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A REVIEW ARTICLE ON PATIENTS WITH OBESE TYPE II DIABETES MELLITUS

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ABSTRACT

Diabetes mellitus is a endocrinological or metabolic disorder with increasing global prevalence and incidence. The main symptom of this disease is the increase glucose levels for long period. Generally, Type II diabetes is associated with impaired insulin secretion due to beta call destruction. Patients with type 2 diabetes mellitus are generally obese. Obesity is defined as a Body Mass Index (BMI) of >30 kg/m², according to WHO criteria. Obesity & overweight are significant public health problems worldwide, affecting an estimated one billion persons and contributing to Hypertension, Diabetes Mellitus, and Cardiovascular Disease & Death. This article will provide the review about the patients who are obese and are suffering from type 2 diabetes mellitus along with its reasons.

Keyword: Diabetes Mellitus, Obesity, Body Mass Index (BMI), Hyperglycemia, Insulin

INTRODUCTION

Diabetes Mellitus

Diabetes mellitus is a combination of heterogeneous disorders commonly presenting with episodes of hyperglycaemia and glucose intolerance, as a result of lack of insulin, defective insulin action, or both.

Such complications arise due to derangements in the regulatory systems for storage and mobilization of metabolic fuels, including the catabolism and anabolism of carbohydrates, lipids and proteins emanating from defective insulin secretion, insulin action, or both **[1]**.

The majority of cases of Diabetes mellitus are broadly classified into:

- **Type 1 diabetes-** It encompasses diabetes that is primarily a result of pancreatic beta cell destruction with consequent insulin deficiency, which is prone to ketoacidosis. This form includes cases due to an autoimmune process and those for which the etiology of beta cell destruction is unknown.
- **Type 2 diabetes-** It may range from predominant insulin resistance with relative insulin deficiency to a predominant secretory defect with insulin resistance. Ketosis is not as common.
- **Gestational diabetes mellitus** refers to glucose intolerance with onset or first recognition during pregnancy.
- **Other specific types** include a wide variety of relatively uncommon conditions, primarily specific genetically defined forms of diabetes or diabetes associated with other diseases or drug use **[2]**.

The classic symptoms of untreated diabetes are

1. Weight Loss
2. Increased Hunger (Polyphagia)
3. Increased and Frequent Urination (Polyuria)
4. Increased and frequent thirst (Polydipsia) **[3]**

Diabetes mellitus could be diagnosed by analyzing by HbA1c Criteria or plasma glucose criteria, Fasting Plasma Glucose (FPG) Value or 2h-plasama glucose value after 75g oral glucose Tolerance Test (OGTT). The American Diabetes Association shows criteria in order to diagnose prediabetes and diabetes **(Tabel 1) [4, 5]**.

Table 1: Criteria for the Diagnosis of Prediabetes and Diabetes [4, 5]

	Normal	Prediabetes	Diabetes
HbA1c	**≤5.6%**	**5.7-6.4%**	**≥6.5%**
FPG	**≤99mg/dl**	**100-125 mg/dl (5.6-6.9mmol/L)**	**≥126mg/dl (7.0mmol/L)**
OGTT	**1313≤139mg/dl**	**100-199 mg/dl (7.8-11.0mmol/L)**	**≥200mg/dl (11.1mmol/L)***
RPG	**-**	**-**	**≥200mg/dl(11.mmol/L)****
***In the absence of unequivocal hyperglycemia, results should be confirmed by repeat testing. **Only diagnostic in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis.RPG, random plasma glucose**			

Obesity and Type 2 Diabetes Mellitus

Obesity (BMI ≥30 kg/m²) is a chronic lifelong condition that results from the environmental factors which causes the excess accumulation of fat in body due to an imbalance between energy intake and it

expenditure, leading to obesity. The increased risk of obesity is recognized as the major risk factors in many diseases including cardiovascular diseases, musculoskeletal diseases, cancer and Type 2 diabetes mellitus. Obesity is considered as the driving force in the diabetic epidemic, in order to prevent obesity in diabetic patients, optimum care is required which include safe and effective weight loss programs, life style modification, exercise and diet regimens **[6]**. Obesity is one of the major factors for diabetes as it reduces Insulin receptors on the target cells. Indian Health ministry has given the diagnostic cut-off of BMI in diabetes as 23 kg/m²as overweight and 25 kg/m²as obese (as opposed to 25 kg/m² and 30 kg/m² at the International level). Also according to guidelines, cut-offs for Waist Circumference for Indian men will now be 90 cm as opposed to 102 cm globally and 80 cm for Indian women as opposed to 88 cm globally **[7]**. The diagnostic parameters for diagnosing type 2 diabetes mellitus in obese and non-obese patients are same only the physiological characteristics of developing the diabetes may be different **[8]**.

Insulin resistance may develop in obese patients due to environmental and genetic factors. As we know, glucose homeostasis is maintained by insulin secretion, insulin action, hepatic glucose production, and cellular glucose uptake. Insulin receptors are present in liver, muscle and adipose tissue which are highly sensitive to insulin. Generally during the absorption phase of glucose insulin is secreted in response to the increased levels of glucose in order to stimulate glucose disposal to muscles. But during post absorptive phase or fasting state the insulin secretion is decreased in order to maintain the normal blood glucose concentration **[9, 10]**. In presence of the increased adiposity there is a development of insulin resistance. Insulin resistance is defined as the diminished ability of insulin-sensitive tissues to respond normally to insulin at cellular level due to genetic, metabolic, and nutritional complications. Visceral adiposity promotes insulin resistance to a higher degree than subcutaneous adiposity **[11]**.

Type 2 diabetes is one of the most detrimental diseases and is a significant public health problem due its high incidence and prevalence as well as high risk of diabetic macro- and microvascular complications **[12]**. Diabetic retinopathy is one of these complications observed in type 2 diabetes mellitus patients. BMI in correlation with hypertension, poor glycemic control and dislipidemia is also associated with the

progression of Diabetic retinopathy. Obesity is one of the modifiable risk factor for the occurrence of diabetic retinopathy but it can be manageable by including various life style modifications along with antidiabetic medications **[13]**.

A study was conducted in June 2018 on 100 type 2 diabetes mellitus patients and both the clinical and biochemical parameters were analyzed. The study revealed that the 30% of the study population had BMI 25-29.99kg/m², 9% had 30.34.99 kg/m² and 3% had BMI between 35-39.99 kg/m². There was 83.67% of males and 96.07% females which had waist circumference complication like Diabetic Nephropathy, Retinopathy, Neuropathy, Foot ulcers, etc. The study concluded that there was significant difference observed in the mean values of the diagnostic parameters of the diabetic patients with different Body Mass Index ratios **[14]**. Another study was conducted on a very less amount of population in which all the subjects taken had type 2 diabetes mellitus but they were divided in three groups in which 10 patients we undergoing antidiabetic treatment with sulfonyl urea, 10 patients without antidiabetic treatment and 10 normal patients with age between 35 to 65 years. The study concluded that there was a variation in BMI observed which reflected alterations in subcutaneous and visceral fat association with the risk factors in relation to the visceral fat accumulation due to exposure of liver to fatty acids. The variations were observed in all the subjects but it was most in diabetic patients as they had sedentary lifestyle as well as has less physical activity. As it is already known that, inactivity is associated with increase in intra abdominal adiposity in type 2 diabetes mellitus and it also strongly related with impaired insulin sensitivity [**15]**.

A study on assessing the effectiveness of the exercise in biochemical parameters in patient with diabetes was done. The 30 patients were randomly divided into two groups and the study was carried out for 8 weeks with continuous 24 sessions of aerobic exercise. Initially they had increased levels of biochemical parameters, Body weight and BMI. The patients were then asked to do continuous 24 sessions of aerobic exercise for 8 weeks. After 8 weeks patients were analyzed again for biochemical parameters, Body weight and BMI. The results obtained, showed reduction in biochemical parameters, body weight and BMI. The study also claimed that safe exercise regimen helps in reducing various complications associated with type 2 diabetes mellitus as well as various cardiovascular risks **[16]**. A comparative study on obese type 2 diabetic

patients with Periodontitis was done. Periodontitis is chronic complication with diabetes

Periodontitis is a gum infection that damages gum and can even destroy jawbone. The comparative study was done on two groups one obese and another non-obese type 2 diabetes mellitus patients. The mean value of BMI and waist-hip circumference was higher in obese group as compared to non-obese group. The study aimed to evaluate the effect of obesity on clinical periodontal parameters in stage II and stage III of the disease. Obesity influences local periodontal conditions and periodontitis may be a risk factor for glycemic control in patients with diabetes because periodonto pathogenic bacteria and their by products in inflamed periodontal tissue may provide a constant source of systemic challenges to the diseased host. Thus the only preventive measure to be done is the weight reduction process in type 2 diabetic patients **[17, 18]**.

There are majority of people with type 2 diabetes mellitus which are overweight or obese, and the major preventive goal is to reduce body weight as well as provide key therapeutic goal in management of type 2 diabetes mellitus. T he Finnish Diabetes Prevention Study was conducted in group of patients and the study concluded that the intensive dietary and weight reduction exercises had benefit effect on diabetic patients as well as in non-diabetic patients the overall decrease of diabetes was reduced by 58%. **[19]**. Similar results were obtained from various other studies. American Cancer Society‘s Cancer prevention study showed that the loss of 10 kg of body weight reduced the reduced the mortality of patients with diabetes by 25%. Other clinical trials like Look AHEAD Study also quotes the beneficial effects of weight loss in individuals. The study provides that loss of 5-10% of body weight, improves the overall fitness, reduce HbA1c levels, reduces cardiovascular risk factors, also with reduced use of various antihyperglycemic, antihypertensive and lipid lowering drugs in patients with diabetes and higher diabetes **[20, 21]**. It is necessary to have weight loss of more than 5%, as it has beneficial effects in diabetic patients. As, weight loss programs requires lot of energy expenditure. But in obese or overweight type 2 diabetes mellitus solely reducing weight is not the goal, so additional anti diabetic drugs are also given to the patients. The patients are also encouraged to reduce energy intake, as which may in regardless of weight loss also helps in improving glycemic control. Besides various anti-obesity drugs can also be used in

management of obese type 2 diabetes mellitus, if the patients are struggling with weight management **[22]**.

An effective weight loss management in obese patients has the ability to improve the body weight, body composition and glycemic control. Therefore an observational study conducted by Eeg-Olofosson *et al*. stated that various cardiovascular risks, stroke and total mortality were correlated with weight gain with antidiabetic therapy. Since there is a correlation between weight gain and type 2 diabetes mellitus, so there should be a focus on antidiabetic treatment with prevention of additional weight gain in patients. Thus, glucose lowering agents, which support weight reduction or are weight neutral should the first choice besides obligatory metformin therapy **[23]**. Currently there are various effective pharmacotherapies for weight management which are being used for obese patients. There are various new drugs available in USA, but only two, Liraglutide (1.8 mg fir type 2 diabetes mellitus and 3mg for obesity treatment) and combination of naltrexone and bupropion have been licensed in Europe in 2015 but are yet to be launched in various European countries. These drugs help in weight loss management and also improve HbA1c levels in type 2 diabetic patients with obesity **[24]**.

Bariatric Surgery is a weight loss management surgery done on obese patients. Bariatric surgery is indicated obese patients with BMI ≥ 40 kg/m² or individuals with BMI > 35 kg/m² and type 2 diabetes or various other co morbidities. Bariatric surgery is highly beneficial in patients with obese type 2 diabetes and also helps in reduction of various cardiovascular events as stated in Swedish Obese Subjects Study. Generally patients underdone Bariatric surgery both obese non-diabetic patients and obese diabetic patients should be examined thoroughly in both pre and post-operative phase on the surgery. More emphasis is given to obese diabetic patients as more rapid and massive weight loss of muscle and fat-free mass could lead to osteoporosis or malnutrition. So, a muscle-fat distribution and bone health of the patients should be checked regularly, also all the patients undergone Bariatric surgery should be checked after 2 year of the surgery **[25-27]**.

CONCLUSION

Diabetes mellitus is a huge burden not only on the patients, but also for their family, community and the country. All types of diabetes should be detected early and managed appropriately to prevent its progression and complications. Obesity is one of the complications associated with type

2 diabetes mellitus patients. Obesity is an emerging epidemic of modern societies; the co-incidence with diabetes is also emerging. Obesity plays an important role in development of diabetes and mobilizing free fatty acids and certain inflammatory cytokines promoting insulin resistance. Adiponectin which is secreted from adipose tissues is inversely correlated with weight gain. Various studies quoted that type 2 diabetic patients with obesity have higher chances of developing various other complication like stroke, cardiovascular risk, mortality, etc. So, the management of obese type 2 diabetes mellitus is to provide pharmacotherapies with various ant- diabetic agents, glucose lowering agents along with various weigh loss management drug therapies or exercises. Patients are also asked to have a low energy expenditure diet and are asked to exercise regularly as it helps to improve HbA1c levels and exercise helps in higher energy expenditure thereby reducing weight and improving patients health.

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