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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network



REVIEW ARTICLE

BIOSCIENCE RESEARCH, 2020 17(2): 1247-11262.

OPEN ACCESS

Causes, medical consequences and management of obesity: A Review

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Obesity rate increase worldwide which considered as major health concerns as it has medical effect on individual health supported by evidence in medical literature, its definition by using Body mass index when the percent ≥ 30 kg/m². obesity is multifactorial disease may has genetic relation, the bad dietary habits and sedentary lifestyle all paly role in its development .later may cause increases the risk of developing high blood pressure, heart disease, type 2 diabetes, stroke, arthritis, liver disease, kidney disease, Alzheimer's disease, gallbladder disease, mental disorder and some types of cancer. Adequate management of obesity as a chronic condition by early detection and using preferred modalities according to each case either by lifestyle intervention with behavioral change or pharmacotherapy or bariatric surgery. Intersectoral action to be taken by the responsible authority in each country to prevent obesity since childhood which need integrated efforts and commitment to reverse current trends. The review directed to whom need a general useful medical informations in obesity like medical student.

Keywords: Obesity, causes, complication, management

INTRODUCTION

As the epidemic of obesity increase globally which is considered as major health concerns for people and health leaders, needs to battle this leading preventable reason for death as it has adverse impact on their population medical, psychological, and emotional wellbeing.

Obesity is defined as excessive fat accumulation that may impede wellbeing. a body mass index BMI ≥ 30 kg/m² is obese According to a WHO report (Flegal KM et al., 2013) obesity is an outcome of a continued, chronic, positive energy balance, with physiological and behavioral factors impacting the regulation of both energy intake and loss (Prentice A, Jebb 2004) others defined it as excess body weight for height, this abundance adiposity can reflect metabolically not just as far as body size(Hu FB 2008): To figure out the magnitude of this issue Overall, about 13% of the world's adult population (11% of men and 15%

of ladies) were obese in 2016. it is anticipated that over 18% of adults will be obese by 2025 (Di Cesare M, Bentham J, et al., 2016) Across the United States, more than one in three adult and one in six kids (ages 2-19) are obese(NCHS Fact 2015). For ladies, the age between 25–44 years is the range when they tend to gain the large amount of fat because the maintenance of gestational weight gain (Siega-Riz AM 2004).

MATERIALS AND METHODS

Methodology:

Using google search mainly to extract articles related to obesity was used to make this complete review directed to whom need a general useful medical information about obesity like medical student.

Sociodemographic factors related to obesity:

One review found progress into marriage is related with weight gain, while inverse lead to weight reduction (Dinour L et al.,2012). obesity in middle age decrease life expectancy by 4–7 years (Peeters A 2003). Low income lead to obesity (Wang Y, Chen X 2011). Regard education ladies with bachelor's degrees are less likely to have obesity contrasted with less taught one (Ogden CL: 2010)

Causes behind obesity:

its considered multifactorial disease causes some linked to dietary habits, Environments, sedentary lifestyle, medical diagnoses, genetic factor, and drug side effect.

dietary habits

The examples of dietary patterns that increase the hazard for increment weight are eating foods rich in saturated fats, fast-food utilization, and frequent snacking particularly during night hours(Eckersley RM:2001) , Sugary soft drinks(Brown CM:2008) ,overeating relative to energy loss(Davis C et al., :2011), night-eating disorder(Lundgren JD 2010) skipping meal (Schlundt DG:1990) all increase weight .

sedentary lifestyle factors

Physical and social environments play a role in rise the obesity rate. Cities designed for transportation via vehicle, work that need hours sitting behind a desk, and entertainment activity focus on watching a screen all enhance a bad lifestyle. Methods of Advertising processed food and sugar-sweetened drinks which are frequently less expensive and more accessible than healthier options(Kumanyika,S :2017). We need the quantity of calories taken from foods equal to the calories that body consumed which called energy balance to preventing weight gain (Hall KD :2011)research support that decreased physical movement(Kyrolainen H:2010) and prolonged screen time will lead to weight gain(Thorp AA et al.,.2011) . when there are more opportunities for physical movement as part of everyday life, will result to slower rise in obesity among those more active persons for ten years (Creatore MI :2016). recently poor sleep quality influences BMI (Sun W2015) and smoking cessation predispose to obesity (-Matsushita Y. 2011)-

Genetic relation:

Most obesity probably results from complicated interactions between genes and

environmental factors which still inadequately understood (multifactorial obesity).(Bouchard C 2011) parental diet and lifestyle have been implicated in subsequent kids obesity risk, including famine exposure(Ravelli AC:1999),parental obesity (Bammann K:2014),smoking(Northstone2014),endocrine-disorder(De Cock M2014), weight gain during pregnancy and gestational diabetes(Dabelea D 2013).It is found adults with severe obesity less than 5% will harbor obesity-associated mutations for example those that cause leptin deficiency or leptin receptor dysfunction(Katzmarzyk PT 2008).

Diseases relate to obesity:

Example of medical and psychological disease associated with obesity: Neuroendocrine Cushing's syndrome(Burt MG2006) , hypothalamic obesity(BlechmanJ2011),hypothyroidism(de Moura SA 2011) , polycystic ovary syndrome(Al-NuaimLA2011),growth hormone deficiency(ScacchiM2010),Prader-Willi syndrome(Butler MG2011) ,Lawrence-Moon-Biedle syndrome(Croft JB1995) ,binge eating(Davis C2011) ,seasonal affective disorder(Cizza G 2011), Depression/anxiety (Lester D 2011)(Bodenlos JS 2011)and Stress(Iversen LB2012).

Drug side effect causing obesity:

Antipsychotics,antidepressant,anticonvulsants and corticosteroids.

Consequences of Obesity on health:

Generally: Obesity increases the risk of developing hypertension, heart disease, type 2 diabetes, stroke, arthritis, liver disease, kidney disease, Alzheimer's disease, gallbladder disease, mental disorder, and some types of cancer (NHLBI 2017)

Medical Consequences of obesity on Specific body system:**Diabetes**

The risk to get type 2 diabetes T2DM increases by 20% for every 1 kg/m² increased in the BMI (Hartemink N2006). it discovered Overweight raises risk of creating T2DM by a factor of three, and obesity by a factor of seven, contrasted with typical weight(Abdullah A2010).In the Diabetes Prevention Program, a median weight reduction of 5.5 % during 2.8years decreased the risk of changing over from

prediabetes to diabetes by 58 % (Knowler WC2009)

Heart and Vascular Diseases

1-Hypertension HTN: Obese patients are 3.5 times more likely to have hypertension (Kotchen TA: 2008)

2-Coronary heart disease: BMI \geq 30kg/m² appear to independently increased hazard for coronary artery disease which is comparable to the impact of hypertension (Wilson PW: 2002).

3-Congestive heart failure and left ventricular hypertrophy

4-Thrombophlebitis and deep venous thrombosis

5-Varicose veins and venous stasis ulcers

6-Pulmonary embolism

Cancer

A 2016 review by The World Cancer Research Fund International found that there is solid proof that obesity is associated with an increased risk of malignancy of the esophagus (adenocarcinoma), pancreas, liver, colorectum, post-menopausal breast, endometrium, kidney ,stomach (cardia), gallbladder, ovary (epithelial) and prostate .other supported evidence has linked that overweight or obesity raise risk of malignancy of the gallbladder/ liver(Larsson SC:2007) , ovaries (epithelial)(. Olsen CM 1990) and leukemia (Larsson SC, Wolk A :2008) A recent meta-analysis revealed that insulin resistance and hyperinsulinemia is a strong risk factor for endometrial malignancy (Mu N,et al.,2012).

Infection

obesity increased hazard of infection like surgical-site, intensive care unit -acquired catheter, blood, nosocomial, urinary tract, cellulitis, other dermatological infections ,community-acquired infections, and poorer recovery consequence lead to increased risk of influenza, pneumonia, bacteremia, and sepsis .Severely obese women additionally had more than twofold the risk of creating wound complications and fourfold the risk of creating decubitus ulcers(Glance LG:2014) and Skin infections(Thorsteinsdottir B:2005).

Gastrointestinal

1-Abdominal hernia

2-Gastro-esophageal reflux disease

3-Gallstones

4-Non-alcoholic fatty liver disease

5-Colorectal cancer

Gastro-esophageal reflux disease (GERD)

A higher BMI promote to GERD, postulate that an increased occurrence of reflux explains the association between high BMI and esophageal adenocarcinoma (Jain S :2017)

Liver

Nonalcoholic fatty liver disease NAFLD, metabolic syndrome and obesity are considered as significant reason of developing chronic liver disease and liver transplantation. The expansion in the prevalence and severity of NAFLD is related with the rising patterns in obesity (Li L, Liu DW: 2016) NAFLD includes simple steatosis and nonalcoholic steatohepatitis, which may advance to cirrhosis and hepatocellular carcinoma (Polyzos SA: 2016) .Other study discovered that one of obesity-related consequence are NAFLD(Younossi Z :2108)and its prevalence correlate with higher BMI. In a meta-analysis Li et al.,. discovered that obesity created 3.3times higher risk of developing NAFLD(Li L, Gan Y:2016).for gallbladder disease found that for every 5 unit increase in BMI the relative risk of gallbladder disease increased by 63%. In a meta-analysis of cohort studies, higher relative risk of hepatic malignancy was seen in both overweight 1.2 and obese 1.9 compared with lean people (Larsson SC:2007) obesity is considered as a risk factor for venous thromboembolism as well as thrombosis of the hepatic artery(Allman-Farinelli MA:2011).

Pulmonary

1-Dyspnea

2-Asthma

3-chronic obstructive pulmonary disease COPD

4-Obesity hypoventilation syndrome

Obstructive sleep apnea.

Obesity reduce chest wall compliance and respiratory muscle endurance with increased airway and chest wall resistance (Ladosky W:2001). When Loosing at least 10 kg of original body weight owing to improvement in lung physiology and function as confirm by improved vital capacity and forced expiratory volume (Aaron SD2004).

Asthma

The relationship between obesity and asthma is seen in most ethnic groups, over all age groups, and in both genders (McClellan, K.M2008).in the British Thoracic Society Difficult Asthma Registry, around 48% of severe asthmatic adult are obese

contrasted with an adult obesity rate of approximately 25% in the general British adult population (Gibeon, D). another study in U.S almost on 30,000 adults and children with persistent asthma and high BMI was associated with increased rate of exacerbations measured as oral corticosteroid dispensing linked to an asthma medication (Schatz, M2013). obese patients are at higher risk of hospital admission for asthma than lean one (Hasegawa, K²⁰¹⁶) while Weight loss will improve lung function, asthma control, and asthmatic quality of life (Peters, U:2018).

COPD

The feasible three explanations for the association between obesity and COPD in both genders are: it causes chest wall tightness with impairs diaphragm movement, inflammation related to obesity provoke it and the symptoms of COPD result in decreased movement and energy loss that rise BMI. Study found that abdominal obesity related to many respiratory diseases including COPD (Zammit C2010).

Renal

Microalbuminuria correlates positively with total and central adiposity even in patient without diabetes and hypertension (Bello AK2007). For every 5 kg/m² rising in BMI, mortality associated with kidney diseases increases via 60% (Whitlock G :2009) Obesity is associated with numerous risk factors lead to nephrolithiasis as example lower urine pH and increased urinary oxalate, uric acid, sodium, and phosphate excretion. In recent meta-analysis collating experimental research in obese CKD patients, interventions to reducing body weight result in decreasing blood pressure, glomerular hyperfiltration, and proteinuria (Bolognani D 2013)

Musculoskeletal

1-Cellulitis and carbuncles.

2-Carpal tunnel syndrome.

3-Degenerative joint disease (osteoarthritis OA.)

Rising BMI by 5 kg/m² is associated with a 36% increase risk of OA. Systemic inflammation come from fat tissue seems to be important factor for the development of OA (Bliddal H2014)

Gout

Aune et al., found the relationship of BMI to the risk of gout in 10 prospective research (Aune D2014).

Neurologic and psychiatric

Being overweight in adulthood increases risk of Alzheimer's disease 35%, vascular dementia 33%, and any type of dementia 26% ,even higher risk is seen for obesity (Anstey KJ:2011) supported meta-analysis has shown a strong relation between obesity and neurological disorders as dementia and Alzheimer's disease (Pedditizi E2016) also Mental disease as depression, anxiety, other mental disorders (Luppino, Floriana S., et al.,2010) , Body pain and difficulty with physical functioning (Roberts, Robert E., et al., :2003) are linked to obesity.

Gynecological health consequences

Obesity during pregnancy increases the occurrence of complications as gestational diabetes, preeclampsia, cesarean delivery, and stillbirth (Leddy MA²⁰⁰⁸) (Cedergren MI2003) (O'Brien TE :2003) Also during and postpartum, obesity increases the risk of deep venous thrombosis 4 to 5 times (Poston L2016).

Obesity and polycystic ovarian syndrome PCOs

Excess fat tissue in women worse PCOS, anovulation that may cause hypothalamic hypogonadism (Tong Q2012), Whereas weight reduction diminishes the androgen levels and improves insulin resistance (Diamanti-Kandarakis E1998). a review by (Pasqueli et al.,:2002) has featured an investigation which have demonstrated improvements in the metabolic and fertility rate of women with PCOS treated with calorie restriction and/or physical exercise.

On menstrual cycle:

Obesity cause premature luteinization and follicular arrest that leads to menstrual cycle disturbance and obesity-induced oligo-anovulation (Franks S,:1996).

obesity and infertility:

Obesity may alter reproductive capacity by affecting both the ovaries and endometrium (Bellver J :2000) Grodstein et al.,:1994 showed that anovulatory infertility was higher in women whose BMI more than 26.9 kg/m². The studies demonstrate that the time need it to get a spontaneous pregnancy rate is increased and pregnancy rates are decreased in fatty women even regular ovulatory obese one (Wise LA :2010). The insulin resistance, leptin levels are increased and hyperandrogenemia

occurs in obese women. Similarly, anovulation, changes in adipokine levels, the hypothalamic pituitary gonadal axis, and steroidogenesis in obese women affects the reproductive functions (Bellver J, 2007)

Fibroid the relation between BMI and the existence of fibroids has been documented in study (Yang Y, He Y: 2014).

Genito-urinary

Stress urinary incontinence

Aging, labor and obesity are recognized as the three significant risk factors for incontinence only the weight can be modifiable. For every 5-unit increment in BMI being related with 20%-70% increase in the hazard of incontinence (Subak LL:2009) and reduce Weight of 5% of initial body weight has been appeared to decrease incontinence severity which reflect as progress in quality of life measures in obese ladies (Auwad W:2008).

Urinary tract infections UTI

A recent large cohort study found that obesity is a risk factor for UTI (M.J. Semins:2012) .

MANAGEMENT

Obesity is a complex, multicausal, and generally preventable condition (AMA 2013) The essential modalities used in adult obesity treatment are lifestyle modification, drugs, and bariatric surgery. Clinically significant weight loss, defined as loss of 5–10% of current weight. client education will improve the therapeutic efficiency and their motivation to change in the long term (.Lagger G2015)

Assessment

Medical history should obtain, focused physical examination and laboratory investigation should be ordered.

Medical History include:

- 1-Food intake pattern/day, Food allergy, Appetite, Any gastrointestinal problem.
- 2-Screening for depression and how much does obesity affect quality of life? Mobility, self-stem, socializing?
- 3-Comorbidities: Type 2DM, HTN, Dyslipidemia, Sleep apnea, metabolic syndrome, PCO, Osteoarthritis, Stress incontinence, Gallstones and Alveolar hyperventilation syndrome. Exclude secondary cause like Cushing Syndrome, Hypothyroidism.

4-Drug history .

5- Assess cardiovascular disease risk factors: Smoking, HTN, High LDL, Low HDL, impaired fasting glucose, Family history of premature coronary heart disease, Age (men ≥ 45 years; women ≥ 55 years or postmenopausal.)

5-Physical inactivity

6 .past surgical history

Physical Examination.

Important measures are Height, weight, Waist circumference WC (> 102 cm in men, > 88 cm in women), blood pressure BP ($> 140/90$) and BMI classified as (overweight 25-29.9 kg/m², Obese 30-39.9 kg/m², morbid obesity BMI ≥ 40 kg/m²)

Cutaneous - look for intertriginous rashes, nails, hirsutism in women, acanthosis nigricans, skin tags, Lipodystrophy and Pressure ulcerations.

Cardiac and respiratory - Exclude cardiomegaly and respiratory insufficiency.

Abdominal - tender hepatomegaly, striae

Joint deformities (eg, coxa vara), evidence of osteoarthritis.

Laboratory investigation to be order are:

Fasting blood sugar, glycosylated hemoglobin HbA1c, liver function test , thyroid study, hemoglobin level ,Serum lipid profile, uric acid and Albumin.

In a recent study, doctors who utilized the 5As approach have a twofold increment in obesity management (diagnosis and coordinating follow-up) in primary care service. Most behavioral strategies stimulate self-monitoring of weight and provided tools to facilitate weight loss or maintenance (e.g., pedometers, food scales, or exercise videos) (LeBlanc, 2018)

5As are as follow:

1-Assess Readiness to Change

Ask client "Are you ready to take actions to reduce weight?" or "How does your weight reflect on your health?"

For the patient showing readiness to change, simple steps are:

Praise who have had recent/past weight loss.

Ask them about past/current weight loss plans. And what is working/not working for them.

Ask them how you may assist in their weight loss efforts.

Acknowledge their values in connecting weight to health issues.

2-Advise

Counseling them about the complications associated with their current weight status and the advantages of weight loss (5%-10%). they should stimulate to decrease their energy intake by 500-1000 calories/day via diet and exercise.

3- Agree

Goal setting is important health behavior change strategy. The goals should be Specific, Measurable, Attainable, Relevant, and Time-based. Self-monitoring of weight, diet, and physical exercise is also important and associated with improved dietary choices and practices, increased physical activity, weight loss/maintenance.

4-Assist

By recognize the barriers the patient is facing in achieving each of their behavioral goal and creating a plan with clear strategies to overcome these obstacles. (e.g., problem solving).

5-Arrange

For follow up visit to monitoring.

The Behavioral interventions include:

- 1- Motivational interviewing MI
- 2-Self-Monitoring.
- 3- Stimulus Control.
- 4-problem solving.
- 5-social support.

1-Motivational Interviewing MI

Motivation is mandatory if behavioral change want to be sustained over the longtime. MI is well efficient communication strategy, a non-judgmental, collaborative discussion style permitting reinforcement of the client's own motivation and stimulating them to reach desired goal (Christie D: 2014). This method has four core steps, each building the foundation for the subsequent step, as follows (adapted from Britt et al., 2014)

1. Engaging – setting up or re-establishing relationships between the practitioner and the clients. Acceptance, compassion, and support are fundamental in this step. Engagement must continue throughout the visit.
2. Focusing – the practitioner, the clients and their family work together targeting an area of possible change. a practitioner may also want to re-focus a new goal if other relevant issues arise.
3. Evoking – the practitioner works to bring forth the underlying motivations for the clients and their

family wanting things to be different, and their desire for change.

4. Planning – when the clients are ready to change, the practitioner works with them to recognize how change may be brought about.

2-Self-Monitoring

Food diaries, Physical activity logs, Weight documents that contain time, place, feeling while eating and exercise. A result of meta-analysis of 21 randomized controlled trials showed adding self-weighing to a behavioral weight loss program will enhance weight reduction. (Madigan, 2015)

3-stimulus-control

Controlling or modifying the stimuli that prompt eating examples: eating only at the dining table, chewing slowly not eating while watching television, no available snack at home, turning off the television set and putting down reading materials may permit person to focus on eating, buy fresh food and prepare lower calorie foods.

4-Cognitive restructuring

Identify negative self-statement through self-monitoring &reframed negative think, for example if one eats a piece of cake, choosing to exercise rather than blaming oneself.

5-Social support by family and friends.

6-Reinforcement by buy smaller size clothes, compliment, improve mobility &health.

Diet

The purpose of dietary therapy is to reduce the total number of calories ingested. proof from clinical trials have shown that caloric restriction, regardless of dietary regimen lead to better weight outcomes (Wadden TA:2012). A calorie deficit of 500kcal/day result a weekly deficit of ~ 3500 kcal, which is roughly equivalent to the energy in 1 pound 0.45kg of fat tissue (Antonetti VW:1973). The recommendations states that "a variety of dietary strategies can produce weight loss in overweight/obese adults, and that the choice need to be based on the patient's preferences and health status.

Mediterranean diet:

it contains a high level of monounsaturated fat relative to saturated; average consumption of alcohol, increase consumption of vegetables, fruits, legumes, and grains; a moderate consumption of milk and dairy products and low

ingestion of meat products. A meta-analysis on the Mediterranean diet significantly showed an 8% reduction of death from all causes, a 10% reduction from death and/or incidence of cardio/cerebrovascular diseases, a 6% reduction from death and/or the incidence of neoplastic diseases and a 13% reduction of the incidence of neurodegenerative disorder (Sofi F:2010). The Mediterranean diet was more effective for weight reduction than low-fat diets, but like the low carbohydrate or American Diabetes diet it improved glycemic control in patients with T2DM (Mancini JG:2016).

Low carbohydrate diets:

Low- and very-low-carbohydrate diets are more effective for short-term weight loss than low-fat diets. It can be implemented in two ways, either by reducing the total amount of carbohydrate or by eating foods with a lower glycemic index. In a meta-analysis Nordmann et al., found that weight loss was greater at 6 months when carbohydrate intake of <60g/ but not at 12 months in contrast with different diets (Nordmann AJ:2006). A meta-analysis by Mansoor et al., comparing the effects of low-carbohydrate diets with low-fat diets on cardiovascular risk factors showed mixed effect: larger weight loss for those on low-carbohydrate diets but also a greater increase in HDL and LDL cholesterol. (Mansoor N:2016)

Very low-carbohydrate (ketogenic) diets VLCKD

A result of review by Bueno et al., comparing VLCKD with low-fat diets with follow-up of at least 1 year are slightly greater weight loss with VLCKD. However, the quality of the low-fat comparison diets was not considered (Bueno NB: 2013) Tay et al., compared a high-fiber low-fat diet with a VLCD in patients with T2DM both achieved substantial weight loss at 12 months. (Tay J:2015)

Low-glycemic index diets

The glycemic index is based on the rise in blood glucose in response to eating. Thomas et al., found a significant but small difference in weight loss of 1.1 kg that favored low glycemic index diets beside both TC and LDL decrease more with it (Thomas DE:2007). Hjorth et al., have reported prediabetic patients may respond better to a lower glycemic index diet with rich fiber and whole grain. (Hjorth MF : 2017)

low-fat diets

The important thing is “adherence” rather than a specific diet is the important step in success. Johnston et al., found that both low carbohydrate and low-fat diets resulted in significant weight loss at 6 and 12 months, there was no significant difference between the two-dietary regimen (Johnston BC:2014).

Very low-calorie diets VLCDs

Define as diet contain energy level between 200 - 800 kcal/d. In a review evaluating low-calorie diets with VLCDs was found that VLCDs produced significantly greater short-term weight loss 16.1% than low-calorie diets 9.7% but similar longer-term weight loss. (Tsai AG:2006) it is found that Low-energy, very low-energy, low glycemic index and modified macronutrient diets plus nutrition advice, can all reach similar weight losses around 4 kg during 1 year. (Vink et al., 2016)

A review by Stelmach-Mardas and Walkowiak, result that energy restricted diets resulted in a reduction in BMI, blood pressure and triglyceride in metabolically healthy obese adults, but no certain diet was recognized as the most suitable for healthy obese adults. (Stelmach-Mardas M:2016) . There are evidences of systematic reviews that VLCDs (diets with a median energy content of 1937 kJ/day around 463 kcal/day), with a median duration 10 weeks) can lead to long-term weight loss, reduced cardiovascular disease risk and obesity comorbidities (Mullholland et al., 2012, Johansson et al., 2014, Parretti et al., 2016).

Physical Activity: .

In general, 150–250 minutes per week of moderate intensity exercise is need it to prevent weight gain or to help in weight loss when joined with caloric restriction (Donnelly JE:2009). The Relaxation time involving sitting like television viewing or screen time are also accompanied with overweight, so encouraging patient to decrease it. Gradually expanding exercise activity as 10% rise from current activity level in minutes per week will be more effective than beginning with an aggressive static goal as doing 60 minutes of daily physical activity. Around 300 min/week of persistence exercise at moderate intensity or 150 min of more intense exercise is enough to mobilize visceral fat. The general prescription for the community is at least of 150 min/week of moderate aerobic activity equal to walking at 5–6 km, increased physical fitness reflect on cognitive

function and psychological wellbeing (Firth J:2017) . a systematic review by Verheggen et al., study the analysis of 117 research comparing exercise training (low to vigorous aerobic exercise at least twice a week) and low energy diets (at least 10% less energy than usual diet), both efficiently decrease visceral body fat with the exercise arm resulting in larger decreases in body fat while low energy diet significantly greater weight reduction. This information demonstrated that changes during weight reduction did not necessarily reflect changes in body fat beside exercise have health advantages like cardiovascular health weight loss (Verheggen RJ2016).

Drugs therapy:

The Endocrine Society clinical practice guideline on obesity pharmacotherapy agree that physicians may choose prescribing drug therapies for patients who:

- 1-struggle to achieve weight goals.
- 2-if BMI > 30kg/m² or BMI >27 kg/m² with comorbidity.
- 3- Need to lose weight for health reasons as (osteoarthritis, prediabetes, fatty liver, other disease).(Apovian CM:2015)

American College of Endocrinology demonstrate that physician may consider drug as a first-line treatment if patients complain of one or more severe comorbidities that would benefit from weight loss of >10% even if patients did not fail lifestyle modification before doctor prescribe medications.(Garvey WT ,2016)

Drugs that expand body weight or have negative metabolic effects need to avoid or replaced preferred either weight loss or weight neutral medications (Yumuk V,2015). If the patient has not lost at least 5% of initial weight after three months with full therapeutic dose it is advisable to stop treatment because lack of efficacy and reevaluate the patient (Yanovski, S. Z 2014).

Orlistat is a potent and selective inhibitor of pancreatic lipase that reduces intestinal digestion of fat. In a meta-analysis of 31 studies using orlistat the maximal weight loss (by modeling) was 6.65kg, and half the maximal effect occurred by 35.4 weeks (Dong Z,2017).

Yanovski et al., studied the pooled estimates from a meta-analysis of 15 orlistat trials BMI range from 27- 50 kg/m² and found a one-year weight loss between 3.4 kg (120 mg tds) and 2.5 kg (60 mg tds) greater than placebo-treated controls. Between 35% and 73% of patients used 120mg tds achieved a clinically significant weight loss at

least 5% of body weight. This dose was associated with beneficial effect on CVD risk factors, decreases TC, LDL, FBG and systolic and diastolic blood pressure after one year of treatment ,because gastrointestinal side effects less than 10% of patients take orlistat for at least one year, and less than 2%t for two years or more(Yanovski SZ:2014).

Lorcaserin

Lorcaserin selectively targets the serotonin-2c receptors to reduce food intake, but it has low affinity for the serotonin-2b receptors on heart valves. Result of meta-analysis of five studies using lorcaserin, the maximal weight loss (by modeling) was 5.39 kg, and half the maximal effect occurred by 19.3 weeks (Dong Z, 2017).

Liraglutide

Physician recommend this drug adding with a reduced-calorie diet and increased physical exercise for chronic weight management in adult patients with an initial BMI of >30 kg/m² or BMI of >27kg/m² who have comorbidities. study showed that after 56 weeks, liraglutide decrease body weight by 8.4 kg in contrast to 2.8 kg in the placebo-treated group(Pi-SunyerX:2015). .In a meta-analysis of three studies using liraglutide , the maximal weight loss (by modeling) was 7.68 kg and half the maximal effect at 12.7 weeks(Dong Z,2017). Liraglutide is contraindicated in patients with a family history of medullary thyroid carcinoma, MENS type 2 and a history of pancreatitis.

phentermine/topiramate

PHEN/TPM ERhas lower doses of phentermine than physician usually prescribe for phentermine alone, it acts by decrease appetite through increasing norepinephrine in the hypothalamus. Topiramate may reduce appetite by its effect on GABA receptors. In a meta-analysis of six studies using PHEN/TPM the maximal weight reduction (by modeling) was 15.6 kg and half the maximal effect at 29.8 weeks (Dong, 2017). Avoid topiramate in the first trimester may increase risk of cleft lip/ palate in infants, in Glaucoma, in hyperthyroidism and within 14 days of treatment with MAO inhibitors.

Naltrexone/bupropion combination

Bupropion is approved as a single agent for depression and for smoking cessation. It reduces food intake by acting on adrenergic and

dopaminergic receptors in the hypothalamus. It has a modest effect on weight loss. Naltrexone blocks this effect of β -endorphin, thus allowing the inhibitory effects of α -melanocyte stimulating hormone to reduce food intake by acting on the melanocortin-4 receptor system. In a meta-analysis of six studies using naltrexone/bupropion, the maximal weight loss (by modeling) was 13.2kg and half the maximal effect at 35.2weeks (Dong, 2017).

Referral: recommendations state that physician should screen adults for obesity and refer whom BMI more than 30kg/m² to intensive, multicomponent behavioral interventions (USPSTF. 2011) Bariatric surgery is advised when ordinary treatment over a certain period has failed and if BMI is > 40 kg/m² or BMI is > 35 kg/m² with comorbidities, or if BMI is > 30 kg/m² with T2DM on individual basis (Yumuk V:2015). Bariatric surgery is the best effective and efficient treatment for patients classified as severe obesity, in the middle and in the long term. The major significant impact from this surgery is related to inducing substantial weight loss not to surgery itself (Livingston EH:2018). The effectiveness of bariatric surgery for weight loss is well established (Colquitt et al., 2014; Chang et al., 2014). Beside it reduced deaths due to cardiovascular disease and cancer, bariatric surgery linked to improvements in the management of diabetes as proof it by Courcoulas et al., 2015, Ding et al., 2015, Mingrone et al., 2015, Schauer et al., 2014 and Murphy et al., 2017. Body weight decreased 23% with gastric bypass, 19% with Sleeve Gastrectomy, and 5% with drug treatment (Schauer PR2017).

Post bariatric

Periodic laboratory investigations for nutritional deficiencies is advisable and required supplements will be individualized accordingly (Busetto L2017). Guidelines recommend routine nutrient supplementation like multivitamins, vitamin B12, iron, minerals, calcium, and vitamin D (Mechanick JI2013). The bariatric surgery has been considered the gold standard method for severe obesity and the most effective choice but the worry about long-term effect, with data showing that more than 20% of patients have weight regain with recurrence of comorbidities. (Sumithran, P 2011)

Laparoscopic adjustable gastric banding

In laparoscopic adjustable gastric banding, a hollow, flexible silicone band is placed around the

upper stomach, which causes a restrictive effect, decrease stomach size, and produces rapid feelings of satiety.

Laparoscopic sleeve gastrectomy

The laparoscopic sleeve gastrectomy cutting most of the body and all the fundus of the stomach, creating a long, narrow, tubular stomach. A prospective study in New Zealand by Lemanu et al., found improvement and resolution rates at five years after laparoscopic sleeve gastrectomy for T2DM (79% resolution), hypertension (61%) and obstructive sleep apnea (73%) (Lemanu DP2015)

Roux-en-y gastric bypass

In Roux-en-Y gastric bypass, a small gastric pouch is formed by dividing the upper stomach and joining it with the resected end of the jejunum, so that food bypasses the stomach and upper small bowel, so restricting the size of the stomach and causing some malabsorption. Roux-en-Y gastric bypass may be a suitable surgery in patients who are more obese and those with T2DM (Davies SW:2014)

Conflict of interest

There was no conflict of interest.

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