Original Article

Study of Serum Prolactin Levels in Type 2 Diabetes Mellitus

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ABSTRACT

Background: Diabetes mellitus is characterized by chronic high blood sugar levels due to either insulin insufficiency or insulin resistance. Prolactin is a peptide hormone secreted by anterior pituitary gland. It performs major functions related to metabolism and immune regulation. Prolactin hormone also found to be linked with diabetes mellitus as it may expand the activity of glucose sensors in β cells. On account of unequivocal findings from various studies, this study was intended to evaluate the risk associated with changes in serum prolactin level in patients with type 2 diabetes mellitus. Aim- To study serum prolactin levels in type 2 diabetes mellitus. Objectives- To estimate serum Prolactin level in type-2 diabetes mellitus patients and compare it with that of controls. **Methods:** The study was done on 30 type 2 diabetes mellitus female patients (age group 20-50 years), attending the OPD of department of medicine in Teerthanker Mahaveer Medical Hospital, Moradabad, Uttar Pradesh. Equal number of age and sex matched individuals were taken as controls (total sample size was 60). **Results:** Increased levels of serum prolactin was found in type 2 diabetic patients which were statistically significant ($p<0.001$). The mean of serum prolactin of diabetic group was 48.77±44.39 and that of non diabetic control group was 17.77±9.08. **Conclusion:** In the present study it can be concluded that the increased levels of serum prolactin observed in type 2 diabetes mellitus patients as compared to healthy controls. Therefore, it is suggested that any patient with diabetes mellitus – Type 2 should be screened for serum prolactin levels and treated at the earliest to avoid complications.

Keywords: Diabetes Mellitus, Insulin, Prolactin.

INTRODUCTION

Diabetes mellitus is characterized by chronic high blood sugar levels due to either insulin insufficiency or insulin resistance.[1] There are two types of diabetes mellitus first is insulin dependent diabetes mellitus which mainly occurs in children and second is non-insulin dependent diabetes mellitus which occurs in adults and this type is more common in eighty to ninety percent of diabetic patients.[2] In 2011, 366 million people all over the world were affected by diabetes mellitus and till 2030 it can reach up to 522 million population. People by means of type 2 diabetes mellitus are on higher risk to various problems that can cause early death.[3] The second type of diabetes mellitus is the chief form of diabetes mellitus which is indicated by high blood sugar level, insulin intolerance and lack of insulin receptors.[4] Type 2 diabetes mellitus occurs from improper balance between the environmental, genetic and behavioural aspect.[5] The long term difficulties of diabetes mellitus comprise of complications that can affect eyes, nerves, kidneys and enlargement of blood vessels.[6] Recently, few studies have observed that prolactin hormone is found to be linked with diabetes mellitus as it may expand the activity of glucose sensors in β cells like six carbon sugars and glucokinase (GCK), Glucose transporter 2 that thereby may find to reduce the threshold of glucose stimulated insulin release.[7] Prolactin, a peptide hormone is secreted by anterior pituitary gland. Also it's other major functions are metabolism and immune regulation.[8] Although, some studies have recommended that higher level of prolactin may have an unfavorable metabolic effect which may be leading to type 2 diabetes mellitus.[9] On account of unequivocal findings from various studies, this study was intended to evaluate the risk associated with changes in serum prolactin level in patients with diabetes mellitus.

Ethics Approval

Ethics approval was obtained from TMMC Moradabad institutional Ethics Committee (TMMC-IEC) Ref. No. TMMC&RC /IEC/18-19/090.

MATERIALS AND METHODS

The study was done on 30 female patients diagnosed with type 2 diabetes mellitus (age group 20-50 years), attending the OPD department of medicine in Teerthanker Mahaveer Medical Hospital Moradabad, Uttar Pradesh. Equal number of age and sex matched individuals were taken as controls (total sample size was 60).

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Type of Study:
Observational and comparative.
Study Period:
Jan. 2019 to Dec.2019
Sample Collection:
With informed consent from patients, after overnight fasting for 8-10 hours venous blood sample was collected and dispensed into following vials for various biochemical tests.
Fasting plasma glucose estimation – Fluoride oxalate vial.
Serum prolactin estimation – Plain vial.
HbA1c estimation – EDTA vial.

Exclusion Criteria [3]
Hepatic disorders
Patient taking medicine which may raise levels of Prolactin (metoclopramide, verapamil etc).
Adrenal disease.
Methodology
Estimation of serum prolactin by ELFA (Enzyme Linked Fluorescent Assay) using Vidas fully automated immunoanalyzer.[10] Glucose Oxidase - Peroxidase method for estimation of fasting plasma glucose.[11] Glycosylated hemoglobin (HbA1c) was estimated by using immunoturbidometric method.[12]

Figure 1: Vidas auto analyzer

Statistical analysis
Mean±SD were calculated for all the parameters analyzed and were compared by Student's t-test and the parameters were calculated using SPSS program.
P values considered significant were as follows:-
P < 0.005 – As significant
P < 0.001 – As highly significant

RESULTS

Table 1: Comparison of fasting plasma glucose between diabetic patients and controls.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
FPG (mg/dl)	146.8±35.96	79.63±12.52	0.000

The mean values of FPG in diabetic patients (146.8±35.96 mg/dl) is significantly higher than that

of the mean value of non-diabetic patients (79.63±12.52 mg/dl) (p-value = 0.000).

Table 2: Comparison of Postprandial Plasma glucose between diabetic patients and controlss.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
P.P.Plasma Glucose (mg/dl)	209.7±8.62	100.3±14.14	0.000

The mean value of Postprandial Plasma glucose in diabetic cases (209.7±8.62 mg/dl) is significantly higher than that of mean value of P.P plasma glucose of non-diabetic control (100.3±14.14 mg/dl) (p value= 0.000).

Table 3: Comparison of HbA1c between diabetic patients and controls.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
HbA1c (%)	8.61±1.66	5.07±0.49	0.000

The mean value of HbA1c in diabetic cases, (8.61±1.66 %) is significantly higher than that of mean value of HbA1c of non-diabetic control (5.07±0.49%) (p-value= 0.000).
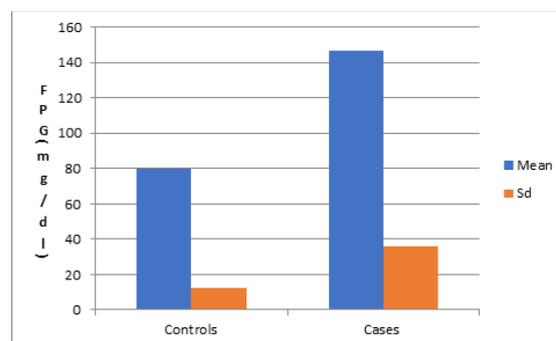

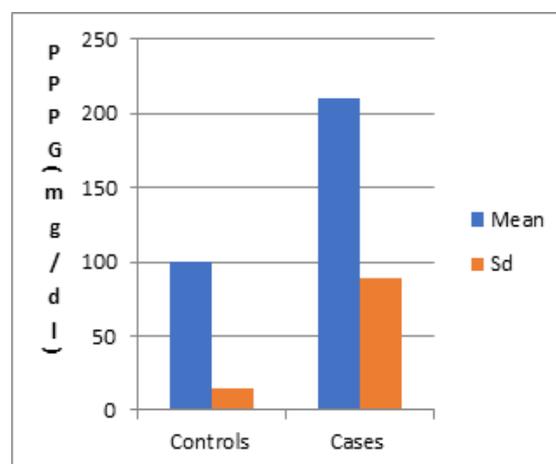**Figure 2: Comparison of FPG between controls and diabetic patients.**

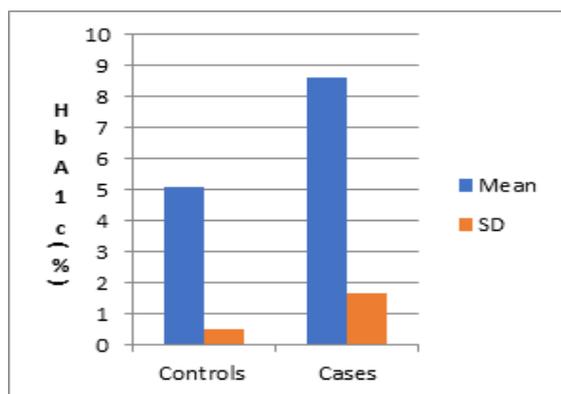**Figure 3: Comparison of P.P.Plasma Glucose between controls and diabetic patients.**

Figure 4: Comparison of HbA1c between Controls and diabetic patients.

Table 4: Comparison of levels of prolactin in diabetic patients and controls.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P-value
Prolactin (ng/ml)	48.77 ± 44.39	17.77 ± 9.08	0.000

The mean value of prolactin level in diabetic patients is (48.77 ± 44.39 ng/ml) is significantly increased than that of mean value of non-diabetic controls (17.77±9.08 ng/ml) (p value=0.000).
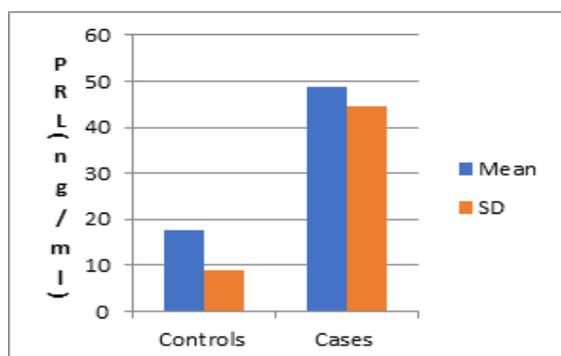

Figure 5: Comparison of prolactin level between controls and diabetic patients.

DISCUSSION

Diabetes mellitus is the major endocrinal disorder in advanced community and also in developing countries like India. The universality of Type 2 diabetes mellitus has been expanding nationally and all over world and is responsible for substantial morbidity and mortality.[13]

Prolactin, an anterior pituitary hormone important for many physiological functions in the body of humans.[14]

Some studies have shown us that there are changes in the prolactin levels of diabetic patients.

Several studies in the past years have been carried out to find out the disturbances in prolactin is due to T2DM and to find out the beneficial approaches to avoid complications associated with it. But, the extent of relationship has not been well defined.

Therefore, in this study we have evaluated the status of serum prolactin in type 2 diabetes mellitus to see if early recognition of these parameters can avoid complications and improve the standard of living in these patients.

Present study has been conducted to assess the levels of serum PRL in patients with diabetes mellitus - type 2. The study was carried out in Teerthanker Mahaveer Hospital, Moradabad. In this Cross sectional study total 60 subjects out of which 30 were healthy controls where as 30 were patients suffering from type 2 diabetes mellitus were taken as sample for study.

In the present study, it has been observed that levels of FPG, Postprandial Plasma Glucose and HbA1c were increased in diabetic patients as compared to controls with mean and SD values of FPG in control group 79.63±12.52 mg/dl and in diabetic cases mean value of FPG is 146.8±35.96 mg/dl as shown in [Figure 2]. Which is statistically significant (p = 0.000)[Table 1]. The mean value of Postprandial Plasma Glucose in control group is 100.3±14.14 mg/dl and in diabetic case, mean value of Postprandial Plasma Glucose is 209.7±88.62 mg/dl as shown in [Figure 3]. which is statistically significant (p = 0.000) as shown in [Table 2] The mean value of HbA1c in control group is 5.07±0.49 % and in diabetic case, mean value of HbA1c is 8.61±1.66 % as shown in [Figure 4] .which is statistically significant (p = 0.000) as shown in [Table 3]. In another study carried out by Abdallah S.M et al,[15] shows that in diabetic patients along with retinopathy or without the levels of fasting blood glucose HbA1c were significantly higher as compare to control groups.

In our study, we have assessed that increased amount of serum prolactin was found in patients with diabetes mellitus - type 2 The mean value of prolactin in control groups is 17.77 ± 9.08 ng/ml and the mean value of prolactin in diabetic patient is 48.77 ± 44.39 ng/ml. which was statistically significant (p=0.000) as shown in [Table 4 & Figure 5].

In a study done by Abdelmoneim B et al,[16] they estimated the levels of prolactin and did not found any consequential variance in PRL amount between case and control group.

It has been postulated in previous studies that generally, prolactin hormone leads to noteworthy biological action on β – cell of the pancreas through activation of protein kinase and phosphatidylinositol - 3 kinase that modulates islets density and insulin sensitivity.

Likewise, Daimon et al,[17] researched on relationship between PRL level and resistance to insulin in non diabetic men and found that prolactin level is elevated in patients with diabetes mellitus-type 2 and this verifies the connection between high PRL amounts and insulin resistance.

Therefore, raised prolactin amounts in type 2 diabetes mellitus may be as a response to hyperglycemia, since prolactin plays an essential part in the improvement of pancreatic β - cell function.

Ruiz – Herrera et al,[18] researched on the role of insulin sensitivity in obese males and found that regulation of prolactin via osmotic force into rodent adipose tissue and results in regulation of insulin reactivity, decreases inflammatory cytokine release in natural fat, decreases adipocyte hypertrophy and increases action of GLUT4 receptors for glucose uptake.

In other study by Nauck M et al,[14] it has been revealed that an inverse association exists between low prolactin concentration and frequency of diabetes mellitus – Type 2 possible in females and males in diabetes mellitus patient. Likewise higher prolactin concentration were linked with notably reduce type 2 diabetes mellitus risk.

Prolactin modulates total body insulin sensitivity and metabolism of glucose by increasing β - cell mass, developing hepatic insulin reactivity and regulating immune function.

It has been detected that prolactin expands the level and activity of glucose sensors in β - cell i.g. glucokinase, hexokinase and GLUT 2 transporter by that decreasing the threshold of glucose stimulated insulin release.

Therefore a high prolactin level in case with type 2 diabetes mellitus is regarded as beneficial phenomena to overcome insulin resistance and diabetic complications.

There are certain limitations in this study which include small sample size, single center and newly diagnosed patients with diabetes mellitus - type 2.

In spite of above limitations this study is regarded as a primary step for large scale to observe the association between prolactin levels and diabetes mellitus – type 2 induced complications.

CONCLUSION

In the present study it can be concluded that the increase levels of serum prolactin are observed in the diabetes mellitus – Type 2 patients as compared to the healthy controls.

So, based on all the finding of this study it can be suggested that plasma glucose level and HbA1c must be measured in hyperprolactinemia.

Therefore, it is suggested that any patient with diabetes mellitus – Type 2 should be screened for serum prolactin concentration and treated at the earliest to avoid complications.

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