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# AN EVALUATION TO FIND OUT THE RELATIONSHIP BETWEEN ADIPONECTIN AND INSULIN RESISTANCE AMONG TYPE 2 DIABETIC AND NON-DIABETICS PATIENTS: A CASE CONTROL STUDY

Biochemistry

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## ABSTRACT

**Background:** Diabetes mellitus is one of the most common non-communicable diseases in the world nowadays. Adiponectin has been associated with insulin resistance in Type 2 diabetes, though the mechanism of association is still uncertain. The adiponectin levels in relation to glycemic control were investigated in type 2 diabetic patients.

**Objectives:** To Evaluate relationship of adiponectin with Insulin resistance in Type 2 diabetics and Non-diabetics patients.

**Material and Methods:** Sample sizes of 180 Subjects where 120 diabetic patients were in test group and 60 non- diabetic patients who were in control group were recruited into this case control study. Socio-demographic characteristics and blood pressure were obtained. Total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein, (HDL), fasting plasma glucose (FPG), and glycated hemoglobin (HbA1c), HOMA-IR and IS were estimated using colorimetric methods, atherogenic index (AI) was calculated, while serum adiponectin was determined by ELISA method.

**Results:** Mean age of non-diabetic Patients was 38.15 while that of type 2 diabetic patients was 48.20 years. No significant difference was seen in type 2 diabetics and non-diabetics Patients in terms of Steady-state plasma glucose (SSPG) and Fasting plasma glucose (FPG). The relationship between diabetics and no diabetic in terms of adiponectin concentrations was quite different while relationship between IS and IS in terms of adiponectin concentrations was not of much difference.

**Conclusion-** According to these studies, it seems that adiponectin may be an important modulator of insulin action for enhancing of sensitivity of insulin.

## KEYWORDS

Diabetes, Adiponectin, Insulin resistance, Insulin sensitivity

## INTRODUCTION

Diabetes mellitus is a group of metabolic diseases [1], with more than 200 million people[2]. It is expected that the total number of these patients reaches 370 million worldwide in 2030 [3-4]. It is caused by a combination of insulin resistance and impaired insulin secretion by pancreatic β cell[2-4]. Insulin resistance is defined as a state that needs more insulin to get the biological effects achieved by a lower amount of insulin in the normal state[5]. Several molecules which are secreted through adipocytes have been involved in insulin resistance and type 2 diabetes development in from animal models and humans[6]. Thus, it seems that these signaling molecules can be as determinative agent of the incidence of type 2 diabetes mellitus[6].

Insulin secretion has been reported to enhance the secretion of an adipocyte complement related protein known as adiponectin.[7] Adiponectin has been shown to play important roles in carbohydrate and lipid metabolism and vascular biology.[8] Dysregulation of adiponectin secretion have been implicated in the development of non-insulin dependent (Type 2) diabetes.[7] Adiponectin, also known as adipocyte complement-related protein of 30 kDa (Acrp30), a type of adipokine. Adiponectin is an endocrine factor synthesized and released from adipose tissue. Basic scientific studies have demonstrated that adiponectin has insulin-sensitizing[9], anti-atherogenic, and anti-inflammatory properties.[10,11] Therefore, it is important to have a thorough understanding of adiponectin as such knowledge may lead to new therapeutic approaches for diseases, such as type 2 diabetes, metabolic syndrome, cardiovascular disease, and obesity. It is of great interest to explore the association of adiponectin with metabolic parameters. So, the aim of this study was to evaluate the relationship between adiponectin and insulin sensitivity among diabetic and non-diabetics female.

## MATERIAL AND METHODS

- **Study design**

This study was observational case control hospital based study which was conducted in the Medicine department of GMC, Azamgarh on type 2 diabetes cases & age-sex matched healthy adult population which is tertiary care teaching hospitals providing health care services after being approved by the Institutional Human Ethics Committee and taking Informed consent from the patients. This study was conducted for a period of six months from June 2018 to November 2018. This study includes all the patients attending the General Medicine and Diabetic OPD of Government Medical College and Hospital, Azamgarh (U.P.)

- **Study population:** The total study population consisted of 180 subjects where Patients diagnosed as type 2 diabetic was 120 which was a test group ($n$ = 180) and non- diabetic Patients was 60 which was a control group ($n$ = 180).

- **Patient's selection criteria**

**Inclusion criteria**

Recent onset (<5 years of disease duration) type-2 diabetics of 30- 60 years of age and of both sexes, attending the General Medicine and Diabetic OPD of Government Medical College and Hospital, Azamgarh (U.P.)

**Exclusion criteria**

- Subjects with any other chronic illness like tuberculosis, malignancy, hepatitis due to any cause, hypertension, renal diseases, hormonal derangements other than diabetes like Cushing's syndrome, hypothyroidism etc, pregnancy, alcoholism, and any other acute or chronic illness related or unrelated to diabetes will be excluded from the study.
- Patient on insulin therapy or on oral hypoglycemics other than short acting 2nd generation sulfonylureas were also excluded.

- **Methodology**

After obtaining informed consent, plasma glucose and lipid concentrations were determined after an overnight fast. Steady-state plasma glucose (SSPG) concentrations were also determined by a modified version insulin suppression test. The results of the insulin suppression test were used to stratify volunteers into insulin resistant (IR) and insulin sensitive (IS) subgroups. Subjects whose SSPG concentrations were in the upper 40% were classified as IR, and those in the lowest 40% as IS. Demographic profiles were also recorded.

Serum insulin was estimated by sandwich ELISA method using Bioline insulin assay kit.

- **Statistical Analysis**

Data were analyzed using the Statistical Package of the Social Sciences (SPSS version 13.0) and were expressed as mean ± standard deviation. Student t-test and Chi-square test were used to compare means of different parameters. The differences among the means were considered significant if $P < 0.05$.

## RESULTS

**Table 1- Demographic details in Cases and Controls**

**(A)**

| Parameters | | Group I (Daibetics) Test group (n=120) | Group II (Non-Daibetics) Control group (n=60) | Total (n=180) | P value |
|---|---|---|---|---|---|
| Age (Years) | 30-40 | 78 | 21 | 99(55.0) | 0.03 |
| | 40-50 | 37 | 27 | 64(35.55) | |
| | ≤60 | 05 | 12 | 17 (9.44) | |
| Weight(kg) | < 50 | 62 | 44 | 106(58.88) | 0.002 |
| | 50-70 | 54 | 14 | 68(37.77) | |
| | >70 | 4 | 2 | 6(3.33) | |
| Height(feet) | <5 | 50 | 23 | 73(40.55) | 0.01 |
| | 5-6 | 69 | 37 | 106(58.88) | |
| | >6 | 1 | 0 | 1(0.55) | |
| BMI(kg/m$^2$) | ≤25 | 120 | | 120(66.66) | <0.001 |
| | >25 | | 60 | 60(33.33) | |

**(B)**

| Parameters | Group-II (Daibetics) | Group-I (Non-diabetics) |
|---|---|---|
| Age | 48.20±0.51 | 38.15±0.51 |
| Weight | 71.6±5.46 | 62.72±7.53 |
| Height | 1.57±0.19 | 1.59±0.063 |
| BMI | 26.71±1.88 | 20.35±1.87 |

As per table 1(B) mean age of non-diabetic women was 38.15 while that of diabetics was 48.20 years. As seen BMI was normal in non-diabetics while it is overweight category for diabetics with high weight in comparison to non- diabetics.

**Table 2- Comparison of Metabolic variables among non- diabetics and Diabetics and IR and IS subgroups (n=180)**

| Parameters | Group-I (Non-diabetics) | Group-II (Type 2 Diabetics) | IR | IS | P-value |
|---|---|---|---|---|---|
| SSPG (mg/dl) | 157±7 | 119±2 | 225±54 | 110±7 | 0.31 |
| FPG (mg/dl) | 95±11 | 93±9 | 93±4 | 95±3 | 0.65 |
| Adiponectin (mcg/ml) | 9.56 ± 5.92 | 7.54 ± 4.62 | 5.16 ± 0.27 | 5.64 ± 0.21 | 0.003* |

*p<0.05 is statistically significant

IR- insulin resistance, IS- insulin sensitivity

As per table 2 significant differences was seen in type 2 diabetics and non-diabetics in terms of SSPG while no significant differences was seen in type 2 diabetics and non-diabetics in terms of FPG. Similarly significant differences were observed in subgroups IR and IS in terms of SSPG while no significant differences were observed in subgroups IR and IS in terms of FPG. The relationship between type 2 diabetics and non diabetics in terms of adiponectin concentrations was quite different. Similarly no significant differences were observed in subgroups IR and IS in terms of adiponectin concentrations.

## DISCUSSION

The relative or absolute contributions of hyperglycemia accelerated protein glycosylation in patients with type 2 diabetes in dysregulation of adiponectin metabolism were examined. The study observed significant differences in the serum adiponectin levels of the diabetics and the non-diabetics population studied. Similar observation has been reported by a previous study between type 2 diabetics and controls.[12-14] while our observation was contradictory to the results reported by a previous study between type 2 diabetics and controls.[15] In our study no significant differences were observed in subgroups IR and IS in terms of adiponectin concentrations. During the study period significant differences was seen in type 2 diabetics and non-diabetics in terms of SSPG while no significant differences was seen in type 2 diabetics and non-diabetics in terms of FPG. Similarly significant differences were observed in subgroups IR and IS in terms of SSPG while no significant differences were observed in subgroups IR and IS in terms of FPG. Not much of the literature has been found for comparison of SSPG and FPG between Type 2 diabetic and Non diabetic groups along with IR and IS subgroups.

## CONCLUSION

Circulating levels of adiponectin are reduced in the presence of Type 2 Diabetic patients. The association of adiponectin with HDL cholesterol, triglycerides, and abdominal fat may partly explain the lower levels of adiponectin found in individuals with Type 2 Diabetic patients. Adiponectin concentrations are mostly linked to insulin sensitivity independent on BMI as a measure of adiposity and not to insulin resistance in type 2 diabetic patients. According to these studies, it seems that adiponectin may be an important modulator of insulin action for enhancing of sensitivity of insulin.

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**Ethical approval:** The study was approved by the Institutional Ethics Committee

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