extremity physical performance in overweight or obese older adults. Resistance exercises are also effective, but data indicates they produce only minimal reductions in body weight [130]. These exercises however help increase the loss of fat mass and help in increasing fat-free mass. Irrespective of the amount of exercise needed to prevent weight gain or to lose weight, these data highlight the important relationship between sedentary behavior and not exercising regularly with obesity.

### Diet

Dietary modification is central to the prevention and treatment of obesity [131]. Recommended daily calorie intakes in the US are around 2,500 for men and 2,000 for women [132]. Intentionally increasing calorie consumption will result in weight gain, as dictated by the First Law of Thermodynamics [133]. Since one pound of weight is equal to 3500 Kcal, a deficit/positive balance of 500 to 1000Kcal/day should help reduce/gain about 1-2 lbs per week. Carbohydrates provide most of the energy and hence the amount of carbohydrates consumed is an important consideration in obesity. It is recommended that fifty-five percent of the dietary calories should come from carbohydrates [134, 135]. Proteins also provide 4 calories per gram, and it is recommended that 10% of all calories consumed should come from proteins [134, 135]. Fat is associated with 9 calories per gram – and excessive intake of fats results in high energy intake and this is considered a major cause of weight gain. Fat intake should be limited to 30% of total caloric intake [134, 135]. The association of increased caloric intake and obesity has popularized many weight-loss diets. These include a very low-calorie diet - this limits the calorie intake to 600–900 per day [136]. A low-calorie diet generates a deficit of 500-750 calories per day by restricting caloric intake to 1,000–1,500 calories per day [137]. A low-fat diet requires consumption of fat as  $< 15\%$ – $20\%$  of daily calories and saturated fatty acids as  $< 7\%$ – $10\%$  [138]. Low-carbohydrate diets require consumption of carbohydrates as  $< 45\%$  of daily calories or  $< 130$  mg/day [139]. Further restriction of carbohydrates to  $< 10\%$  of daily calories or  $< 50$  mg/day results in ketosis (ketogenic diet) [140]. A high-protein diet increases protein intake to 30% of total daily calories or 1–1.2 g/kg of ideal body [141]. These diets primarily work by reducing caloric intake, although several other mechanisms come into play. However, not all calories are created equal. Besides the influence of calories, the quality of diet also matters. In carbohydrates, sugars and other refined carbohydrates are detrimental – it is recommended by WHO that sugar intake should be restricted to  $< 10\%$  of total energy intake [142]. Sugar

and sugar-sweetened beverages, and ultra-processed foods (most junk foods are ultra-processed and are high in salt, sugar, and saturated fats – all of which harm obesity) offer a deficient nutrient supply [143]. They usually have a high glycemic index – high-glycemic load carbohydrates produce hormonal changes that promote calorie deposition in adipose tissue, exacerbate hunger, and lower energy expenditure [144]. Sugar and sugar-sweetened drinks often lead to an excess energy intake, and if not expended, result in an increase of body fat [145] and body weight [146]. Ultra-processed foods are pervasive in our society and include daily foods like pastries, buns, cakes, biscuits, confectionery, packaged salty snacks, bagel, burger bun, bread roll, chips/French fries, sausage, nuggets, fish fingers, industrial pizza, and packaged pre-prepared meals. Milk-based drinks, soft and fruit drinks, fruit juices, alcoholic drinks, and coffee drinks, spreads, margarine, and other spreads, sauces, dressing and gravies, chocolate/nut spread, spreadable cheese, sweeteners, and sweetened cereal. They are energy-dense, nutrient poor and harmful. They are usually high in sodium, sugar, and saturated fats. A study of 8451 university graduates in Spain found that higher consumption of ultra-processed food was associated with a higher risk of developing overweight and obesity within 9 years of follow-up [147]. Another prospective cohort study of 11, 827 Brazilian civil servants has found that during an approximately four-year follow-up time, greater ultra-processed food consumption led to larger increases in BMI and WC [148]. Findings from a prospective cohort study of British adults show that diets rich in ultra-processed foods were associated with a 79% and 30% significant increase in the risk of obesity and abdominal obesity, respectively [149].

Protein intake recommendation is 0.83 g/kg body weight [150] – it is higher in muscle-building athletes – these individuals may need to consume a protein intake equivalent to 1.4 to 1.8 g per kg/day [151]. Protein, depending upon amino acid composition, stimulates insulin secretion, but this macronutrient also elicits the secretion of glucagon, a catabolic hormone that antagonizes insulin - a high protein diet may therefore help enhance weight reduction [152]. Animal and plant protein-containing foods differ in their amino acid content [153], absorption kinetics, and nutrient to food matrix interaction [154]. This may result in different results on the body [155]. Vegetable proteins (legumes, nuts, and soy), combined from different sources to provide all essential amino acids, are safer. Compared to proteins from animal sources (eggs, milk, meat, fish, and poultry), they may result in a reduction in the intake of saturated fat and cholesterol [156]. Vegetable sources of protein also provide numerous other nutrients such as phytochemicals and fiber that are also highly regarded in the diet. Phytochemicals such as polyphenols activate  $\beta$ -oxidation; stimulate energy expenditure by inducing thermogenesis in brown adipose tissue, promoting

adipocyte apoptosis and increasing lipolysis [157]. Dietary fat induces overconsumption and weight gain through its low satiety properties and high caloric density. Obese and post-obese subjects do not appear to adapt to dietary fat, and therefore fat storage is increased [158]. The consumption of a high-fat diet may also decrease fat taste sensitivity and result in excessive fat intake. A recent six-week randomized dietary intervention study showed that a low-fat diet reduced fat taste thresholds, or increased fat taste sensitivity, which likely helped induce a health satiety response to dietary fat and accordingly decreased body weight in people with overweight and obesity [159]. A high-fat diet may induce hyperleptinemia and hyperinsulinemia accompanied by leptin and insulin resistance and lower suppression of ghrelin secretion [160]. High fat intake and high energy intake from fat are positively associated with body weight, BMI, and the risk of overweight and obesity [161].

Some non-calorie and non-macronutrient restricted diets are also associated with decreased risk of obesity. Diets such as Mediterranean, DASH, and vegetarian/vegan diets, besides mitigating several chronic diseases can also help prevent weight gain and reduce obesity. The Mediterranean diet is common in the olive tree-growing areas of the Mediterranean [162]. It consists of high consumption of vegetables, fruits, olive oil, nuts, and legumes, as well as fish and unprocessed cereals, low intake of meat and meat products, a low intake of dairy products, and a glass of red wine during meals. Individuals following a Mediterranean diet not only have a lower weight gain but also reduce their BMI of 0.29 kg/m<sup>2</sup> [163]. Dash diet, popularized for its ability to decrease blood pressure, is rich in fruits, vegetables, and low-fat dairy products, and included fish, nuts and legumes, a moderate sodium restriction [164]. A vegetarian diet (in contrast to the omnivorous diet (Omni) which contains all food groups) does not contain meat, fish, or poultry but does contain eggs and dairy, in addition to plant-based foods, such as fruits, vegetables, whole grains, and legumes/beans [165]. A vegan diet does not contain any animal products (meat, fish, poultry, eggs, or dairy) and consists of plant-based foods, such as fruits, vegetables, whole grains, and legumes/beans. The pesco-vegetarian diet avoids meat or poultry but does allow fish and shellfish, eggs, and dairy, in addition to plant-based foods, such as fruits, vegetables, whole grains, and legumes/beans. Semi vegetarians eat all foods, including meat, poultry, fish and shellfish, eggs, and dairy, in addition to plant-based foods, such as fruits, vegetables, whole grains, and legumes/beans – they however limit their red meat and poultry intake. These diets are also good for preventing or reducing obesity. The Adventist Health Study showed that vegans had the lowest BMI, followed by veg, pesco-veg, semi-veg, and finally omni diets [166].

In general, plant-based diets help prevent obesity [167]. Both the large AHS and EPIC studies demonstrated that omnivores had the highest prevalence of overweight and obesity compared to individuals following mostly plant-based diets [168]. The EPIC-PANACEA study found that an increase in 250 g/day of meat led to a 2 kg weight gain after 5 years [169]. Two recent meta-analyses of clinical trials assessing plant-based diets (PBDs) and weight loss found significant weight loss among participants prescribed PBDs [170, 171]. Plant based diets can lead to nutritional deficiencies of proteins,  $\omega$ -3 fatty acids, vitamin B12, iron, zinc, iodine, vitamin D, and calcium [172]. However, this can be avoided if the PBDs are well planned and balanced, even during pregnancy or in breastfeeding women [173].

## CONCLUSION

Obesity is not a benign disorder and is associated with an increased risk of several major diseases, including cardiovascular, diabetes mellitus, and cancer. Excess body weight is often associated with smoking cessation, but smokers appear to have more visceral obesity, enhancing the morbidity and mortality associated with smoking. Further other lifestyle behaviors such as alcohol intake in excess, lack of physical activity, and a diet high in calories, also help the development of obesity. Preventing obesity entails maintaining a normal body weight (BMI 18.5–24.9 kg/m<sup>2</sup>) with no visceral obesity (WC < 102 cm in males and <88 cm in females), regular physical activity (150 min/week of moderate to vigorous physical activity), and a healthy diet (ideally 32 g/day of dietary fiber, 400 g/day of fruit and non-starchy vegetables, 0 g/week of processed meat, <500 g/week of red meat; <2300 mg per day of salt, sugar <6 tsp for women and <9 tsp for men), low to moderate intake of alcohol and with caloric intake matching the expenditure.

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