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# Current Concepts in Obesity Management

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**Abstract:** ***Obesity is considered as a gateway to chronic diseases and disabilities effecting all age groups of the population. Profound changes in society, worldwide nutrition transition and behavioural patterns of communities over recent decades reflect the rising epidemic. Prevention and management of obesity has become one of the most important objective of the health care sector.As obesity is a chronic disease a long term strategy is required its prevention and management. The treatment of the obesity consist of two steps: Assessment and management. The assessment consist of determining the degree of obesity and risk status. The management include different approaches which can be accomplished by a multi-disciplinary obesity management team.***

**Keywords:** Waist – Hip ratio, chronic disease, body mass index

## 1. Introduction

Throughout the most human history, weight gain and fat storage have been viewed as signs of health and prosperity. Today, however, as standards of living continue to rise, weight gain and obesity are posing a growing threat to the health of inhabitants of countries all over the world.

A high-rise in interest of obesity can be attributed to several reports from the World Health Organization which has been instrumental in putting obesity on the agenda of ministries of health in developed and developing countries as a major concern in their nation's health.[1] Obesity is a chronic disease, prevalent in both developed and developing countries, affecting children as well as adults. Indeed, it is now so common that it is replacing the most traditional public health concerns, including under nutrition and infectious disease, as one of the most significant contributors of ill health. Furthermore, as obesity is a key factor in the natural history of other chronic and non communicable diseases (NCDs), it is only a matter of time before developing countries are likely to experience the same high mortality rates for such diseases that industrialized countries with well established market economies exhibited 30 years ago.Obesity is excessive enough to cause many to define this as an obesity epidemic[2].

Trends of obesity are difficult to quantify or to compare internationally, as a wide variety of definitions of obesity is in use, and no commonly accepted standard has yet emerged. Although less sensitive than skinfold thickness,[3]the body mass index (weight/height$^2$) is widely used in adult populations, and a cut-off point of 30 kg/m$^2$ is recognised internationally as a definition of adult obesity[4].

Obesity is a chronic disease, and both the patient and the practitioner need understand that successful treatment requires a lifelong effort[5] and obesity result from a complex interaction between genes and the environment[6] .Attempts to prevent overweight and obesity are difficult to both study and achieve. Because obesity is difficult to treat, public health efforts need to be directed toward prevention [7, 8].In countries with developing economies the problem of obesity is emerging at a time when the under-nutrition remains a significant problem. Strategies that take fromcount of both these nutritional problems will need to be developed particularly when dealing with children whose growth may be stunted[9].

## 2. Prevalence

Before the 20th century, obesity was rare [10]. In 1997, the WHO formally recognized obesity as a global epidemic.[11] As of 2008 the WHO estimates that at least 500 million adults (greater than 10%) are obese, with higher rates among women than men.[12] The rate of obesity also increases with age at least up to 50 or 60-year old[13]and severe obesity in the United States, Australia and Canada is increasing faster than the overall rate of obesity[14- 17].Once considered a problem only of high-income countries, obesity rates are rising worldwide and affecting both the developed and developing world[18]. These increases have been felt most dramatically in urban setting[13].

## 3. Tools for Assessment

### 3.1 Body Mass Index

BMI is a simple index used commonly to classify overweight and obesity. It is calculated as the weight in kilograms divided by the square of the height in meters (kg/m$^{2)}$.Obesity is classified as a BMI ≥ 30.0. The classification is in agreement with that recommended by WHO[19], but includes an additional subdivision at BMI 35.0-39.9 in recognition to the fact that management options for dealing differ above a BMI of 35.

### 3.2 Waist circumference and waist-hip ratio

Abdominal fat mass can vary dramatically within a narrow range of BMI. For any accumulation of total body fat, men have on average twice the amount of abdominal fat than found in pre-menopausal women[20].Over the last 10 years or so, a high WHR (WHR > 1.0 in men and > 0.85 in women) has become accepted as the clinical method of identifying patients with abdominal fat accumulation[21].However, recent evidence suggests that waist circumference alone-measured at the midpoint between the lower border of the rib cage and

the iliac crest-may provide a more practical correlate of fat distribution and associated ill health[21-,23].Waist circumference is a convenient measurement, unrelated to height[24], correlates closely with BMI and WHR, and is an index of intra-abdominal fat mass[25-27] and total body fat[28].Changes in waist circumference reflect the rise in risk factors for cardiovascular disease[29] and other obesity-related illness due to abdominal fat accumulation.

## 4. Factors Influencing the Development of Overweight and Obesity

Obesity is a consequence of an energy imbalance where energy intake has exceeded energy expenditure over a considerable period. Numerous different complex and diverse factors can give rise to a positive energy balance, but it is the interaction between a number of these influences, rather than any single factor acting alone, that is thought to be responsible. A limited number of cases are due primarily to genetics, medical reasons, or psychiatric illness [30]. In contrast, increasing rates of obesity at a societal level are felt to be due to an easily accessible and palatable diet[31], increased reliance on cars, and mechanized manufacturing[32, 33].

Under normal circumstances, energy balance oscillates from meal-to-meal, day-to-day and week-to-week without a persistent change in body stores or weight. Multiple physiological mechanisms act within everyone to equate overall energy intake with overall energy expenditure and to keep body weight stable in the long term. Thus, it is only when there has been a positive energy balance for a considerable period that obesity is likely to develop.

The other possible contributors to the recent increase of obesity include.

1) Insufficient sleep
2) Endocrine disruptors (environmental pollutants that interfere with lipid metabolism)[32]
3) Decreased rates of smoking, because smoking suppresses appetite[33, 34].
4) Increased use of medications that can cause weight gain.)
5) Pregnancy at a later age (which may cause susceptibility to obesity in children)[35,36]
6) Epigenetic risk factors passed on generationally

### 4.1 Diet

The per capita dietary energy supply varies markedly between different regions and countries. It has also changed significantly over time[37]. Most of this extra food energy comes from an increase in carbohydrate consumption rather than fat consumption[38]. The primary sources of these extra carbohydrates are sweetened beverages, which now account for almost 25 percent of daily food energy in young adults[39], and potato chips[40]. Consumption of sweetened drinks is believed to be contributing to the rising rates of obesity[41,42].As societies become increasingly reliant on energy-dense, big-portions, and fast-food meals, the association between fast-food consumption and obesity becomes more concerning[43,44].

### 4.2 Sedentary lifestyle

A sedentary lifestyle plays a significant role in obesity[45].Worldwide there has been a large shift towards less physically demanding work[46-48], and currently at least 30% of the world's population gets insufficient exercise[47]. This is primarily due to increasing use of mechanized transportation and a greater prevalence of labour-saving technology in the home.[58-60] In children, there appear to be declines in levels of physical activity due to less walking and physical education[49].There is an association between television viewing time, and the risk of obesity[50-52].A review found 63 of 73 studies (86%) showed an increased rate of childhood obesity with increased media exposure, with rates increasing proportionally to time spent watching television[53].Physical activity levels (PALs) are a universally accepted way of expressing energy expenditure and to help to convey an easily understandable concept.In order to avoid obesity, populations should remain physically active throughout life at a PAL of 1.75 or more.

### 4.3 Genetics

Like many other medical conditions, obesity is the result of interplay between genetic and environmental factors. Polymorphisms in various genes controlling appetite and metabolism predispose to obesity when sufficient food energy present. As of 2006, more than 41 of these sites on the human genome have been linked in the development of obesity when a favourable environment is present[54].People with two copies of the FTO gene (fat mass and obesity associated gene) have been found on average to weigh 3–4kg more and had a 1.67-fold greater risk of obesity compared with those without the risk allele[55].The percentage of obesity that can be attributed to genetics varies, depending upon the population examined, from 6% to 85%[56].

Obesity is a major feature in several syndromes, such as Prader-Willi syndrome, Bardet-Biedl syndrome, Cohen syndrome, and MOMO syndrome[57].Studies that have focused on inheritance patterns rather than on specific genes have found that 80% of the offspring of two obese parents, in contrast to less than 10% of the offspring of two parents who were of normal weight[58].

### 4.4 Other illnesses

Certain physical and mental illnesses and the pharmaceutical substances used to treat them can increase the risk of obesity. Medical illnesses that increase obesity risk include several rare genetic syndromes as well as some congenital or acquired conditions: hypothyroidism, Cushing's syndrome, growth hormone deficiency [59], and the eating disorders: binge eating disorder and night eating syndrome. However, obesity is not regarded as a psychiatrical disorder, and therefore, is not listed in the DSM-IVR as a psychiatrical illness[60] .The risk of overweight and obesity is higher in patients with psychiatrical disorders than in persons without psychiatrical disorders[61].

### 4.5 Social determinants

Many explanations have been put forth for associations between BMI and social class. It is thought that in developed countries, the wealthy are able to afford more nutritious food, they are under greater social pressure to remain slim, and have more opportunities along with greater expectations for physical fitness. In undeveloped countries, the ability to afford food, high energy expenditure with physical labour, and cultural values favouring a larger body size are believed to contribute to the observed patterns[62]. Stress and perceived low social status appear to increase the risk of obesity[63- 66].

### 4.6 Infectious determinants

The study on the effect of infectious agents on metabolism is still in its early stages. There is an indication that gut flora in obese and lean individuals can affect the metabolic potential. This apparent alteration of the metabolic potential is believed to confer a greater capacity to harvest energy contributing to obesity. Whether these differences are the direct cause or the result of obesity has yet to be determined unequivocally. An association between viruses and obesity has been found in humans and several different animal species. The amount that these associations may have contributed to the rising rate of obesity is yet to be determined[65].

## 5. Pathophysiology

Flier summarizes the many possible pathophysiological mechanisms involved throughout the development and maintenance of obesity[66].Leptin and ghrelin are considered to be complementary in their influence on appetite, with ghrelin produced by the stomach modulating short-term appetitive control (i.e. to eat when the stomach is empty and to stop when the stomach is stretched). Leptin is produced by adipose tissue to signal fat storage reserves in the body, and mediates long-term appetitive controls (i.e. to eat more when fat storages are low and less when fat storages are high). Although administration of leptin may be effective in a small subset of obese individuals who isleptin deficient, most obese individuals are thought to be leptin resistant and have been found to have high levels of leptin[67].

## 6. Health Consequences

Obesity is one of the leading preventable causes of death worldwide[68 -70]. On average, obesity reduces life expectancy by six to seven years[71,72], a BMI of 30–35 kg/m$^2$ reduces life expectancy by two to four years, while severe obesity (BMI > 40 kg/m$^2$) reduces life expectancy by ten years[73].

Complications are either directly caused by obesity or indirectly related through mechanisms sharing a common cause such as a poor diet or a sedentary lifestyle. The strength of the link between obesity and specific conditions varies. One of the strongest is the link with type 2 diabetes. Excess body fat underlies 64% of cases of diabetes in men and 77% of cases in women[74]. The chronic health problems associated with obesity fall into.

a) Cardiovascular problems, including hypertension[75]and stroke [76];
b) Certain types of cancers, mainly the harmonically related and large-bowel cancers;
c) Respiratory illnesses like asthma and sleep apnoea;
d) Musculoskeletal problems namely osteoarthritis and gout;
e) Gallbladder disease;
f) Urinary incontinence and kidney stones;
g) Skin conditions like acanthosisnigricans, pressure sores, stretch marks, psoriasis and skin tags;
h) Psychological problems of depression and body shape dissatisfaction.

## 7. Management

The American College of Sports Medicine recommends that individuals seek weight loss treatment and prevention of weight regain select programs that certain guidelines. It is recommended that individuals with a body mass index 25 kg·m$^2$ consider reducing their body weight, especially if this level of body weight is accompanied by an increase in abdominal adiposity. Individuals with a body mass index 30 kg·m$^2$ are encouraged to seek weight loss treatment. Overweight and obese individuals target reducing their body weight by a minimum of 5–10% and maintain at least this magnitude of weight loss long-term. This amount of weight loss is consistent with what is attainable with standard weight-loss programs that focus on modifying eating and exercise behaviours. Individuals strive for long-term weight maintenance and the prevention of weight regain over the long-term, especially when weight loss is not desired, or when attainment of ideal body weight is not achievable. Prevention of weight gain or weight regain has been defined as maintaining a body weight that is within 2.3 kg (5 pounds) of one's current weight[77]. Weight loss programs target changing both eating and exercise behaviours, as sustained changes in both behaviours have been shown to result in significant long-term weight loss. It is important for programs targeting modifications in these behaviours to incorporate strong behavioural modification strategies to facilitate the adoption and maintenance of the desired changes in behaviour.Overweight and obese individuals reduce their current level of energy intake by 500–1000 kcal/d to achieve weight loss and that this is combined with a reduction in dietary fat to 30% of total energy intake. It is also recommended that an individualized level of energy intake be established that prevents weight regain after initial weight loss, while maintaining a low-fat diet[78]. Overweight and obese individuals progressively increase to a minimum of 150 min of moderate intensity physical activity per week, as this level of exercise may have a positive impact on health in overweight and obese adults. However, for long-term weight loss, overweight and obese adults should eventually progress to higher amounts of exercise.Resistance exercise supplement, the endurance exercise program in overweight and obese adults that are undertaking modest reductions in energy intake to lose weight. Resistance exercise should focus on improving muscular strength and endurance in this population. Pharmacotherapy for weight loss only be used in individuals with a body mass index 30 kg·m$^2$, or with a body mass index 27 kg·m$^2$ in the presence of additional co-morbidities.

**Management Programme**

Obesity management encompasses a spectrum of four strategies:

1) Prevention of weight gain
2) Weight maintenance
3) Management of obesity and co-morbidities
4) Weight loss

**7.1 Prevention strategies**

A wide variety of therapies are available in the treatment of obesity. These include dietary management, physical activity, behaviour modification, pharmacological treatment and surgery. However, there is a need to control the promotion of dangerous and deliberately deceptive approaches to weight loss/ control, such as special weight-loss aids, equipment, "miracle cures," and certain drugs and treatments often offered through unlicensed weight loss centres[2].

**7.2 Dietary management**

The promotion of healthy diets that are low in fat, high in complex carbohydrates and plentiful in fruits and vegetables should be a priority for obese prevention efforts. Diet programs may produce weight loss over the short term[79] but maintaining this weight loss is frequently difficult and often requires making exercise and a lower calorie diet a permanent part of a person's lifestyle[80 -82].

*Energy intake:* It is common for weight-loss programs to reduce energy intake to 1000–1500 kcal/d to induce weight loss in overweight adults[83], and this has been shown to be safe and effective for weight loss for individuals averaging 90.7 kg (200 pounds) before weight loss. Assuming that resting energy expenditure (REE) is approximately one kcal/kg/h (1 metabolic equivalent [MET]); this level of energy intake would result in an energy deficit of approximately 500–1000 kcal/d for individuals weighing approximately 90.7 kg (200 pounds). Currently, there is no evidence that a faster rate of weight loss or greater magnitude of initial weight loss will improve long-term weight loss outcomes compared with more conservative approaches.

*Very-low-calorie diets:* Provide 200–800kcal/day, maintaining protein intake but limiting calories from both fat and carbohydrates. The use of a VLCD can greatly increase the magnitude and rate of weight loss compared with more conservative reductions in energy intake[79]. However, they subject the body to starvation and produce an average weekly weight loss of 1.5–2.5kilograms (3.3–5.5lb). Due to the low-energy value of these diets, they are used for relatively short periods of time (e.g., 12–16 wk), are used in conjunction with dietary supplements, and require medical supervision. These diets are not recommended for general use as they are associated with adverse side effects such as loss of lean muscle mass, increased risks of gout, and electrolyte imbalances. People attempting these diets must be monitored closely by a physician to prevent complications[80].

*Macronutrient composition:* Commercial programs recommend various combinations of macronutrient compositions for weight loss, including high fat, high protein, and low-carbohydrate diets. Despite the popularity of many of these dietary approaches, the optimal macronutrient composition of the diet for weight loss has not been determined. However, current scientific evidence suggests[84] that the level of energy intake has the greatest impact on weight loss short-term and that change in the composition of the diet affects' weight loss by ultimately affecting energy intake. Continuing to maintain a low fat intake may also be important for maintaining weight loss long-term. In addition, reducing dietary fat intake may significantly affect risk factors such as blood lipid concentrations[85],which further improve health outcomes in overweight adults.

**7.3 Exercise prescription considerations for weight loss**

It is important to consider the amount, intensity, and type of exercise that should be recommended for weight loss. To allow adequate time for individuals to progressively increase their exercise, the recommended level of exercise for sedentary adults during the initial phases of weight loss should be differentiated from the amount of exercise that can be achieved at later stages to the weight loss process. Moreover, the amount of exercise necessary to improve fitness may be different than the amount of exercise necessary for successful long-term weight loss.

*Exercise duration and weight loss*:The current public health recommendation for physical activity is for individuals to participate in at least 30 min of moderate intensity physical activity on most, preferably all, days of the week. This recommendation has typically been interpreted as a minimum of 150 min of physical activity per week (5 d, 30 min/d) and is based primarily on the effects of exercise on cardiovascular disease and other chronic conditions such as diabetes mellitus. However, close examination of the scientific evidence suggests that levels of exercise greater than this minimum recommended amount may be important for maintaining weight loss long-term. Results from a randomized trial of overweight women in a weight-loss program that included dietary modification showed that individuals adopting and maintaining an average of 280 min of exercise per week maintained a weight loss of 13 kg over an 18-month intervention[86]. This amount of weight loss was significantly greater than the 6.5kg and 3.5kg weight losses after 18 months shown with 150–200 and 150 min of exercise per week, respectively. Moreover, individuals averaging approximately 280 min of exercise per week showed no weight regain from 6 to 18 months of treatment, whereas individuals exercising 200 min/wk showed significant weight regain during this period.

*Exercise intensity and weight loss:*There have been few studies that have adequately examined the impact of various intensities of exercise on weight loss. Studies have shown that the intensity of exercise affected the magnitude of change in cardio respiratory fitness, with greater increases demonstrated with higher intensities of exercise, but the intensity of exercise did not result in differential effects on

body weight or body composition after 24 weeks of treatment [87].

*Intermittent exercise and weight loss:* Intermittent exercise has typically been defined as accumulation of 30–40 min of exercise per day through participation in multiple 10-15 min exercise session'sdaily[86]. There has been interested in this form of exercise because early studies showed that intermittent exercise effectively increased cardio respiratory fitness and favourably impacts coronary heart-disease risk factors. This resulted in the Centres for Disease Control and Prevention and the American College of Sports Medicine recommending the "accumulation" of at least 30 min of moderate intensity activity per day. This strategy can be effective for initial adoption of exercise; however, there was no added weight loss benefit when compared with continuous exercise across an 18-month behaviouralweight-loss program that also included a dietary intervention.

*Resistance exercise and weight loss***:** Although most research studies have examined the effect of endurance exercise on weight loss, the inclusion of resistance training in weight-loss programs has clear advantages. Resistance training is a potent stimulus to increase fat-free mass (FFM), muscular strength, and power and thus may be an important component of a successful weight-loss program by helping to preserve FFM while maximizing fat loss[88]. Although resistance exercise may improve

### 7.4 Behaviour modification

The primary goal of behaviour treatment is the improvement of eating habits (i.e. what to eat, where to eat, when to eat, how to eat) and the levels of physical activity. Behaviour treatment is considered to be an essential component of any adequate obesity treatment programme[89].

### 7.5 Pharmacological treatment

Although lifestyle interventions are helpful for many obese individuals, without recurrent contacts by health care professionals, most individuals regain their lost weight within 3–5 years. These poor long-term results, and the understanding that obesity is a chronic disease requiring lifelong management, have led in the development of pharmacological approaches that may minimize weight regain and enhance long-term weight loss. All current guidelines consider pharmacotherapy to be an adjunct to lifestyle modification interventions and limit their use to patients with a BMI 30 kg/m$^2$ (obese), or a BMI 27 kg/m$^2$ (overweight) with additional co-morbidities (such as hypertension, dyslipidemia, or type 2 diabetes).

Weight management drugs can be broadly divided into two categories, those which act on the central nervous system to influence feeding behaviour, appetite and other mechanisms (For e.g.: Sibutramine, Rimonabant) and peripherally acting drugs such as those which target the gastrointestinal system to inhibit absorption or enhance a feeling of fullness (For e.g.: Orlistat. Metformin, Exenatide) Increasing dietary fibre as a part of dietary modification may have a role in energy restriction.

Un- researched non-prescription products or programs for weight loss are heavily promoted by mail and print advertising and on the Internet. The US Food and Drug Administration recommends caution with use of these products[90], since many of the claims of safety and effectiveness are unsubstantiated.

### 7.6 Surgical management

Surgery is considered to be the most effective way of reducing weight, and maintaining weight loss, in severely obese (BMI > 35) and very severely obese (BMI > 40) subjects.Long-term studies show the procedures cause significant long-term loss of weight, recovery from diabetes, improvement in cardiovascular risk factors, and a reduction in mortality of 23% from 40%[91].

Patients should be selected for surgery according to the following principles[92]:

- Non-surgical treatment, including dietary measures and weight-reducing drug therapy should be tried first.
- Surgery with gastric placation procedures should be used only on well-informed and motivated patients with acceptable operable risks.
- Patients should have a BMI> 40 or >35 together with high risk, life-threatening co-morbid conditions
- Patient age should be not less than 18 and with an agreement for life-long follow-up.

Traditionally bariatric surgery procedures have been divided into two categories[93]:

*Restrictive procedures:* Limit the 'preload' or volume capacity of the upper alimentary tract at any one time. This is done by reducing stomach volume directly or by narrowing a portion of the stomach with a prosthetic device[93]. Procedures include: Vertical banded gastroplasty (Mason procedure), Adjustable gastric band, Sleeve gastrectomy, Intra Gastric Balloon (gastric balloon), Gastric Plication.

*Malabsorptive procedures:* Limit the absorptive capacity of the gut, limiting the quantity of nutrients that are absorbed regardless of ingested quantity. This is done by reducing the surface area present for absorption[94]. This leads to a large amount of weight reductions, although they also have a greater amount of side effects involving long term, nutritional deficiency and require careful follow up. Procedures include: Biliopancreatic diversion,Jejunoileal bypass and Endoluminal sleeve implantation[93].

*Mixed procedures:* Apply both techniques simultaneously-Gastric bypass surgery[94]

## 8. Conclusion

Obesity is a significant public health problem in all over the world with the prevalence of obesity increasing over the past few decades. Based on scientific evidence, there are a number of intervention strategies that can be used to induce and maintain significant weight loss, and these include changes in energy intake and energy composition, increase

in energy expenditure through exercise and other forms of physical activity, and, when indicated, the use of pharmacotherapy. Regardless of the intervention approach, it is necessary for these changes in behaviour to be maintained to enhance long-term weight loss outcomes. Harmonious public messages, a smooth coordination of a multi-disciplinary team, and ongoing patient-centric interventions could become effective for both the prevention and the treatment of obesity, and may help to reduce the public health burden related to this chronic condition.

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