

AN OVERALL REVIEW ON OBESITY AND ITS RELATED DISORDERS

A.KRISHNA SAILAJA

Associate Professor, RBVRR Women's college of Pharmacy, Hyderabad

Received: 21 January 2015, Revised and Accepted: 10 February 2015

ABSTRACT

Obesity can be defined as an excess proportion of total body fat. Obesity is increasing rapidly around the world. Nearly 20-25 % of the children are either overweight or obese. More than 80 % of the deaths in U.S are in patients with body mass index over 30. If the BMI is more than 40, life span is going to be reduced as much as 20 years for men and five years for women. Obesity develops number of chronic diseases like insulin resistance, Type 2 diabetes, hypertension, congestive heart failure. In this review the role of dietary modifications, genetic background and life style modifications in the prevalence of obesity was discussed. Its main reasons, complications and treatment of obesity were also explained in detail manner. Measurements to be taken to control the weight, importance of physical activity were also given significance in this article.

Keywords: BMI, Central adiposity, Hypertension, Type 2 diabetes, cardiovascular disorders

INTRODUCTION [1, 2]

Obesity can be defined as having an excessive amount of body fat. A Person becomes obese by consuming more calories than required. A person is considered to be overweight if the body mass index lies in between 25-30. There are different reasons for the occurrence of obesity.

Age: - When the age advances, the ability of the physiological system to metabolize the food decreases. After crossing 40 years the consumption of food has to be decreased. Instead if they are consuming the same quantity of food it leads to obesity.

Gender: Women Prone to overweight more than men. Because men have higher resting metabolic rate than women. After menopause metabolic rate decreases in women. If they consume same quantity as earlier, it may leads to obesity [3, 4].

Genetics: Genetics play a major role in obesity. If both the parents are obese, the probability of the child to become obese is 75%.

Life style modifications: - Life style modifications include consumption of high energetic food and reduction of physical activity may leads to obesity. [5, 6]

Dietary modifications: - Carbohydrate increases blood glucose levels and stimulate insulin release. Insulin promotes the growth of fat tissue that results in weight gain. Simple carbohydrates consumption leads to obesity. Because they are rapidly absorbed into blood stream than complex carbohydrates.

Frequency of eating: Scientist observed that people eating meals in small proportions four to five times daily have lower cholesterol and more stable blood glucose levels than people who eat large meals at a glance. So to maintain stable insulin levels it is required to take small meals frequently.

Psychological factors: Some people eat more in response to negative emotions such as sadness, anger. Psychological factors also show its impact on obesity.

Illness: Certain hormonal problems such as hypothyroidism, depression may lead to overeating and obesity.

Medications: Steroids and anti depressants may cause excessive weight gain.

Risk factors associate with obesity

Insulin resistance: Insulin is essential for transport of blood glucose to the cells. Insulin resistance is the condition where the cell will not respond to insulin. So the effectiveness of insulin in transporting glucose into the cell is diminished. Insulin resistance occurs mainly because of obesity. Several studies on Asian Indians showed that they are characterized by higher insulin resistance, early onset type 2 diabetes and hyper tension. Small size at birth coupled with subsequent obesity increases risk for insulin resistance syndrome in later life. For a given body mass index (BMI), Indian children have a higher percentage of body fat and more visceral fat than members of other population. The tendency of Indians to have higher percentage of body fat and more visceral fat than members of other population may be programmed in uterus. This thin fat phenotype is present at birth. Dietary factors play an important role in initiation of insulin resistance syndrome. The oil preferred for cooking in India is considerably Changes the ratio of W6/W3 fatty acids [7]. When individuals with thrifty genotype are supplied energy rich food with reduction in physical activity results in prevalence of obesity and impaired glucose tolerance.

Type2 diabetes: Central obesity causes type 2 diabetes. A person with central obesity has excess fat around the waist. So body acquires apple shape. Central obesity is more common in Indians. The reason for central obesity in Indians can be explained by means of thrifty phenotype hypothesis. The thrifty phenotype hypothesis proposes the epidemiological association between poor fetal and infant growth and subsequent development of type 2 diabetes. This metabolic syndrome results from the effects of poor nutrition in early life which produces permanent changes in glucose insulin metabolism. These changes results in

Reduced capacity for insulin secretion
Insulin resistance

These changes along with obesity and physical inactivity lead to type 2 diabetes. Therefore the presumed genotype behind IR syndrome is

a thrifty one. This hypothesis postulates that a cast array of genes will favor the storage of energy from food stuffs protecting the individuals against the consequences of starvation. However if an abundance of nutrients and sedentary life style are present, the effects of those thrifty genes will become deleterious by altering the energetic equilibrium due to predominance of energy storage over energy expenditure thus promoting visceral obesity which is the major risk factor for type 2 diabetes.

High blood pressure: Obesity is one of the major causes for blood pressure. People with central obesity are more prone to BP when compared to pear shaped.

Heart attack: The probability of occurrence of heart attack is 3 to 4 times more in women having BMI more than 29. In the patients already exposed to heart attack, obesity increases the risk of second heart attack.

Measurement of body fat:- Body mass index measurement approximates the body's fat percentage. Methods for determining the body fat were given below.

Underwater weighing (hydrostatic weighing): This method weighs a person underwater and then calculates lean body mass and body fat. This is one of the accurate methods but requires research facilities and costly equipment.

BOD POD: The BOD POD is a computerized, egg-shaped chamber. Using the same whole-body measurement principle as hydrostatic weighing, the BOD POD measures a subject's mass and volume, from which their whole-body density is determined. Using this data, body fat and lean muscle mass can then be calculated.

DEXA: Dual-energy X-ray absorptiometry (DEXA) is used to measure bone density. It uses X-rays to determine the percentage of body fat how much fat is located in the body.

The following two methods are simple and straightforward:

Skin calipers: This method measures the skin fold thickness of the layer of fat just under the skin in several parts of the body with calipers. The results are then used to calculate the percentage of body fat.

Bioelectric impedance analysis (BIA): There are two methods of the BIA. One involves standing on a special scale with footpads. A harmless amount of electrical current is sent through the body, and then percentage of body fat is calculated. The other type of BIA involves electrodes that are typically placed on a wrist and an ankle and on the back of the right hand and on the top of the foot. The change in voltage between the electrodes is measured. The person's body fat percentage is then calculated from the results of the BIA. Early on, this method showed variable results. Newer equipment and methods of analysis seem to have improved this method.

BMI and its significance: - BMI can be calculated as weight in Kilograms divided by height in meters square. If the BMI lies in between 19 to 25 that is called healthy weight. World Health Organization uses a classification system using BMI to define overweight and obesity.

Persons having BMI in the range of 25 to 29.9 are grouped into pre obese. Persons having BMI in the range of 30 to 34.9 are grouped into obese class 1. Persons having BMI in the range of 35 to 39.9 are grouped into obese class 2. Persons having BMI more than 40 are grouped into obese class 3.

Apple and Pear shape: - Depending upon the location of distribution of fat, the persons are classified as pear shape and apple shape. In general women collect fat in their hips and buttocks giving the figure of pear. Men collect fat around belly giving apple shape. Apple shaped people have high risk of developing cardiac problems and metabolic disorders. In order to know the shape whether pear or apple shape doctors have developed one simple calculation. This measurement is called waist to hip ratio. To find out a person's waist to hip ratio one has to measure the waist at its narrowest point, and hips at the widest point then divide the waist measurement by the

hip measurement. Women with waist-to-hip ratios of more than 0.8 and men with waist-to-hip ratios of more than 1.0 are "apples."

Treatment of obesity

The main goal of obesity treatment should be achieving "healthier weight". By reducing the weight one can lower the risk of getting blood pressure, heart attack, type 2 diabetes. Treatment of obesity includes

1) Physical exercise 2) dietary modifications c) Medication

Physical exercise: - The national health and examination survey (NHANES 1) proved that people doing exercise regularly are maintaining the weight within the limits. Physical exercise reduces the weight by burning the calories. The amount of calories burned depends upon so many factors like type of exercise, duration and intensity of activity. The extent of weight loss also depends on the weight of the person. For the same physical activity the obese class IV person burns more calories than obese class 1. By doing the exercise regularly there will be a greater loss of body fat versus lean muscle. The other benefits of physical exercise includes improved blood sugar control, reduction of triglycerides level in the blood, less chance of getting heart attack and reduction of abdominal fat.

Recommendations for physical activity

Daily moderate exercise should be performed for 20-30 minutes. This exercise includes walking, bicycling, walking on a treadmill and swimming. Small breaks can be given up to 10 minutes.

Precautions to be taken during the period of exercise

Person with heart problems, asthmatic patients should consult doctor before starting exercise. Men above the age of 40, women above the age of 50 should consult physician. While doing the exercise if there are any signs of chest pain immediately they should stop the activity and advised to consult doctor.

Role of diet in the treatment of obesity

The first target is to control further weight gain. Normally adults require 1200-2800 calories per day depending upon the body size and their activities. For every kilogram of body weight 22 calories are required to maintain that weight. So women weighing 100 kg requires 2,200 calories to maintain that weight. If she starts burning calories by doing physical exercise and consuming low fat diet she can lose initial weight faster than a women weighing 60 kg.

Diet chart to achieve healthy weight

Diet plan should be safe and effective. It should include all vitamins and minerals

Diet chart should contain more "low energy density" nutritious foods like vegetables, lean meat, fruits, grains and beans.

Diet chart should include a minimum quantity of "high energy dense" foods like simple sugars, ice creams, egg yolks, fried foods, red meat, sweets, pastries, butter, high fat salad dressings. Healthy diet contains less than 30 % fat.

It is beneficial to eat complex carbohydrates like brown rice, whole grain breads, fruits, vegetables. Better to avoid simple carbohydrates. Because they cause excessive insulin release by pancreas and insulin promotes growth of fat tissue.

Before making any dietary changes always better to consult doctor. Because doctor will suggesting the number of calories for the body and precautions to be taken to avoid nutritional deficiencies.

Role of medication

Medications should be given to reduce the weight only to those patients who have health risks related to obesity. Normally medicines are not advised for treating obesity. If the patients have health risks related to obesity then only medicines will be prescribed. Medicines are used in patients with BMI greater than 30 and in those suffering from blood pressure, cholesterol and diabetes

mellitus. By using medicines along with physical exercise and diet restrictions one can lose 5 pounds in the first month of treatment.

First class category of drugs

They act by stimulating sympathetic nervous system. Major side effects of these drugs are blood pressure. These medicines decrease appetite and create a sensation of fullness. Hungry and satiety are regulated by neurotransmitters. Ex: - sibutramine, Phenteramine

These drugs suppress appetite by increasing the levels of neurotransmitters like dopamine, serotonin, nor epinephrine at the junction between nerve endings in the brain.

Phenteramine : They act by suppressing the appetite by releasing nor epinephrine in the body. The common side effects are headache, insomnia.

Sibutramine: U.S FDA approved sibutramine in 1997 for treating obesity. It acts by increasing the levels of serotonin and nor epinephrine in the brain. It was withdrawn from the market in 2010. Because clinical trial data indicated that it was associated with increased risk of heart attack and stroke.

Second class of drug: - These drugs act by changing the metabolism of fat. Orlistat is the only US FDA approved drug. These are also called as lipase inhibitors. By inhibiting the enzyme lipase orlistat prevents the intestinal absorption of fat by 30%. It has no systemic side effects. Some of the side effects include changes in bowel habits, irregularities in menstrual cycles for women.

Belvic:- In 2012 FDA approved one more medicine Belvic which acts by controlling the appetite. This medicine can be used for obese patients suffering from weight related health problems. Pregnant patients are not supposed to use this medicine since it causes birth defects.

Qsymia: It is a new medicine approved for weight loss. It is a combination of phenteramine and topiramate extended release. It also leads to birth defects in pregnant ladies.

Herbal Phen: - The main ingredients in herbal Fen contain ephedrine. It acts by stimulating CNS and heart. Ephedrine promotes weight loss by increasing body's temperature. When the body temperature rises body burns more calories. Ephedrine causes high blood pressure, heart rhythm irregularities, strokes, insomnia, seizures and tremors.

Use of artificial sweeteners and OTC products in the treatment of obesity

Saccharine and Aspartame are the artificial sweeteners that provide minimum calories to the body. People with phenylketonuria should not use aspartame as it contains phenylalanine. On comparison fructose Sorbitol and xylitol may be used to provide more calories than saccharine and aspartame.

Over the counter weight loss products

Weight loss products contain a combination of ma huang, white yellow, hoodia gordonii and kolanut. These agents increase the metabolism and help the body to break down fat. Mahuang has been linked to serious side effects such as heart attacks, seizures and death. Chromium is also a popular ingredient in weight loss product. But scientifically its role in weight reduction has not yet proved.

Role of surgery: - According to the National Institute of health Consensus surgery is required for obese patient whose BMI is greater than 40. Surgical procedures of upper GI Tract are called as bariatric surgery. But it has been associated with huge number of problems. Currently procedures including making the stomach area smaller or bypassing the stomach completely.

Restrictive surgery: These surgeries restrict the size of stomach, but bypass or remove a part of the digestive system to decrease absorption of food.

Now a day's surgical treatment was done by laposcopic methods. The risks of surgery include the usual complications of infection, blood clots in the lower extremities. Vitamin B12 deficiency can also develop and could lead to nerve damage.

CONCLUSIONS

Now a day's obesity is becoming worldwide major health problem. Obesity is one of the major causes of type2 diabetes, hypertension and cardiovascular disorders. Genetics also playing major role in the prevalence of obesity. Physical exercise and dietary charts will help in achieving "healthy weight". Low birth weight coupled with reduced physical activity in later stage is coupled with obesity and type 2 diabetes. Precautions should be taken to control overweight.

REFERENCES

1. W. B. Droyvold, T. I. Lund Nilsen, S. Lydersen, K. Midthjel, P. M. Nilsson, J. Nilsson, J. Holmen; "Weight change and mortality: the Nord-Trondelag Health Study." *Journal of Internal medicine.* Vol 257(4), pp 338-345.
2. National Center for Health Statistics; "National Health and Nutrition Examination Survey." <http://www.cdc.gov/nchs/nhanes.htm>.
3. Lederman SA. The effect of pregnancy weight gain on later obesity. *Obstet Gynecol* 1993; **82**: 148-155.
4. Fowles ER, Walker LO. Correlates of dietary quality and weight retention in postpartum women. *J Commun Health Nurs* 2006; **23**: 183-197.
5. Gillies CL, Abrams KR, Lambert PC et al. Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis. *BMJ* 2007; **334**: 299.
6. Wing RR, Venditti E, Jakicic JM, Polley BA, Lang W. Lifestyle intervention in overweight individuals with a family history of diabetes. *Diabetes Care* 1998; **21**: 350-9.
7. Seshadri P, Samaha FF, Stern L, Chicano KL, Daily DA, Iqbal N. Free fatty acids, insulin resistance, and corrected at intervals in morbid obesity: effect of weight loss during 6 months with differing dietary interventions. *Endocr Pract* 2005; **11**: 234-9.
8. Bharati P1, Pal M, Bandyopadhyay M, Bhakta A, Chakraborty S, Bharati P. Prevalence and causes of low birth weight in India. *Malays J Nutr.* 2011 Dec; **17**(3):301-13.
9. AK Choudhary1, Asha Choudhary2, SC Tiwari3, R Dwivedi4 Factors associated with low birth weight among newborns in an urban slum community in Bhopal. *Indian journal of public health.* 2013. vol 57(1), pp 21-23. 10) <http://www.lpch.org/DiseaseHealthInfo/HealthLibrary/hrnewborn/vlbw.html>
11. Maciejewski ML, Winegar DA, Farley JF, Wolfe BM, Demaria EJ. Risk stratification of serious adverse events after gastric bypass in the Bariatric Outcomes Longitudinal Database *Surg Obes Relat Dis* 2012; **8**: 671-7 12) Finks JF, Kole KL, Yenumula PR et al. Predicting risk for serious complications with bariatric surgery: results from the Michigan Bariatric Surgery Collaborative. *Ann Surg* 2011; **254**: 633-40.
13. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults—The Evidence Report. National Institutes of Health. *Obes Res* 1998; **6** Suppl 2: 51S-209S. 14) Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA* 2010; **303**: 235-41.
15. Ogden CL, Carroll MD. Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, Trends 1960-1962 Through 2007-2008. 2010.
16. Online BMI Calculator for adults. <http://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm>