

## Obesity – A Review

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### ABSTRACT

When an individual is carrying excess body fat for their height and sex, the condition is coined as obesity. A person is considered obese if they have a body mass index (BMI) of 30 or exceeding it. The way of life we are habituated to including very less physical activities as it used to be earlier. Life style today is very easy with minimal amount of physical movements. Lower the exercise, higher is the obesity. It is defined by body mass index (BMI) and further evaluated in terms of fat distribution via the waist-hip ratio and total cardiovascular risk factors. Obese patients are at an increased risk for developing many medical problems, including insulin resistance and type 2 diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, stroke, sleep apnea, gallbladder disease, hyperuricemia and gout, and osteoarthritis. All these factors makes obesity and overweight as a disease to be studied on a large scale, also to be fully aware of as it is a lifestyle disorder, which when progressively proliferates makes one's style of life, disordered.

**Keywords:** Obesity ,Lipotoxicity, Hyperlipidemia, Type 2 Diabetes.

### I. INTRODUCTION

Obesity is a persistent Global issue. It is a metabolic disorder occurring due to excess fat

deposition. Obesity is a result of imbalance between the energy intake and its expenditure. About 1.3 billion people which accounts to be nearly the one third of the world's adult population was found to be overweight or obese in the year 2005 and it is estimated that by 2030 nearly two third of the world's adult population which is 3.3 billion people would be obese.<sup>1</sup> Obesity and overweight also brings along various associated diseases such as coronary artery disease, diabetes mellitus, hypertension, hyperlipidemia, gall bladder disorders, cerebrovascular accidents, osteoarthritis, sleep disorders and other pulmonary diseases. It is one of the most common chronic disorders found in developed and developing countries. It is reported to occur due to chronic alcoholism, sedentary lifestyle, over ingestion of unhealthy diet. This disorder accounts for Global public health issue because of its ever-increasing prevalence across all sex, age groups, ethnicity or race. This disorder is associated to carbohydrates and fat metabolism. Obesity is characterized by extreme fat deposition in the adipose tissue and other organs such as the heart skeletal muscle liver and pancreas islet. Researchers claim that there are chances of obesity and overweight amount the individual experiencing modifications in dietary habit and minimizing the required physiological work. This also increases

the chances of experiencing other lifestyle disorders.<sup>2</sup>

Moreover, it is also very clear that obesity is a hereditary disorder associated to genes. In most of the cases the causative genetic variants are uncertain and their mechanism of action to the disease phenotype is also unclear. The consequence of obesity is a multi-factorial and hence there is a need to understand this condition and significant researches in this particular area.

This disorder is the fifth leading cause of global death the American medical association has officially recognized obesity as a disease. The evidences demonstrate the impact of obesity on the morbidity and mortality index. This disease profoundly affects health care cost and professional-personal quality of life. The factors to blame are the lack of access to healthy, save an affordable food, safe place for physical activity, inferiorly not fresh or poorly cooked food, fast food or packaged food which contains preservatives, another unhealthy ingredients for portability and palatability, low-income neighborhoods and communities. Another major reason for obesity and overweight is the over exaggerated falls marketing of the dietary substances. The marketing of mostly on healthy product by the food for the beverages industries mostly other reason for the modern culture habit that increases the sedentary behavior and decreases eating cadences. All this together increases the stress level and sleep dept. Several reports make it evident that there is a three-fold increase in childhood obesity rates in the past 30 years. Children are increasingly being diagnosed with adult diseases such as Type 2 diabetes and coronary heart disease.<sup>3</sup>

Together this calls for a very prominent need to create awareness about obesity. The awareness of significance of a healthy lifestyle that comes from healthy food and its metabolism through proper exercising and yoga it is a need of time.

## II. SCALE DEPICTING OVERWEIGHT AND OBESITY:

Obesity, this issue is defined generally by an indirect measure of body fat. The measure of body fat is indirectly known as the body mass index (weight (kg)/ (height (m)<sup>2</sup>)<sup>4</sup>. Body mass index (BMI) is a numerical value obtained from the weight and height of a person. The BMI is defined as the body mass divided by the square of the body height, and is expressed in units of kg/m<sup>2</sup>, resulting from mass in kilograms and height in meters. The BMI is a convenient rule of thumb used to broadly categorize a person as underweight, normal weight, overweight, or obese based on tissue mass (muscle, fat, and bone) and height.<sup>5</sup>

Commonly accepted International BMI ranges are as:

- Underweight (under 18.5 kg/m<sup>2</sup>)
- Normal weight (18.5 to 25)
- Overweight (25 to 30)
- Obese (over 30)

BMI's under 20 and over 25 have been associated with higher all-causes mortality, with the risk increasing with distance from the 20–25 range.

Body mass index categorizes the distribution of body fat, which is important because excess intra-abdominal fat is an independent

predictor of health risk. Waist circumference correlates with visceral fat and indirectly measure central obesity<sup>13</sup>. An increased risk to health is present when waist circumference exceeds 94 cm (37 inches) for men and 80 cm (32 inches) for women.<sup>6,7</sup>

### III. GENETICS

On the basis of genetics, obesity is a multitude of gene polymorphisms. Obesity is associated with many genetic syndromes. Polymorphs located in genes and candidate regions throughout the genome regulates an individual's susceptibility to weight gain in a permissive environment. The Syndrome obesity is a particular case in which there are 20-30 mendelian disorders in which patients are clinically obese, yet these are additionally distinguished by dysmorphic features, mental retardation, and organ-specific developmental abnormalities.<sup>8,9</sup>

The genetic factors associated to obesity are represented as the following:

3.1) Monogenic obesity- Single mutations contribute to the development of obesity (monogenic obesity). These forms of obesity generally start in childhood. It is a very rare form of obesity. The common receptors for the genes associated to monogenic obesity includes Leptin (LEP), Proopiomelanocortin (POMC), Neurotropic tyrosine kinase receptor type 2 (NTRK2), Melanocortin-4 receptor(MC4R) etc. Along with being rare it is the most severe type.<sup>10,11</sup>

3.2.)Polygenic obesity- This arises when many genetic variants interact with the environment in common obesities. The risk for obesity can be due

to high number of loci, each with multiple disease low frequency predisposing alleles.<sup>12</sup>

### IV. GENERAL CONSIDERATION

The regulation of obesity evidently is related to the molecular regulation of appetite. Such regulations affect the energy homeostasis, this results into misbalancing the lipid and glucose metabolism.<sup>13,14</sup>The cytokines secreted in ample quantity by excess adipocytes, contributes to the vascular dysfunction in hypertension and dyslipidemia, as manifested by hypercholesterolemia. Obesity further is a critical factor in the dysregulation of cellular metabolism that accounts for insulin resistance in diabetes mellitus type 2. Significantly, this results into atherosclerosis.<sup>15,16</sup> Recent researches related to fatty liver and its association with inflammation, as well as visceral adiposity's effect on gastroesophageal reflux, cancer of the bowel, gallstone disease, makes the liver and gut vulnerable to obesity. Further additional such dysregulation constitutes to the metabolic syndrome associated with obesity or diabetes and insulin resistance.<sup>16,17</sup>

### V. DYSREGULATION OF LIPID AND GLUCOSE METABOLISM:

Starvation is a condition where there is a depletion of nutritional substances in the human body. Such condition results when there is a lack of nutrition required by the stored food, for the survival. Obesity basically results from the excess the deposition of fat. The abundance of prolonged storage of food converts the efficient fats into the excess fats. Hence, the fats stored for survival in

the conditions of starvation gets converted into excessive fat, further leading to diabetes.<sup>18,19</sup> The end product of this fat is a free fatty acid, this free fatty acids when in numerous amount circulate freely in the vasculature reduces oxidative stress by disseminating itself throughout the body. Such action leads to fatty acid toxicity. Hypothetically triacylglycerol and the adipocytes provide protection against the free fatty acid toxicity hence they are known as the essential fatty acids.

The enhance life policies causes the release of fatty acids which leads to obesity. Lipolysis is catalyzed by the enhanced prolonged sympathetic state existing in obesity. Such excessive release of free fatty acids for the leads to lipotoxicity as the lipids and their metabolites are responsible to create an oxidant stress on the mitochondria as well as the endoplasmic reticulum (EPR). Another related term is lipogenesis. Inhibition of lipogenesis is due to the free fatty acid released from the stored triacylglycerols in an excessive amount. The excess level of serum triacylglycerols contribute to hypertriglyceridemia. Thus, there is a need to adequately clear the serum level of triacylglycerol.<sup>20,21</sup> The liver toxicity affects adipose tissues and non adipose tissues which are responsible for the pathophysiology of essential organs such as the liver and the pancreas. This and desired effect on the adipose tissues and the non adipose tissues leads to inhibition of lipogenesis which contributes to hypertriglyceridemia.

Another reason for the lipotoxicity is the release of fatty acids by the endothelial lipoprotein lipase. This excess secretions is the outcome of the increased serum triglycerides within the elevated

lipoprotein levels. Insulin receptor dysfunction is the result of such kind of lipotoxicity. If this insulin resistance and for the continuous it leads to hyperglycemia with associated with hepatic gluconeogenesis. The hepatic gluconeogenesis is primarily responsible for insulin resistant diabetes. This condition however contributes to hyperglycemia as a result of decrease in the utilization of insulin stimulated muscle glucose. The decrease in the secretion of pancreatic beta cells insulin is also a result of excessive free fatty acids leading to lipotoxicity. This ultimately results in the exhaustion of beta cells.<sup>22,23,24</sup>

This further suggests that Diabetes and Hyperlipidemia are the most popular clinical manifestations of Obesity.

## VI. TYPES OF OBESITY

Usually people tend to get confused between what is being fat and what is being obese.

Obesity is classified into 6 different types namely,

6.1) Food obesity- This kind of obesity is caused due to the over intake of diet containing high amount of food and sugars. This obesity is the most common type of obesity around the globe.

6.2) Thickness due to 'Nervous Stomach'-This type of obesity is usually a result of stress and depression. People experiencing this kind of obesity usually tend to have more sweet diet.

6.3)Gluten diet-It is more of a women centric obesity. This mainly occurs at the time of female adolescence, menopause and ovulation. This type of obesity is the hormonal imbalance in the female body during the menstrual phase.

6.4)Genetic metabolic Obesity- Genetic reason is mainly passed on from one generation to the other

generation through genes. People experiencing genetic metabolic diabetes often have their body swelled and have breathing issues.

6.5) Inactive obesity- When suddenly a part of a body becomes less active, this means that the presently inactive part was in very much use in the past for the physical work. Usually the inactive part is not in picture the fat tends to deposit in there. The common example for the population experiencing inactive obesity is the population of sports person.

6.6) Venous circulation obesity- The perfect example for Genetic inherent obesity is the Venous circulation obesity. This is dormant in the early phase of life. This type obesity becomes is very much active during the time of pregnancy.

#### 7. Treatment of Obesity:

There involve 5 Potential Strategies for Anti-Obesity Drug Action-<sup>25,26</sup>

7.1) Reduce unhealthy food and sugar intake: This amplifies effects or block the signals/factors that inhibit and augment food intake respectively.

7.2) Modulate the fat metabolism/storage: Appropriate adjustments to food intake or energy expenditure regulates the fat synthesis/breakdown.

7.3) Thermogenesis: Thermogenesis is the increment of metabolism or food energy dissipation as heat. It is also possible to increase energy expenditure by enhancing the physical activity.

7.4) Intake of Appetite suppressants: Blocking nutrient absorption the intestinal fat or carbohydrates, by blocking reuptake norepinephrine into neurons (e.g., mazindol) or stimulating its release (e.g., phentermine, benzphetamine).

7.5) Modulation of the body weight: Central regulation of the body weight is by altering the internal set point or fat stores signal modulation.

## VII. CONCLUSIONS

Obesity is serious because it is associated with poorer mental health outcomes and reduced quality of life. Obesity is also associated with the leading causes of death in the United States and worldwide, including diabetes, heart disease, stroke, and some types of cancer. Awareness regarding obesity is extremely low. There is very inadequate amount of knowledge about some healthy lifestyle practices. Awareness regarding obesity had a lot of wrong perceptions. Health education should be provided to students regarding risk factors of NCDs and impactful ways to reduce the risk by regularly exercising the healthy lifestyle practices.

Conflicts of Interest: Nil

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