

BIOCHEMICAL STUDY ON ROLE OF ADIPONECTIN AS ADIPOCYTE PROTEIN WITH INSULIN RESISTANCE IN IRAQI PATIENTS WITH TYPE-2 DIABETES MELLITUS

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ABSTRACT : For the assessment of adiponectin level in the serum of Iraqi patients with diabetic mellitus type 2 and to create an association between insulin resistance and adiponectin in the serum of participant. Adiponectin was measured in sixty Iraqi subjects; 30 diagnosed with type 2 diabetes and 30 healthy subjects were registered in this revision. The age of patients and control ranged between (39-65) years. The level of adiponectin was assessed in serum by enzyme-linked immunosorbent assay (ELISA) technique. Serum levels of adiponectin displayed a significant decrease in diabetic group associated with control group ($p < 0.01$). Among diabetic Iraqi patients, decrease level of adiponectin, indicate the significant relationship between adiponectin and diabetic.

Key words : Diabetic, adiponectin, insulin resistance.

INTRODUCTION

Most of diabetes mellitus type 2 is related with aging, rise in weight, the presence of history of diabetes in the family, if the patients have gestational diabetes before, sedentary life style and subject live in urban societies, and is considered by a mixture of weakened in the secretion of insulin from beta cells in the pancreatic and insulin resistance of the outlying target tissues (Singh, 2011). It is also associated with oxidative stress results in oxidation of proteins and lipids peroxidation that cause a significant increase in SOD, CAT, GPx, GSH and MDA in addition to a dramatic DNA damage (Almamoori *et al*, 2019).

About 382 million people affecting with the problem of diabetes mellitus and this problem is dramatically growing worldwide. Diabetic's people live in lower income and medium income countries consist nearly 80%, wherever eighty out of one hundred people are said to have diabetes mellitus type 2. All the categories of diabetes are accumulative. Notice that the number of people may be affected with diabetes mellitus Type 2 is predicted to rise about 55% in the year 2035 (Christine Faith *et al*, 2015).

Adipose tissue not only an inert energy-storing tissue, but is considered as an active endocrine organ, which secretes many types of adipocytokines (Lara-Castro,

2007). The predominant types of adipocytokines are Adiponectin, with a normal concentration ranged between 5 and 30 μ g/ml. There are three chief forms for the secretion of adiponectin by adipocytes: trimer, hexamer and high molecular weight molecule involving about 18 monomers (Hui *et al*, 2012).

One of the most important elements that cause diabetes mellitus type 2 is decrease the sensitivity to Insulin and is quite often linked with obesity (Reaven, 1995).

The essential metabolic and anti-inflammatory actions that recommend as a defensive factor in the improvement of diabetes is Adiponectin (Pajvani *et al*, 2003).

Inversely to other adipocytokines, Adiponectin concentration is inversely connected with adiposity, adipocyte size and insulin sensitivity (Lara-Castro *et al*, 2007). It has the main part in improving sensitivity of insulin by activating the addition of phosphate group to AMP-activated protein kinase in insulin target tissues, such as skeletal muscle and liver (Buff *et al*, 2002). Decreased plasma adiponectin go before a diminution in the sensitivity of insulin in all the body tissues and has been associated to independent diabetes, while elevate adiponectin concentrations act as protective against type 2 diabetes (Christine Winzer *et al*, 2004).

MATERIALS AND METHODS

Ethical issues

The study was agreed dependent on the local ethics group, all patients participate in the revision give an idea about the purpose of the review, agree, and signed consent were informed.

Study design

This revision designated as a case-control study.

Patients and control

The size of sample was designed rendering to Daniel sample size formula equation. Thirty of the Iraqi patients were participate in this study, all of the participants have type 2 diabetes, complete history from all patients was taken, which include: age, dwelling, smoking, family history, therapeutic and medication history, those patients don'ts given any drug that may interfere with the measured parameters and thirty subjects apparently healthy and therapeutically free were employed to serve as non-diabetic control group. Patients with Type 1 diabetic, patients with kidney and heart disease, pregnant female, all were excluded from the study. The age of these groups from 39 to 65 years. SPSS version 18 was used for the statistical analysis. The results were expressed as Mean ± SD and P values less than 0.05 is considered significant.

Chemicals and methods

- A. Determination of serum adiponectin concentration by the sandwich-ELIZA kit as the method. In this kit, an antibody specific to ADP/Acrp30 was pre-coated to the micro- ELIZA plate (Elabscience biotechnology Co. Ltd, ELIZA kit).
- B. The sandwich-ELIZA has been used for the determination of serum insulin concentration. An antibody specific to insulin was pre-coated to the micro- ELIZA plate supplied with the kit.

RESULTS

The study groups consist of 60 adults designate on two categories.

1. Adults have diabetic (n = 30)
2. Adults as control group (n = 30)

Age

The variance in age (as mean) recorded no significant different between control and diabetics as demonstrated in Fig. 1.

Gender

Spreading of diabetics rendering to sexual characteristics that shown in Fig. 2. The current review

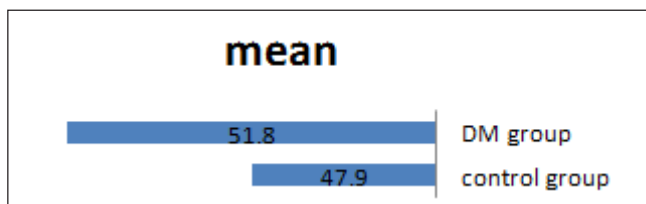


Fig. 1 : Age studied groups.

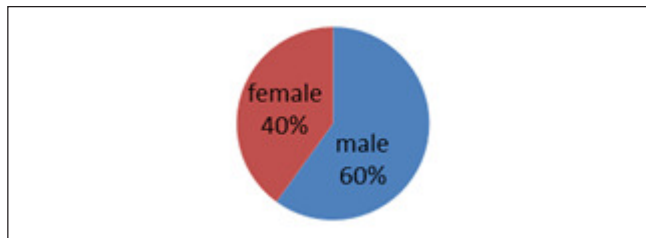


Fig. 2 : Distribution of groups studied according to gender.

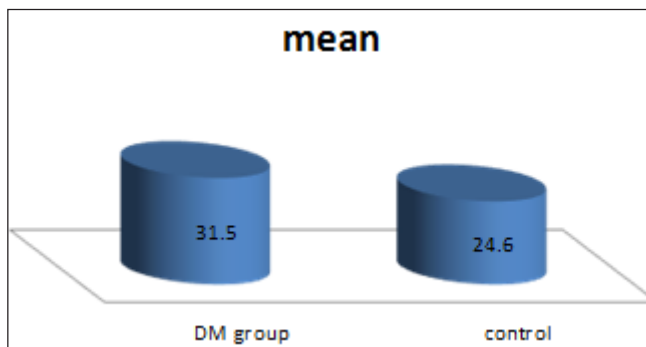


Fig. 3 : Distribution of groups studied according to body mass index.

Table 1 : The study sample characteristics.

Parameters	Diabetic group n=30	Control group n=30	P value
HbA _{1c} Mean±SD	8.1 ± 1.1	3.9 ± 0.75	P<0.001
FSG (mmol/l) Mean± SD	9.7 ± 2.2	5.3 ± 0.52	P<0.001
FSI (MIU/ml) Mean± SD	10.9± 2.5	5.8 ± 1.7	P<0.001
HOMA-IR Mean± SD	4.7 ± 1.09	1.3± 0.48	P<0.001
Adiponectin Mean± SD	10.5 ± 1.05	11.2 ± 1.6	P<0.05

SD = standard deviation, FSI = fasting serum insulin, FSG = fasting serum glucose, HbA_{1c}= haemoglobin A_{1c}.

established that the prevalence of diabetics in male (60%) is larger than females (40%).

Body mass index (BMI)

Spreading of groups rendering to BMI that shown in Fig. 3. The mean± standard deviation [SD] of BMI for control and diabetic group were 24.6 ± 2.9 and 31.5 ± 2.5, respectively. The result of the study shown that BMI in diabetics group was greater than control group with significant increase (p < 0.001) as shown in Fig. 3.

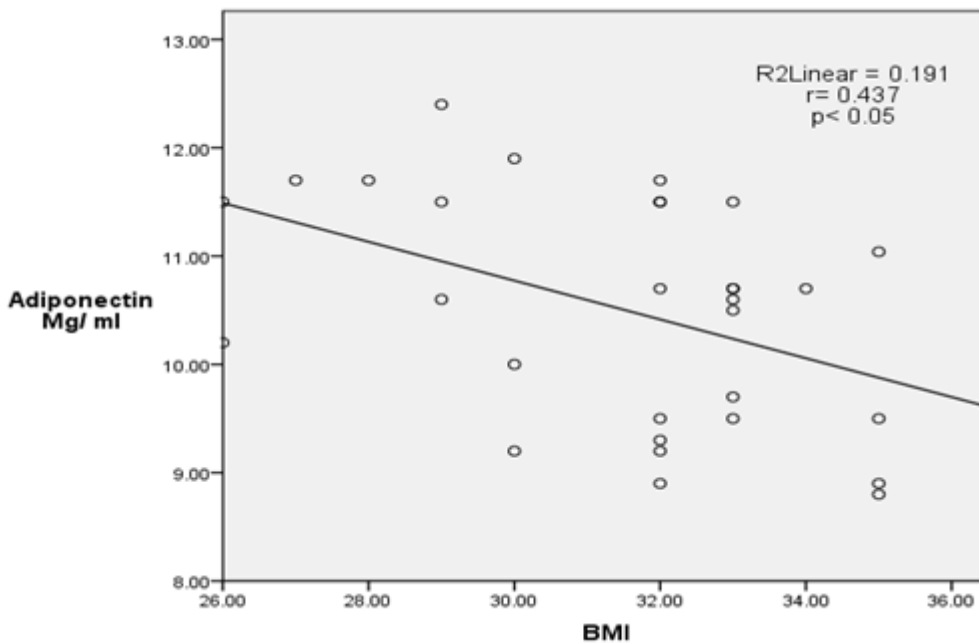


Fig. 4 : Correlation between BMI and adiponectin in diabetic group.

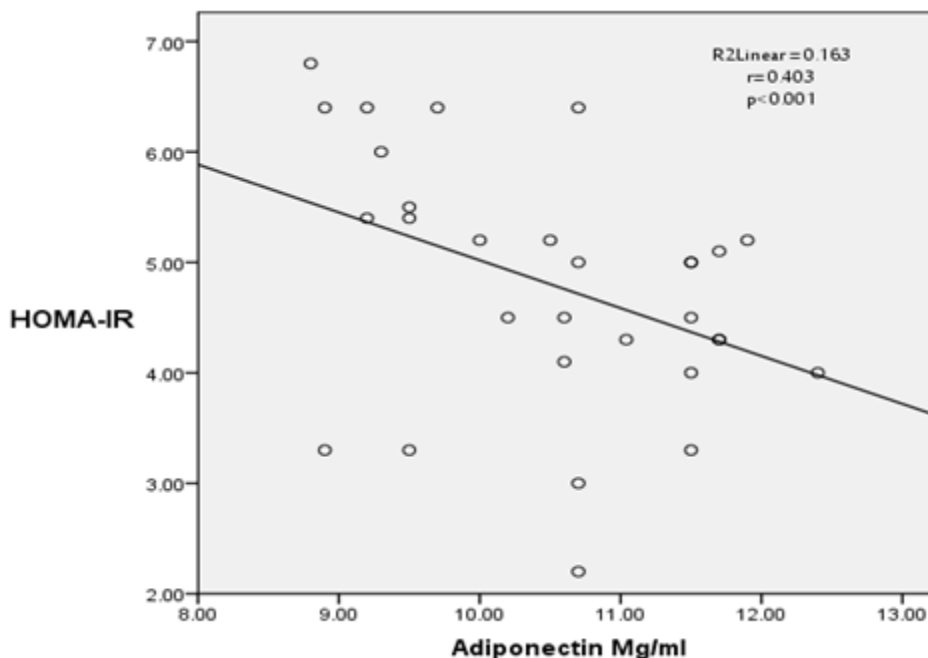


Fig. 5 : Correlation between HOMA-IR and adiponectin in diabetic group.

As shown in Table 1, the mean \pm SD of adiponectin in diabetic group was 10.5 ± 1.05 with a significant ($p < 0.01$) difference with control group and the concentration of serum HOMA-IR mean \pm standard deviation increase significantly ($p < 0.001$) in diabetic subject comparison with control group.

Correlation of adiponectin with body mass index (BMI) and insulin resistance (HOMA-IR)

In our revision the result of linear regression analysis show negative association ($r = 0.437, p < 0.05$), ($r = 0.403, p < 0.01$) between adiponectin and BMI, HOMA-IR in

diabetic group respectively as revealed in Figs. 4 and 5.

DISCUSSION

One of the most essential causes of illness and death is type 2 diabetes. Universally, the most important health issue is the avoidance of diabetes and its related problem, mainly cardiovascular disease and its complication (Koenig *et al*, 2006). Adiponectin is one of the most important secretory proteins and has main role in the metabolic pathway and decrease the risk of diabetes mellitus (Yuji Matsuzawa *et al*, 2004).

Decrease the level of systematic inflammation with higher levels of inflammatory cytokines, adiponkines, and acute phase proteins is the main characteristic of obesity (Afrah Nazar Al Mamoori *et al*, 2017). Really, obesity simplifies the improvement of metabolic disorders and cardiovascular disease in addition to chronic disease (Bollapragada *et al*, 2017; Derdemezis *et al*, 2011).

Based on the measurements of this revision the mean age of subjects, who were established as diabetics and control were 51.8 and 47.9 years, respectively, control and diabetics groups has no significant variance in age (as mean), as presented in Fig. 1. This age matching helps to remove the difference in elements that may initiate due to the huge difference of age, this in contrast to the result of Bottner *et al* (2004) and Nishizawa *et al* (2002) which include the fact that the level of adiponectin were amplified with age. Furthermore, this review found a slight male predominance with 1.4/1ratio. This outcome is consistent with those of Natasha Sobers-Grannum *et al* (2015), found that In the wild area of the world women are at the same or lesser danger of type 2 diabetes in comparison with men, even when obesity is higher in women.

The most hallmarks of type-2 diabetic mellitus are insulin resistance. The disruption of the response of different body cells to insulin occurs as a result of fat accumulation, leading to insulin resistance and high level of blood glucose (Laila Ahmed Elissa *et al*, 2015). Mostly, it has been described that obesity is intensely connected with decrease of adiponectin and the response to insulin among patients with diabetic (Mohammadzadeh *et al*, 2014).

HOMA-IR, the parameter controlled by fasting serum glucose and fasting insulin level, is used for the estimation of insulin resistance where the ability for the secretion of insulin is constant to some level, and is commonly used as an investigation apparatus in epidemiological studies (Ahsan *et al*, 2012).

As showed in Table 1, the insulin resistance were detected in diabetic subject than those of control group with significant variance between them ($p < 0.001$). Our finding was in agreed with Kazuo Hara *et al* (2002) that found the same result.

Adiponectin is the peptide derived from an adipocyte that is completely and plentifully produced in adipose tissue, considered as a hormone with anti-inflammatory and insulin stimulating agents (Spranger *et al*, 2003).

Most of the previous study found low level of adiponectin in the plasma of patients with obesity, type 2 diabetes, and heart disease (Arita *et al*, 2000). In our

study population decrease the level of adiponectin is more than the interruption of insulin sensitivity in the human body and has the chief effect in the enhancement of diabetes. All of these given an idea that the main factor of increase the sensitivity of insulin are adiponectin (Shereen Aleidi *et al*, 2015), while high level of adiponectin in the plasma were motivate energy metabolism, so act as the defensive against type 2 diabetes (Tschrutter *et al*, 2003; Lindsay *et al*, 2002).

Indeed, adiponectin concentration in the present study was correlated negatively to the levels of insulin resistance, and BMI. The results of this revision demonstrated that insulin resistance is strictly linked to the release of adiponectin and insulin sensitivity is the chief factor of adiponectin levels, our result in agree with Aili Sun *et al* (2016), so it is necessary to remember the elements decreasing adiponectin levels likes obesity, could link with insulin resistance (Shereen Aleidi *et al*, 2015).

Similarly, low levels of adiponectin in diabetics group in this revision provide an anti-inflammatory role of adiponectin. These result is in consistent with Hivert *et al* (2008), Kawano *et al* (2009) and Ahsan *et al* (2014).

CONCLUSION

Among diabetics Iraqi patients, decrease the level of adiponectin and insulin sensitivity; indicate the significant linked between adiponectin and diabetics.

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