

Obesity - One of the Leading Cause of Type II Diabetes Mellitus: A Review Work

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Abstract

Vigorous food intake indicates to obesity. Obesity is strongly associated with insulin resistance, when coupled with relative insulin deficiency, leads to type II diabetes mellitus. Children and adolescents with type II diabetes mellitus may experience the microvascular and macrovascular complications of this disease at younger ages than individuals who develop diabetes in adulthood, including atherosclerotic cardiovascular disease, stroke, myocardial infarction, and sudden death, renal insufficiency and chronic renal failure, limb-threatening neuropathy and vasculopathy, and retinopathy leading to blindness. Health care professionals are advised to perform the appropriate screening to the obese person at risk for type II diabetes mellitus diagnose the condition as early as possible.

Key words: Obesity, Insulin resistance, Type II Diabetes mellitus

1. Introduction

Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia (high blood sugar) and other signs, as distinct from a single illness. The World Health Organization recognizes three main forms of diabetes type I, type II, and gestational diabetes (occurring during pregnancy), which have similar signs, symptoms, and consequences, but different causes and population distributions. Diabetes mellitus (DM) and obesity have a complicated relationship, with Type II Diabetes strongly associated with obesity ¹. Obesity may be a precursor for

Type-II Diabetes mellitus following insulin resistance²⁻³. Most researchers consider that this relationship is different in different types of obesity and type II diabetes mellitus⁴. The main causes of obesity are probably different for many types. Genetic disposition is clearly one⁵⁻⁷. The lifestyle and genetics must be studied in a broad way in order to understand more of these patterns. Diabetes mellitus is a devastating disease which is reported to kill silently to a larger extent. It is presumed that Diabetes mellitus will be an epidemic throughout the world by the year 2025⁸. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy or increased health problems². People are considered obese when their body mass index (BMI) a measurement obtained by dividing a person's weight by the square of the person's height, exceeds 30 kg/m². Eating more than the body can consume makes a person obese that is fat⁸. Eating high energy foods containing more carbohydrates and fats can also lead to obesity therefore giving rise to high cholesterol in the blood. This may eventually lead to heart diseases, type II diabetes mellitus, certain types of cancer, and osteoarthritis. Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness. Evidence suggests that some obese people are eating little yet gain weight due to a slow metabolism. Diet quality can be improved by reducing the consumption of energy-dense foods such as those high in fat and sugars, and by increasing the intake of dietary fiber⁴. Anti-obesity drugs may be taken to reduce appetite or decrease fat absorption when used together with a suitable diet. If diet, exercise and medication are not effective, surgery may be performed to reduce stomach volume or bowel length, so that it can absorb nutrients from food in reduced amount.

2. Frequency of Obesity

Internationally, at least 2.8 million people die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3%) of global DALYs are caused by overweight or obesity. Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Risks of coronary heart disease, ischemic stroke and Type II diabetes mellitus increase steadily with increasing body mass index (BMI), a measure of weight relative to height. Raised body mass index also increases the risk of cancer of the breast, colon, prostate, endometrium, kidney and gall bladder. Mortality rates increase with increasing degrees of overweight, as measured by body mass index¹. To achieve

optimum health, the median body mass index for an adult population should be in the range of 21 to 23 kg/m².

In 2008, 35% of adults aged 20+ were overweight (BMI - 25 kg/m²) (34% men and 35% of women). The worldwide prevalence of obesity has nearly doubled between 1980 and 2008. In 2008, 10% of men and 14% of women in the world were obese (BMI - 30 kg/m²), compared with 5% for men and 8% for women in 1980. An estimated 205 million men and 297 million women over the age of 20 were obese - a total of more than half a billion adults worldwide⁹.

In Indian scenario, we should not think about obesity, huge number of peoples are not getting proper food, still obesity has reached epidemic proportions in the 21st century, with morbid obesity affecting 5% of the country's population⁹. India is following a trend of other developing countries that are steadily becoming more obese. Unhealthy processed food has become much more accessible following India's continued integration in global food markets.

3. Frequency of Type II Diabetes mellitus

The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people >65 years of age. These findings indicate that the "diabetes epidemic" will continue even if levels of obesity remain constant. Given the increasing prevalence of obesity, it is likely that these figures provide an underestimate of future diabetes prevalence¹.

4. Pathophysiology of Type II Diabetes mellitus

The common symptoms of diabetes are polyuria (frequent urination), polydipsia (increased thirst), polyphagia (increased hunger), and weight loss¹⁰. Other symptoms that are commonly present at diagnosis include a history of blurred vision, itchininess, peripheral neuropathy, recurrent vaginal infections, and fatigue⁷. Many people, however, have no symptoms during the first few years and are diagnosed on routine testing¹. People with type II diabetes mellitus may rarely present with hyperosmolar hyperglycemic state (a condition of very high blood sugar associated with a decreased level of consciousness and low blood pressure)³.

Type II diabetes is typically a chronic disease associated with a ten-year-shorter life expectancy⁴. This is partly due to a number of complications with which it is associated including: two to four times the risk of cardiovascular disease, including ischemic heart disease, stroke and renal disease. There is possible of uncontrolled infection may lead to limb amputations even, and increased rates of hospitalizations⁷. In the developed world, type II diabetes is the largest cause of nontraumatic blindness and kidney failure⁶. It has also been associated with an increased risk of cognitive dysfunction and dementia through disease processes such as Alzheimer's disease and Vascular dementia¹¹. Other complications include acanthosis nigricans, sexual dysfunction, and frequent infections⁹. As researchers begin to unravel the genetic basis of Type II DM, the gradual accumulation of genetic polymorphisms in multiple genes-rather than the mutation of a single "diabetes gene"-appears to be the driving force behind the increase in Type II DM risk. Emergent therapies for the management of Type II DM include incretin-based agents, which can effectively target two key processes in Type II DM by augmenting insulin secretion and inhibiting glucagon production.

Type II diabetes is mainly due to insufficient insulin production from beta cells of pancreas. Insulin resistance, which is the inability of cells to respond adequately to normal levels of insulin occurs primarily within the muscles, liver, and fat tissue¹². In the liver insulin normally suppresses glucose release. However, in the setting of insulin resistance, the liver inappropriately releases glucose into the blood⁹. The proportion of insulin resistance versus beta cell dysfunction differs among individuals, with some having primarily insulin resistance and only a minor defect in insulin secretion and others with slight insulin resistance and primarily a lack of insulin secretion¹³.

Other potentially important mechanisms associated with Type II diabetes and insulin resistance include: increased breakdown of lipids within fat cells, high glucagon levels in the blood, increased retention of salt and water by the kidneys, and inappropriate regulation of metabolism by the central nervous system¹¹. Not all people with insulin resistance develop diabetes, since an impairment of insulin secretion by pancreatic beta cells is also required¹².

6. Effects of Obesity on Insulin Sensitivity

Glucose homeostasis is maintained by insulin secretion, insulin action, hepatic glucose production and cellular glucose uptake. Insulin receptors in the liver, muscle, and adipose

tissue are normally exquisitely sensitive to insulin. During the absorptive state, insulin secreted in response to rising blood glucose concentration inhibits hepatic glucose production and stimulates glucose disposal, primarily in muscle. During the fasting state, insulin secretion decreases to basal levels, inhibiting hepatic glucose production to a lesser degree to maintain normal fasting blood glucose concentrations¹³. The lower the insulin sensitivity (ie, the greater the insulin resistance), the more insulin that is secreted. If insulin sensitivity decreases, pancreatic β -cell insulin secretion must increase to maintain the same glucose- disposition index in an individual.

7. Comprehensive Approaches to the Evaluation of Obese for Type II DM

Genetic and environmental risk factors such as maternal obesity, gestational diabetes, and lack of physical activity should be identified at an early age of 32-36. BMI should be plotted by health care providers annually on the Centers for Disease Control and Prevention BMI growth charts, specific for age and gender, for all children in their care. Age-, gender-, and ethnicity-specific data for hip- waist circumference ratio can be used as an indicator of visceral distribution of fat. Counseling to promote weight loss through lifestyle modification should be offered to all children identified as being at risk for overweight or being overweight¹⁴.

8 Screening of Individuals at Risk for Type II DM

No major organization recommends universal screening for diabetes as there is no evidence that such a program would improve outcomes¹⁵. Screening is recommended by the United States Preventive Services Task Force in adults without symptoms whose blood pressure is greater than 135/80 mmHg¹⁴. For those whose blood pressure is less, the evidence is insufficient to recommend for or against screening¹⁶. The World Health Organization recommends only testing those groups at high risk. High-risk groups in the United States include: those over 45 years old; those with a first degree relative with diabetes; some ethnic groups, including Hispanics, African-Americans, and Native-Americans; a history of gestational diabetes; polycystic ovary syndrome; excess weight; and conditions associated with metabolic syndrome¹⁷.

9. Diagnosis of Type II DM

The World Health Organization definition of diabetes (both type I and type II) is for a single raised glucose reading with symptoms, otherwise raised values on two occasions, of either fasting plasma glucose 7.0 mmol/l (126 mg/dl) or with a glucose tolerance test, two hours

after the oral dose a plasma glucose 11.1 mmol/l (200 mg/dl). A random blood sugar of greater than 11.1 mmol/l (200 mg/dL) in association with typical symptoms¹⁷ or a glycated hemoglobin (HbA1c) of greater than 6.5% is another method of diagnosing diabetes¹⁸. Recently diabetes may be diagnosed by following criteria fasting sugar upto 110mg/dl consider as non diabetic, 111 mg/dl to 126mg/dl IGT (impaired glucose tolerance test i.e prone to be diabetic) over 200mg/dl is diabetic. In 2009 an International Expert Committee that included representatives of the American Diabetes Association (ADA), the International Diabetes Federation (IDF), and the European Association for the Study of Diabetes (EASD) recommended that a threshold of 6.5% HbA1c should be used to diagnose diabetes¹⁹. This recommendation was adopted by the American Diabetes Association in 2010²⁰. Positive tests should be repeated unless the person presents with typical symptoms and blood sugars >11.1 mmol/l (>200 mg/dl)²¹. Threshold for diagnosis of diabetes is based on the relationship between results of glucose tolerance tests, fasting glucose or HbA1c and complications such as retinal problems²². A fasting or random blood sugar is preferred over the glucose tolerance test, as they are more convenient for people.¹⁴. HbA1c has the advantages that fasting is not required and results are more stable but has the disadvantage that the test is more costly than measurement of blood glucose¹⁸. It is estimated that 20% of people with diabetes in the United States do not realize that they have the disease⁴. Diabetes mellitus type II is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency²³. This is in contrast to diabetes mellitus type 1 in which there is an absolute insulin deficiency due to destruction of islet cells in the pancreas and gestational diabetes mellitus that is a new onset of high blood sugars associated with pregnancy. Type I and type II diabetes can typically be distinguished based on the presenting circumstances. If the diagnosis is in doubt antibody testing may be useful to confirm type I diabetes and C-peptide levels may be useful to confirm type II diabetes, with C-peptide levels normal or high in type II diabetes, but low in type I diabetes²⁴.

10. Conclusion

Childhood obesity has increased substantially and the prevalence of type II diabetes has now reached epidemic levels in Asia. It is known to us and every one support the fact that some obese people are eating little yet gain weight due to a slow metabolism. Urgent action is

needed, and advocacy for lifestyle changes is the first step. No feast no fast, avoid over eating particularly fast food. To avoid obesity especially childhood diet will be C: P: F= 2:1:1 (carbohydrate:protein:fat). Countries should review and implement interventions, and take a comprehensive and integrated public health approach. At the level of primary prevention, such programmes can be linked to other non-communicable disease prevention programmes that target lifestyle related issues.

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