

Managing Obesity and Type 2 Diabetes through Lifestyle Modification: A Case Report

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Abstract: *This article delves into the critical relationship between obesity and type 2 diabetes, characterized by excessive body fat and metabolic dysfunction. The most prevalent comorbidity associated with obesity, type 2 diabetes, often arises from factors like insulin resistance or hyperinsulinemia. This study underscores the paramount importance of a comprehensive assessment and strategic lifestyle modifications in effectively addressing not only weight management but also the intricate web of metabolic disorders, including type 2 diabetes. It represents a compelling case report involving a 47-year-old male with a BMI of 35.7kg/m² and an HbA1c level of 8.7%. Through diligent adherence to the prescribed lifestyle modifications alongside oral hypoglycemic drugs, the patient's remarkable progress in the weight reduction and improved HbA1c levels is showcased, highlighting the transformative potential of tailored interventions in fostering, enduring health and wellbeing.*

Keywords: Insulin resistance, insulin deficiency, hyperinsulinemia, Leprechaunism, lipodystrophy, ovarian hyperthecosis

1. Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Almost 30 - 60% of Indians are either overweight or obese, directly correlating with increases prevalence of obesity related comorbidities like hypertension, metabolic syndrome, dyslipidemia, type 2 diabetes, cardiovascular disease sleep apnea, PCOS, infertility and gestational diabetes. [1] Obesity is linked to many medical, psychological and social conditions, the most devastating of which is type 2 diabetes mellitus. [2]

Type 2 diabetes encompasses individuals who have blood sugar levels that are higher than normal, which may lead to increased insulin resistance and insulin deficiency. [3] The risk factors for type 2 diabetes are either modifiable or non-modifiable risk factors. Modifiable risk factors include high blood pressure obesity (BMI > 30 kg/m²), change in cholesterol levels and lack physical exercise. The non-modifiable risk factors associated with T2DM are history of hyperglycemia, pre-diabetes, and/or gestational diabetes, genetics, family history, race, ethnicity and age. [4] Many patients with type 2 diabetes have hyperglycemia because of deficiencies in both insulin secretion and insulin action, that is, β -cell dysfunction and insulin resistance. Insulin resistance is a state of reduced insulin sensitivity, an inability of insulin to lower plasma glucose levels through suppression of hepatic glucose production and stimulation of glucose utilization in skeletal muscle and adipose tissue. [5]

The relationship between hyperinsulinemia, insulin resistance, and obesity has remained unresolved for decades. Insulin is responsible for postprandial use and storage of nutrients, which includes inhibiting fatty acid oxidation and increasing lipogenesis. Fasting and postprandial hyperinsulinemia occur as a response to systemic insulin resistance in an attempt to maintain glucose homeostasis. [6] Hyperinsulinemia directly contributes to the development of excess lipid accumulation [obesity] in several tissues.

Insulin resistance, earlier thought to be a rare complication of the treatment of diabetes, is now recognized as a component of several disorders, including the following:

- Extreme insulin-resistance syndromes, such as the type B syndrome with autoantibodies against the insulin receptor, and rare inherited disorders, such as Leprechaunism with insulin-receptor mutations and the lipodystrophy states.
- Impaired glucose tolerance and type 2 diabetes mellitus.
- Obesity, stress, infection, uremia, acromegaly, glucocorticoid excess, and pregnancy, which cause secondary insulin resistance.
- Common disorders such as the metabolic syndrome, hypertension, hyperlipidemia, coronary artery disease, polycystic ovary syndrome, and ovarian hyperthecosis, in which the mechanism of the associated hyperinsulinemia is unknown. [7]

The primary focus is to assess and treat obesity along with the associated comorbidities. The first line treatment includes lifestyle management. Nutritional interventions focused on lifestyle changes aimed at reducing weight loss are effective in staving off the progression toward type 2 diabetes in people at high risk of developing diabetes. [8, 9] Behavior modification is the cornerstone of lifestyle intervention. It focuses on restructuring a person's environment, nutrient intake, and physical activity by using goal setting, stimulus control, cognitive restructuring, and relapse prevention. A caloric deficit of 500 to 1000 kcal daily usually meets this goal. The low-calorie diet should be individualized for carbohydrates (50% to 55% of total kilocalories), using sources such as vegetables, fruits, beans, and whole grains.

Generous protein, approximately 15% to 25% of kilocalories, is needed to prevent conversion of dietary protein to energy. Fat content should not exceed 30% of total calories. Extra fiber is recommended to reduce caloric density, to promote satiety by delaying stomach-emptying time, and to decrease to a small degree the efficiency of intestinal absorption. Vitamins and minerals supplements

that met age related requirements usually are recommended when there is a daily intake of less than 1200 for women and 1800kcal for men. Or when it is difficult to choose foods that will meet all nutrient needs at the restricted energy intake. ^[10] Researches also show that the balance of pH in the body through alkaline diets helped in better control over blood sugar levels, reduction in elevated blood pressure, improved mobility, reduction in cholesterol levels, improved ability to survive cancers, improved skeletal health with reductions in osteoporosis and arthritic pain, improve digestion and the reduction of gastrointestinal pain as a result of acid reflux, ulcers and bowel problems, improved nutrient uptake, better detoxification and weight loss. Alkaline diet can be defined as focusing on tools required to be given to the body to thrive like the nutrients and nourishment for maintaining health, energy and vitality of the body. Most nourishing foods in nature are alkaline and include leafy leaves, nuts, seeds, healthy oils and fats, oily fish, vegetables like spinach, avocado, cucumber, kale, almonds, salmon, watercress, carrots, celery, lemons, limes, coconut, beets, pumpkin and beans. ^[11]

Exercise is one of the important components for treating obesity. When performed regularly and properly, exercise has a powerful protective effect against obesity comorbidities. Physical activity not only contributes to an increased energy expenditure and fat loss but also protects against the loss of lean body mass, improves cardiorespiratory fitness, reduces obesity - related cardiometabolic health risks, and evokes sensations of well-being. The type of exercise is important to treat obesity, Endurance exercise is probably the most popular and effective exercise type for body weight loss, as it is easily applicable to obese people and ensures high energy expenditure. Nevertheless, resistance exercise and intermittent exercise can also be included in a weight management program, offering variety and additional beneficial effects on health and fitness determinant. ^[12, 13]

2. Case Presentation

The present case study examines the weight loss of 47yr old male patient who was referred to dietician outpatient clinic for his weight control along with diabetes and hyperlipidemia. A comprehensive initial assessment and evaluation was done. And thereafter an individualized dietary modification and recommendation was advised.

The patient is a known case of obesity with height 180.34cm (about 5.92 ft) and weight 116kg (about 255.74 lb.) having BMI 35.7kg/m², diabetes with hba1c 8.7% and fasting insulin 27.8uu/ml. He was on OHD Gluconorm Sr 1000mg once a day and Azulix forte 1mg once a day.

A dietary intervention was done to improve metabolism and to reduce inflammation using a low - calorie diet which focused on inclusion whole grains, vegetables and high biological value protein sources. The diet focused on creating an alkaline medium in the body to enhance insulin function. Including raw vegetables in the form of salad, sprouts, smoothie as help in meeting the essential vitamins and minerals requirement. Also, regular exercise was advised which included walking up to 5000 steps initially

which was later increased to 10000steps. The diet prescribed was in consideration with the medical management.

The patient followed the dietary recommendation and achieved a 33kg weight loss in a period of 9months also improvement in hba1c from 8.7% to 5.8% was seen. The OHD was stopped, also triglyceride levels were well maintained.

3. Discussion

Obesity is a major problem worldwide. It is therefore very crucial to focus on lifestyle management to protect one from various comorbidities. The case showed an adverse effect of obesity where insulin sensitivity was affected which led to diabetes. A Proper assessment and analysis can help an individual to lead a healthy life. Effective intervention for weight management through dietary modification, exercise, behavior modification along with medical management will be more favorable on body weight.

Dietary intervention helped the body to create a medium for the insulin in the body to function better and exercise helped in taking up of excess glucose from the blood to the muscle mass giving a result of decrease in hba1c.

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