

Obesity is Shifting People toward Life-threatening Diseases

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Abstract: Obesity is the condition when the excess energy is stored as fat in our body. This type of condition occurs when we take excess amount of energy than the expenditure. Marker for body fat content is body mass index (BMI). BMI is calculated by using the formula $BMI = \text{weight of a person (kg)} / \text{height of the person (m}^2\text{)}$. In clinical term a BMI greater than 30kg/m^2 is called obese and BMI between 25 kg/m^2 and 29.9kg/m^2 is called overweight. Distribution of abnormal body fat associated with no of disorders like Diabetes mellitus type-2, insulin resistance, atherosclerosis, cardiovascular disease, stroke, hypertension, kidney and liver related disease, some types of cancer, etc. Abdominal fat distribution (visceral fat) is more dangerous than the subcutaneous fat. Visceral fat releases bad chemical signals that cause various lethal disease. Excess cholesterol in blood plasma cause obstruction in blood vessels whereas belly fat plays a role in developing chronic or long lasting inflammation in the body. This inflammation can contribute to insulin resistance, diabetes mellitus type-2 and several other diseases. It also evokes some type of cancer.

Key Words: Atherosclerosis, Diabetes mellitus, Insulin resistance, Cardiovascular disease, Obesity.

1. INTRODUCTION:

Obesity is metabolic disorder, occurs due to intake of excess calories but expenditure is none or physical inactivity. However sometimes it is caused by hormonal imbalance, genetical cause, thyroid hormone imbalance, Cushing's syndrome, excess of insulin, side effects of medicine, ageing, insomnia, pregnancy, etc. When we take much quantity of energy than the expenditure, body mass increases and the excess energy is store as fat this condition is called obesity. According to the data of WHO (2016) approximately 13% (11% man and 15% women) of adults, age 18 years or older were obese in the whole world and Indian council of medical research (ICMR) says 13% of Indian population suffering from obesity and 39% of adult were overweight, whereas 40million children (under the age of 5 years) were overweight or obese in 2018. These figures are frightening and, are constantly increasing. Worryingly, obesity in children is increasing rapidly. If this persists then the country will become the most obese in the productive category (below the 35 years). When we take too much kilocalories as food then our body consumes energy as needed and the rest of the energy is deposited in the adipose tissue as triglyceride. In an adult, the number of adipocytes, which is also called fat cells, are 40 to 50 billion on average. In the initial stage these cells store access energy inside due to which they begin to grow in size but this is possible only to an extent. At most, one fat cell can store 1.2 mug of triglyceride and once these cells are full, they increase their number to store excess energy. In this way, obesity is maintained by increasing the number of adipocytes [1]. Obesity is measured by according to the Body mass index (BMI), the weight of a person(kg) divided by the height of the person (m^2).

$$BMI = \text{weight of a person (kg)} / \text{height of the person (m}^2\text{)}$$

If a person's body mass index is less than 25kg/m^2 , it is considered normal. If BMI between $25- 29.9\text{kg/m}^2$, it is considered overweight and BMI in range $30-40\text{kg/m}^2$ are obese. BMI more than 40kg/m^2 are morbidly obese [2]. Obesity can be caused by many reasons like physical inactivity, abnormal feeding etc. But the topic of discussion is how obesity is pushing people towards lethal disease. WHO estimate that 44% of diabetes in the world, 23% of heart disease and 7 to 41% burden of certain types of cancer is due to obesity. Apart from this, it also causes diseases like liver disease, obstructive sleep apnea, polycystic ovarian syndrome, osteoarthritis, depression etc. Obesity alone causes many diseases; here we will see how fatal diseases arise from obesity.

2. STUDY: We see, how the risk of having many fatal diseases increases with increasing obesity.

2.1. Atherosclerosis, Cardiovascular disease and stroke:

Atherosclerosis is caused by the accumulation of fat in the inner wall of large or intermediate artery, which is called atheromatous. In the beginning, cholesterol starts to accumulate in the form of small crystals in the intima and smooth muscle of the artery. This happens only if the concentration of cholesterol in the blood plasma is high, as it happens in obese people. Although cholesterol is a necessity of the body, but excess cholesterol harms the body. Cholesterol that accumulates in artery is called low density lipoprotein (LDL). LDL accumulate to the artery wall in the form of very small crystals, but over time they come together to form crystal beds on the artery wall. Apart from this,

after some time, fibers and smooth muscles associate with it and make the plaque bigger. As a result, the diameter of the lumen of the artery is greatly reduced, causing the reduction of blood flow. Sometimes plaque completely blocks the artery. Often, calcium also plays a role in this situation. This turns the plaque into a calcified bony hard plate[3]. Therefore, the higher the level of LDL in the blood, greater the risk of atherosclerosis. Apart from this, another type of cholesterol called very low density lipoprotein (VLDL), contains triglyceride. It also increases the level of LDL significantly. While high density lipoprotein (HDL) carries excess body cholesterol back to the liver. Atherosclerosis is a major cause of cardiovascular disease (CAD) and ischemic heart disease. Some people whose ancestors are suffering from atherosclerosis or obese people who take high cholesterol or fatty substances, In such people, cholesterol starts accumulating in endothelium of blood capillary at many places. Fibrous tissue quickly grows in such places and it becomes calcified. This forms atherosclerosis plaque. They block the blood vessels completely or half[3]. Heart attack occurs when the coronary artery is completely blocked while half-blocked artery restricts blood flow, it causes angina. Atherosclerosis is most common form of arteriosclerosis. The risk of stroke is also significantly increased due to atherosclerosis. When the blood vessels of the brain are narrowed due to atherosclerosis then there is a risk of ischemic stroke. When plaque in one of the arteries of the brain causes blood clot and obstructs the blood supply, it is called thrombotic stroke. It is the type of ischemic stroke. When this clot is formed in another organ away from the brain, it usually forms in the artery of the heart and blocks the artery reaching the brain via the blood supply, than it is called embolic stroke. Apart from this, the transient ischemic stroke, also called mini stroke, stops the blood supply in some part of the brain for some time and the brain does not work properly. People with android type of obesity (Characterized by abdominal fat distribution) is associated with increased risk of disease because the greater proportion of visceral fat is more harmful than accumulation of subcutaneous fat. Visceral fat releases bad chemical signals that promotes various disease like insulin resistance, diabetes mellitus, atherosclerosis, heart disease, etc. According to a 2017 figure, among the 100 dead people in the world. The number of people who died of cardiovascular disease was 32. From this we can infer how obesity shifts us towards fatal diseases.

3. Diabetes mellitus type-2(NIDDM):

Obesity has strong relationships between diabetes and insulin resistance. Type two diabetes is metabolic disorder characterized by high blood sugar level and presence of sugar in urine. Storage synthesis and secretion of insulin remains normal in this disease but hyperglycemia (blood glucose level remains high) occurs [4]. This is because target cell fails to utilize glucose. NIDDM develops mostly in obese adults. Obesity is the major independent risk factor for developing the disease. With increasing body fat or body weight, insulin resistance increases, and decreased ability of insulin to move glucose into muscle and fat and to stop glucose from liver[5]. Various observations and data suggested that fat cell of obese individual's secretes tissue necrosis factor- alpha and resistin, which impair the function of insulin resistance. Evidence for this, did an experiment in recent and observed that when glucose transporters. are selectively knocked out in adipose tissue, there is an associated decrease in glucose transport in muscle in vivo, but when the muscles of those animals are tested in vitro their transporter is normal[5]. People who are suffering from obesity as well as diabetes, the risk of heart disease also increases significantly in such people because diabetes is directly related to heart disease. Process of Plaque formation in the artery due to diabetes is greatly accelerated. Diabetes patients have a significant risk of silent heart attack. We can understand how obesity shifts us to another deadly disease. According to the data proposed by Institute for health matrix and evaluation in 2017, 2.45% of the deaths in the world are caused by diabetes mellitus.

4. Cancer:

Cancer is a dreaded disease and according to the data proposed by Institute for health matrix and evaluation in 2017 show that 17.08% people die because of cancer every year in the world. There can be many reasons for getting cancer but according to WHO, the risk of certain types of cancer in obese people is much higher than that of ordinary people. This may also be the reason that in obese people both the type and distribution of body fat is quite different from the normal people. However data from observational studies can be difficult to interpret and cannot definitively establish that obesity causes cancer. Despite this there is consistent evidence that obesity increase risk of a number of cancer[6]. For example chances of endometrial cancer in obese women are twice than the normal women and the risk increased 7 times in extremely obese women[7]. The chances of liver cancer in obese people or overweight people up to twice as like as normal people. The table below shows how much the risk of different types of cancer is higher in obese people than in normal people.

Table 1: Table shows how much the risk of different types of cancer in obese people than the normal people.

No.	Types of Cancer	Chances of affection in obese people than normal people.
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1.	Endometrial cancer	2-4 times more than normal people. In extremely obese, it becomes 7times more
2.	Esophageal adenocarcinoma	2 times more than normal people
3.	Gastric Cardia cancer	2 times more than normal people
4.	Liver cancer	2 times more than normal people
5.	Kidney cancer	2 times more than normal people
6.	Multiple myeloma	1.2-1.3 times more than normal people
7.	Pancreatic cancer	1.5 times more than normal people
8.	Colorectal cancer	1.3 times more than normal people
9.	Meningioma	1.5 times more than normal people, but 1.2 times more in overweight person.
10.	Gall bladder cancer	1.6 times more than normal people but 1.2 times more in overweight person.
11.	Breast cancer	1.2 – 1.4 times more among postmenopausal obese women and 1.2 times more among premenopausal obese women.
12.	Ovarian cancer	1.1 times more than normal people
13.	Thyroid cancer	1.1 times more than normal people

People suffering from obesity having low level inflammation which can, overtime, cause DNA damage that leads to cancer[8]. Chronic local inflammation induced by gastroesophageal reflux disease is likely cause of esophageal adenocarcinoma. Despite this adipose tissue produces higher amount of estrogen, higher level of estrogen increased the risk of breast, endometrial, ovarian and some other cancer. In those obese people which have increased insulin and insulin like growth factor-1 increased the risk of development of colon, prostate, kidney and endometrial cancer[9]. Adipocytes may also have direct and indirect effects on other cell growth regulators including mammalian target of Rapamycin (MTOR) and AMP- activated protein kinase[10]. Adipocytes produce adipokines that may stimulate or inhibit cell growth. For example adipokine, leptin promote cell proliferation. The amount of leptin increases in blood with increasing body fat. Obesity could affect cancer risk include change in the mechanical properties of the scaffolding that surrounds breast cell and altered immune response effect on the nuclear factor kappa beta system, and oxidative stress . This is the other possible mechanism which can cause cancer in obese person.

4.1. Hypertension:

It is also known as silent killer. Usually it does not show its initial symptoms and it is fatal without symptoms. According to WHO, 1.13 billion people are suffering from hypertension. The pressure produced by the heart to reach different parts of the body falls on the wall of the blood vessels. This pressure is called blood pressure. For some reason, when it increases, then it is called hypertension. There are many reasons for this, but in obese people its risk increases significantly. Obesity plays major role in establishing hypertension. Due to excessive amount of cholesterol in the body, it begins to accumulate in the blood vessels, due to which the blood vessels begin to shrink as well as obstructs the flow of blood. In such a situation, the heart exerts more pressure than usual. If this condition persists long time, it causes hypertension. Apart from this obesity leads to hypertension and cardiovascular disease by activating renin-angiotensin aldosterone system, sympathetic activity, insulin and leptin resistance, procoagulatory activity and by increasing endothelial dysfunction[11]. According to the study, the factors released from adipose tissue also cause hypertension. Hypertension may cause headaches, shortness of breath, tiredness, paralysis, heart attack, etc. Apart from this, it also affects the kidneys and eyes.

5. Obesity harms both kidney and liver :

Excess accumulated fat impedes kidney and liver functions. In addition to affecting its functions, it also causes a lot of damage. Therefore, along with increasing obesity, the risk of kidney and liver related disease also increases. Kidney or liver failure may also occur in chronic conditions. Excess fat present in blood (hypercholesterolemia) can immediately affects these organs. It is easy to understand that excess weight forces the kidney to work harder and filter wastes more than normal level. This extra works increases the risk of kidney disease. Obesity increase urinary albumin loss and progressive loss of renal function caused by focal segmental glomerulosclerosis [12]. Obesity can cause glomerular hyperfiltration. The involvement of insulin and angiotensin II in the development of glomerular hyperfiltration have been shown in obese animals in which leptin contributes to the development of renal injury through induction of cytokines. Consistently fat tissue particularly those of visceral fat may special exert systematic effects through the secretion of a variety of hormones and cytokines, leading to obese associated glomerulopathy [12]. Obesity also can cause damage in liver. It is associated with an increased risk of nonalcoholic fatty liver disease (NAFLD). It causes steatosis, it is characterized by an increase in intrahepatic triglyceride (IHTG) content with or without fibrosis

and inflammation (Steatohepatitis). Steatosis occurs when, the rate of fatty acid uptake from plasma and de novo fatty acid synthesis is greater than rate of fatty acid oxidation and export[13].

6. CONCLUSION:

After considering so many discussions and many aspects we can say that obesity shifts people towards fatal disease like Diabetes mellitus type-2, stroke, cardiovascular disease, stroke, cancer etc.

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