

## Serum Leptin Levels in Type 2 Diabetes Mellitus with Chronic Complications

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**Abstract:** Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Hyperglycemia along with hyperlipidemia leads to microvascular and macrovascular complications of diabetes mellitus. Leptin is an adipose tissue derived hormone which primarily acts on hypothalamus to regulate hunger and satiety. The aim of this study is to see the leptin levels in non-obese diabetes mellitus patients and its association with chronic complications. The difference in serum leptin levels among gender in the study population is statistically significant. Leptin level is significantly higher in diabetic patients with complications. This is due to the inflammatory property of leptin responsible for vascular inflammation, increased oxidative stress, endothelial dysfunction and proliferation of vascular smooth muscle cells (VSMC), and resultant intimal hyperplasia. Leptin also has a negative correlation with HbA1c.

**Keywords:** Leptin, Type 2 Diabetes mellitus, chronic complications

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### I. Introduction

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Type II diabetes mellitus is the commonest one and the primary defect is due to insulin resistance<sup>1</sup>. Hyperglycemia also occurs due to increase in counter regulatory hormones like glucagon, lipolysis and decreased incretin effect<sup>2</sup>. Hyperglycemia along with hyperlipidemia leads to microvascular and macrovascular complications of diabetes mellitus. Leptin is an adipose tissue derived hormone which primarily acts on hypothalamus to regulate hunger and satiety. Studies have shown the non-hypothalamic action of leptin on glucose homeostasis<sup>3</sup>. Leptin inhibits insulin secretion by repressing the preproinsulin mRNA<sup>4</sup>. Leptin resistance in obese individuals leads to increased insulin secretion which eventually leads to beta cell failure and diabetes mellitus<sup>5</sup>. Leptin has a pleotropic effect on complications of diabetes mellitus. The aim of this study is to see the leptin levels in non-obese diabetes mellitus patients and its association with chronic complications.

#### Objectives of the study:

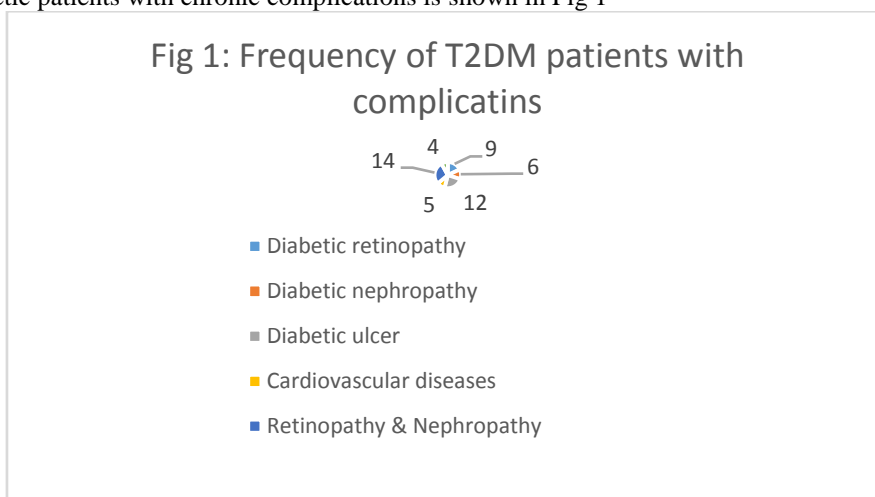
1. To find out the change in serum leptin levels in non-obese diabetic individuals with and without chronic complications
2. To find out the association of serum leptin levels and glycemic status of diabetes mellitus patients.

### II. Materials And Methods

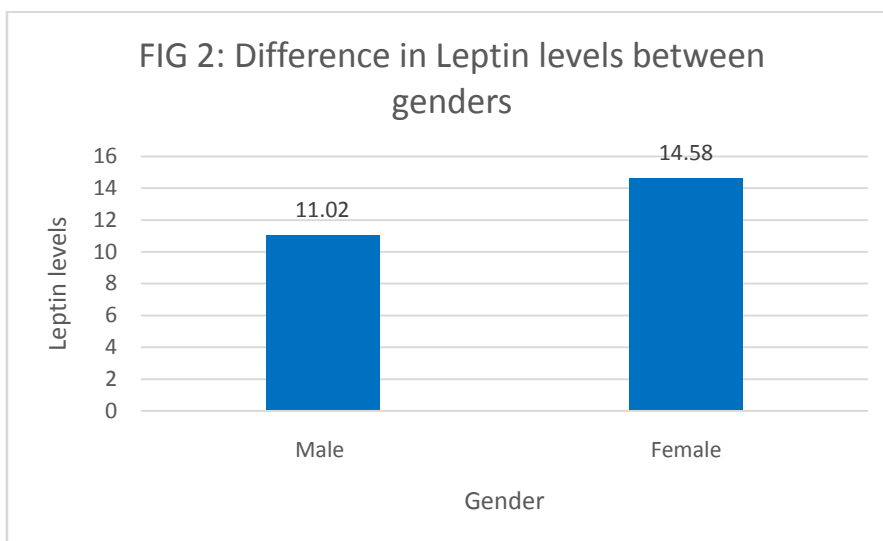
After obtaining institutional ethics committee approval study was done Cross sectional study Sample size: 100 (50 - non obese Diabetic patient with one or more chronic complication of diabetes mellitus. 50 - non obese Diabetic patient free of chronic complication of diabetes mellitus) Inclusion criteria: Established cases of T2DM patients (30-60 years) with and without chronic complications on treatment with sulphonylureas/biguanides or both. Chronic complications include diabetic retinopathy, neuropathy, nephropathy, diabetic ulcers and cardiovascular diseases. Exclusion criteria: T2DM patients with peripheral vascular diseases, Body mass index (BMI)  $\geq$  23, patients on insulin therapy, patients with other comorbid conditions like hypertension, bronchial asthma. Blood glucose was estimated by glucose oxidase peroxidase method, HbA1c was estimated by Turbidimetric inhibition immunoassay, serum urea measured by uv kinetic method, serum creatinine by modified jaffe's method, Microalbumin by immunoassay and serum Leptin level was estimated by ELISA method. All the parameters were analyzed using fully automated analyser. Statistical analysis was done using Microsoft excel 2009 and SPSS version 17.

### III. Results

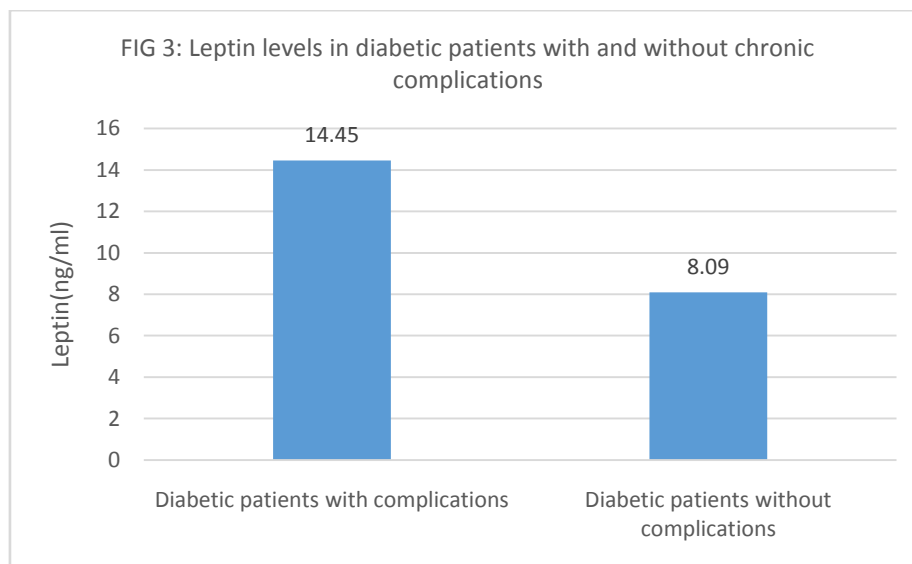
The mean age of our study group is 45.75years and the mean BMI is 21.32 kgm<sup>2</sup>. There was no significant difference in age and BMI among diabetic patients with and without complications. The distribution of type 2 diabetic patients with chronic complications is shown in Fig 1



The difference in serum leptin levels among gender in the study population is statistically significant (Fig 2)



Leptin levels were significantly high in diabetic patients with complications when compared to diabetic patients without complications. (Fig 3)



Pearson correlation was done and glycemic status of individuals had a negative correlation with that of serum leptin levels and found to be statistically significant. ( $p < 0.05$ )

#### IV. Discussion

Various studies have shown the association of leptin levels with obese diabetic patients and the difference in leptin levels among genders<sup>6</sup>. Similar to other studies, leptin levels were found to be higher in female than males. The reason behind this could be subcutaneous fat in females and the effect of sex steroids in leptin production<sup>7</sup>. Association between body fat and serum leptin is most likely due to the increased release of leptin from large fat cells<sup>8</sup>. Leptin levels are high in obese individuals and this is related to body mass index and body fat percentage<sup>9</sup>. There was no significant difference in mean BMI between both the study populations. Leptin level is significantly higher in diabetic patients with complications. There are varying results about the association of leptin levels with diabetic complications. Jung et al, stated that there was no significant difference in patients with diabetic retinopathy and patients without diabetic retinopathy<sup>10</sup>. Accordind to kopeisy et al, leptin levels are significantly elevated in patients with microalbuminuria and macroalbuminuria compared to patients with normoalbuminuria<sup>11,12</sup>. Studies have also stated higher leptin levels in patients with diabetic neuropathy<sup>13</sup>. Microvascular complications of diabetes mellitus are principally due to vascular inflammation and leptin has deleterious effects on vasculature. Leptin has emerged as an important inflammatory molecule responsible for vascular inflammation, increased oxidative stress, endothelial dysfunction and proliferation of vascular smooth muscle cells (VSMC), and resultant intimal hyperplasia<sup>14,15</sup>. Our results are similar to Mariyo et al, Leptin has a negative correlation with HbA1c<sup>16</sup>. Leptin increases insulin sensitivity, thereby improving glycemic status.

#### V. Conclusion

Leptin, an adipose tissue derived hormone and its relationship with type 2 diabetes mellitus patients with chronic complications was studied. The study mainly included patients with microvascular complications. Leptin levels are significantly higher in patients with complications and this is attributed to the inflammatory property of leptin responsible for vascular inflammation, increased oxidative stress and endothelial dysfunction. Therefore, leptins are clinically relevant to diabetic microvascular complications and may have future potential as novel therapeutic targets or markers for risk prediction.

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