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# Evaluation of Serum Leptin Level and BMI in Diabetic Patients: An Institutional Based Study

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## Abstract

**Background:** Diabetes mellitus is one of the major public health problems these days. Diabetes is a metabolic diseases characterized by hyperglycemia. Micro vascular and macrovascular complications of diabetes mellitus are very common. Leptin is a protein which is released from adipose tissue. Leptin can have a significant role in pathogenesis of diabetes. Aim: The objective of this study was to evaluate the variation in serum leptin levels in type 2 diabetes mellitus and control group. **Subjects and Methods:** The study group consisted of 100 patients. 50 patients of type 2 DM and 50 normal healthy controls were selected for the study. Blood glucose (FBS and PPBS), HbA1c, Serum lipids and lipoproteins, Serum leptin, and Body mass index (BMI) were estimated type 2 DM patients and normal healthy controls. **Results:** In group 1 (healthy individuals), BMI was 23.6± 2.1 and in group 2 (type 2 DM patients), it was found to be 26.1 ± 2.1. A statistically significant difference was observed in BMI of both groups. Serum leptin level in group 1 was found to be 5.42±2.22 and in group 2 it was found to be 9.22± 1.82. A highly significant difference was observed in leptin level in both groups p<0.0001. **Conclusion:** We concluded that serum leptin levels are higher in patients suffering from Type 2 diabetes mellitus and it is strongly correlated positively with BMI.

**Keywords:** BMI, Type 2 DM, Leptin, Obese, HbA1c.

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## Introduction

Diabetes mellitus is a metabolic disorders characterized by chronic hyperglycemia. Diabetes mellitus is one of the world's major public health problems and its complications imposes a tremendous burden both on patients suffering from diabetes as well as on our health care system.[1] Obesity is very common in type 2 DM. However it's been observed that in many patients with type 1 DM are also obese, and children and adolescents with type 1 DM are more prone to high body mass index (BMI) than their non-diabetic counter- parts and unaffected sibling.[2,3]

Leptin is an adipose tissue derived hormone which primarily acts on hypothalamus to regulate hunger and satiety. Leptin circulating levels increases with weight gain and decreases with weight loss.[3,4] leptin was discovered in 1994 and since than many studies have been conducted to evaluate its physiological importance.[3,4] Leptin is strongly correlated with adiposity and is a potential determinant of obesity and its complications. It is been suggested that Leptin along with other adipocytokines affect insulin sensitivity and is accepted to play a role in pathogenesis of obesity-related disorders.[6] Studies have shown that Leptin is associated with body mass index (BMI) and body fat in non-obese and obese subjects and in patients with Type 2 diabetes mellitus.[7] Literature revealed that Leptin levels were found to be associated with a number of endocrine substances such as insulin, glucocorticoids, thyroid hormones and testosterone.8 So in present study we aimed to study the variation of serum leptin levels in Type 2 Diabetes mellitus and is compared with healthy control group of non-diabetic subjects.

## Subjects and Methods

A total of 100 patients were selected for the present study. Our study was conducted in the Department of Biochemistry, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India. 100 patients diagnosed as type 2 DM were included in the study. Inclusion and exclusion criteria are as follows:

**Inclusion Criteria**

- Patients diagnosed as type 2 DM
- Patients willing to participate

**Exclusion Criteria**

- The patients suffered from type 1 DM,
- Gestational diabetes
- Patients treated with insulin therapy
- Those not willing to participate

- Mentally retarded patients

Patients were divided in to two groups; each group consisted of 50 patients. Study group comprised of patients suffering from type 2 DM and control group consisted of healthy individuals.

Group 1: Healthy individuals (n=50)

Group 2: Type 2 DM patients (n=50)

Ethical committee clearance was obtained before starting the study. All the patients were explained in detail regarding the study its procedure and importance. A written informed consent was obtained before initiating the procedures. Detailed history, past medical history and information of medication were recodred. Classification of American Diabetes Association criteria (fasting plasma glucose ≥126 mg/dl, post parandial blood glucose ≥ 200mg/dl and HBA1c ≥6.5%) was considered for diagnosis of type 2 diabetes.9 Anthropometric assessments and body weight was measurement was done for all the patients. Measuring tape was used to measure height. In present study patients with BMI > 25 kg/m2 were considered as obese. The patients who had total cholesterol [TC] level of >200 mg/dl, triglyceride [TG] >150 mg/ dl, high density lipoprotein-cholesterol [HDL-C] levels <40 mg/dl in males and <50 mg/dl in females, low density lipoprotein-cholesterol [LDL-C] levels >100 mg/dl were considered to be dyslipidemic. Blood sample was taken from all the patients and patients were kept on fasting for 10 to 12 hours before sample withdrawal. Estimation of serum leptin, serum lipids included total cholesterol and triglycerides and serum lipoproteins included HDL-C and LDL-C was done from blood sample.

### Statistical Analysis

Each variable were analyzed and A p-value <0.05 was considered statistically significant. Data was analyzed by specific statistical software (IBMSPSS V10 STATISTICS, IBM, ARMONK, USA).

## Results

In present study a total of 100 patients were included 50 patients in each group. Study group comprised of 50 patients suffering from type 2 DM i.e. 50% and control group consisted of 50 healthy individuals i.e. 50% [Figure 1]. In our study all the 50 patients in study group were obese. In present study mean age of patients in group 1 was found to be 40 ± 1.6 and in group 2 it was 43 ± 6.4. No statistical difference was observed in age group between both the groups. Mean weight in group 1 was found to be 60.4 ± 6.2 and in group 2 it was 71.8±7.9. A statistically significant difference was observed in weight of patients. In group 1 mean height of the patient was 1.62 ± 3.1 and in group 2 it was 1.63 ± 8.2. No statistically significant difference was observed between both the groups. BMI was calculated and it was found that mean BMI was 23.6± 2.1 in group 1 and in group 2 it was found to be 26.1 ⊥ 2.1. A statistically significant difference was observed in BMI of both groups.

Changes in glucose level and HbA1C levels in both groups were examined. The result showed that in group 1 mean fasting blood sugar was found to be 82.6 ± 1.8 and in group 2 it was 171.4 ± 2.8. Mean post parandial blood sugar was found to be 107 ± 2.9 in group 1 and 272.0 ± 6.9 in group 2. HBA1c in group 1 was 5.1 ± 1.8 and in group 2 it was 9.1±2.5. a highly significant difference was observed in FBS, PPBS and HBA1c in both groups. Serum leptin was evaluated for both the groups. Result showed that serum leptin in group 1 was found to be 5.42±2.22 and in group 2 it was found to be 9.22+ 1.82. A highly significant difference was observed in leptin level in both groups p<0.0001.

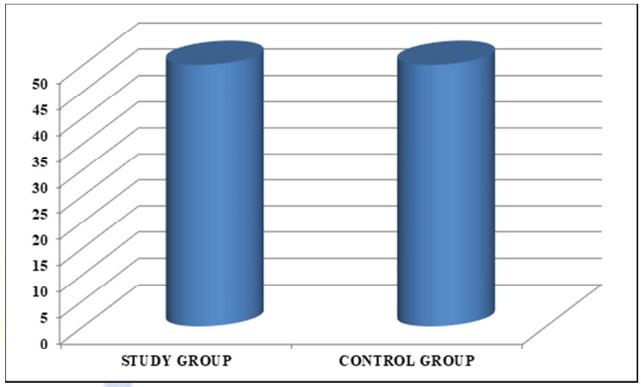


**Figure 1: Group Distribution**

**Table 1: Anthropometric parameters in both groups**

| Parameters | Group 1 | Group 2 | p value |
|---|---|---|---|
| Age | 40 ± 1.6 | 43 ± 6.4 | 0.005 |
| Weight (Kg) | 60.4 ± 6.2 | 71.8±7.9 | 0.001* |
| Height (m) | 1.62 ± 3.1 | 1.63 ± 8.2 | 0.005 |
| BMI (Kg/m²) | 23.6± 2.1 | 26.1 ± 2.1 | 0.001* |

**Table 2: Changes in Glucose and HbA1c Levels in Both Groups**

| Parameters | Group 1 | Group 2 | p value |
|---|---|---|---|
| FBS (mg/dl) | 82.6 ± 1.8 | 171.4 ± 2.8 | 0.001 |
| PPBS (mg/dl) | 107 ± 2.9 | 272.0 ± 6.9 | 0.001 |
| HbA1c(%) | 5.1 ± 1.8 | 9.1±2.5 | 0.001 |

**Table 3: Variation in Levels of Serum Leptin in Both Groups**

| Parameters | Group 1 | Group 2 | p value |
|---|---|---|---|
| Serum leptin | 5.42±2.22 | 9.22± 1.82 | 0.001 |

## Discussion

Type II diabetes mellitus is the commonest problem world faces these days. Diabetes mellitus is a group of metabolic disorder. Either defects in insulin secretion, insulin action or combination of both leads to hyperglycemia. Regulatory hormones like glucagon, lipolysis and decreased incretin effect are responsible for hyperglycemia.[10] Leptin is an adipose tissue and it inhibits insulin secretion by repressing the preproinsulin mRNA.[11] In obese patients leptin resistance leads to increased insulin secretion which eventually leads to beta cell failure and diabetes mellitus.[12]

Studies in past have found that a strong association of leptin levels in obese diabetic patients exist. Authors have reported difference in leptin levels among genders. In present study we found high serum leptin in obese Type 2 DM patients whereas normal leptin in control group. However in present study no gender differentiation was studied.[13]

Study conducted by Fischer S et al reported that leptin may play a role in the pathophysiology of diabetes, possibly by suppressing insulin secretion.[14] Wannamethee SG et al in their study found that increased levels of serum leptin and low adiponectin were associated with increased risk of type 2 diabetes.[15] In present study no statistical difference was observed in age group and height between both the groups. However a statistically significant difference was observed in weight of patients in both groups. BMI was calculated and it was found that mean BMI was 23.6± 2.1 in group 1 and in group 2 it was found to be 26.1 ± 2.1. A statistically significant difference was observed in BMI of both groups. Studies in the past have reported that visceral fat and BMI were independent predictors of diabetes.[16] Few authors have found that serum leptin levels were observed to be higher in obese group and positively correlated with body fatness and obesity.[17] Our study is in agreement with the authors. Result showed that serum leptin level in group 1 was found to be 5.42±2.22 and in group 2 it was found to be 9.22± 1.82. A highly significant difference was observed in leptin level in both groups $p<0.0001$. Our results are similar to the results reported by others in past.

## Conclusion

Based on the result of our study we conclude that Leptin levels are significantly higher in patients with Type 2 Diabetes mellitus. Within the limits of our study we suggest that leptins are clinically relevant to type 2 DM and have potential to serve as markers for risk prediction. A strong association exists between leptin levels and obese diabetic patients. Higher leptin levels is an additional risk factor in patients of type 2 DM with high BMI.

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