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Original Research Article

The antagonistic relationship of fetuin-A and adiponectin in obese type 2 diabetes mellitus

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ABSTRACT

Background: Fetuin-A and adiponectin display noteworthy affiliations, bolstered by recent prove, with metabolic disorder, obese type 2 diabetes including hyperglycemia, central weight and insulin resistance as the most components, but their natural capacities are inverse. The point of this consider was to confirm the role of fetuin-A and adiponectin are the touchy marker for assessment of obese type 2 diabetes.
Materials and Methods: In this analytical cross-sectional study, 100 control and patients were chosen from the physical examination database. Serum levels of fetuin-A and adiponectin were measured utilizing an enzyme-linked immunosorbent measure (ELISA) method. The Statistical software namely SAS 9.2, SPSS 15.0, Stata10.1, MedCalc 9.0.1 , Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.
Result: Compared with fetuin-A or adiponectin was significantly associated with obese type 2 diabetes mellitus ($P < 0.001$).
Conclusions: Fetuin-A or adiponectin are antagonistic linked with each other in obese type 2 diabetes mellitus

1. Introduction

Type 2 diabetes mellitus is the foremost common sort of diabetes, the clinical signs including hyperglycemia, dyslipidemia due to insulin resistance and disabled insulin secretion.[1,2] Obese type 2 diabetes which causing a serious burden on the worldwide care system.[3,4] According to the Worldwide Diabetes Association (IDF, 2017) the rate of diabetes in grown-ups has rise suddenly to 425 million around the world, and the number is anticipated to extend to 629 million by 2045.[5] Currently, the biggest number of individuals with diabetes (20–79 years) are in China (114 million), India (73 million), and in the USA (30 million).[6,7] sedentary lifestyle, unhealthy eat less diet, and urbanization are too responsible for increased prevalence of obese type 2 diabetes mellitus. Obesity is a condition in which excessive fat accumulate in to adipose tissues.[8] It may be due to social, natural and hereditary factors. The prevalence of obesity according to World Health Organization in 2015, 2.3billion. Type 2 diabetes and obesity both are interconnected by insulin resistance.[9] The non-esterified fatty acids which are secreted from adipose tissue of obese people may be responsible for insulin resistance.[10]

Fetuin-A is a glycoprotein with molecular weight 60 kDa.It is synthesized from hepatocytes.[11] Fetuin-A tie to insulin receptors in fat and muscle tissue, inhibits insulin receptor tyrosine kinase action as well as insulin receptor autophoshorylation in vivo and in vitro.[12] The interruption of fetuin A in insulin mechanism is responsible for development of type 2 diabetes mellitus.[13] In terms of treatment or anticipation of insulin resistance,fetuin-A may

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be considered as a new therapeutic target for obese type 2 diabetes mellitus. [14]

Adiponectin is a protein hormone produced by adipocytes. It act as an anti-inflammatory and anti-diabetic biomolecule. Adiponectin has N- terminal collagen like space and a C- terminal complementary figure globular domain. It is circulate as trimers, hexamers and high molecular weight form. It activated AMP-dependent protein kinase mechanism. Which initiate the regulation of glucose level by increasing glucose uptake in muscles and stifle gluconeogenesis in hepatocytes and also enhance the fatty acid breakdown. The level of adiponectin also reduced in diabetes as compared to non-diabetes peoples. [15]

The most recent studies have revealed that fetuin-A is additionally emitted and communicated in adipose tissue, and this discharge is more rich in visceral fat tissue than in subcutaneous fat tissue particularly within the obese. It is considered as a novel interface between obesity and type 2 diabetes. Data from the Heart and Soul Consider has pointed out essentially positive relationships between high fetuin A levels and an atherogenic lipid profile in type 2 diabetic patients. In differentiate to fetuin-A, higher adiponectin levels are considered to be beneficial since of its antidiabetic and antiatherogenic potential. A expansive body of researches have illustrated that low adiponectin levels may relate with dangers and the seriousness of type 2 diabetes. By differentiate, expanded adiponectin levels have been demonstrated as an autonomous defender for the advancement and relapse of type 2 diabetes in a few imminent ponders. Although fetuin-A and adiponectin are both intimately involved in type 2 diabetes, they act in opposite aspects. Previous genome wide scans have yielded a clear evidence that both fetuin-A and adiponectin genes are located at chromosome 3q27-qter which is a susceptibility locus for type 2 diabetes. Therefore, fetuinA and adiponectin are speculated to work together in the metabolic balance.

The goal of the present study was to investigate role of fetuin –A and adiponectin in obese type 2 diabetes mellitus.

2. Material and Methods

The present study was conducted after the approval of Research Advisory Committee and Ethical Committee (LNCTU/CC/BI/009166) of LN College of Medical Science and Centre for Scientific Research and Development (CSRD), LN University Bhopal. This study consist of 100 healthy control and 100 with obese type 2 diabetes mellitus, during of Informed written consent was obtained from all study subjects.

2.1. Study design

This is a hospital base Analytical Cross sectional study.

2.2. Source of data

The blood samples collected from obese type 2 diabetic and, non-diabetic persons under the supervision of Physician who were attend their routine checkup in the Department of Medicine, at J.K. Hospital Bhopal.

2.3. Inclusion criteria

1. Patients diagnosed with obese type-2 diabetes, according to ADA (American Diabetes Association) value for BMI, FBG, PPG (2 h) and HbA1c is taken into consideration for selection of patients.
2. Patients newly diagnosed with type 2 diabetes are take.
3. Age between 40-70 years.

2.4. Exclusion criteria

1. Patients with diagnosis of any other disease other than obese type 2 diabetes like acute myocardial infarction, renal failure, liver disease, critical illness, tuberculosis, carcinoma and any severe infection.
2. Pregnant woman
3. Patients with anemia
4. Patients below 40 and above 70 years will be excluded.

2.5. Sample collection

After overnight fasting for 10-12 hours, approx. 3-5ml blood sample for glucose will be collected in fluoride vial, for HbA1c in EDTA vial and for Fetuin-A, Adiponectin and Insulin, lipid profile in plain vials. Samples will be centrifuged at 3000 rpm for 10 minutes: serum is separated and immediately stored in freezer at – 20°C till further analysis. Fasting blood glucose determined by GOP-POD method, HbA1c turbidimetric inhibition immunoassay, insulin, fetuin-A and adiponectin by ELISA method. Insulin resistance estimated by the homeostasis model assessment (HOMA-IR) and calculated as FPI x FPG / 22.5.

FPI=Fasting Plasma Insulin

FPG=Fasting plasma Glucose

2.6. Statistical software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

This table shows distribution of demographic characteristics and biochemical parameters in controls and patients. FBG, HbA1c, Insulin, HOMA-IR(Homeostatic model assessment-Insulin resistance) and Fetuin-A were significantly higher in obese type 2 diabetes patients as compared to healthy controls and adiponectin is significantly lower in obese type 2 diabetes patients as compared to healthy control.

Table 1: Distribution of demographic characteristics and biochemical parameters in controls and patients.

Parameters	Group	n	Mean	Std. Deviation	'p' values
Age (Yrs.)	Control	100	36.45	11.12	0.312
	Patient	100	38.12	12.28	
BMI	Control	100	64.23	13.21	<0.001
	Patient	100	78.92	15.42	
FBG (mg/dl)	Control	100	90.02	10.16	<0.001
	Patient	100	209.50	63.57	
HbA1c (%)	Control	100	5.29	0.15	<0.001
	Patient	100	8.91	1.26	
Insulin (mu/l)	Control	100	11.31	3.53	<0.001
	Patient	100	30.43	3.06	
HOMA-IR	Control	100	2.51	0.83	<0.001
	Patient	100	16.04	6.11	
Fetuin-A (microg/ml)	Control	100	264.40	6.49	<0.001
	Patient	100	335.30	6.64	
Adiponectin(micg/ml)	Control	100	51.70	6.16	<0.001
	Patient	100	36.62	10.70	

p<0.05(Significant), p<0.001(Highly significant)

3. Results

Clinical characterization of the study subjects were summarized in Table 1. The number of control and patients are 100 in number. Table 1 was show high mean value of BMI, FBG, HbA1c, insulin, HOMA-IR and fetuin-A in patients as compared to the healthy controls. When we compared the adiponectin mean value in between controls and pateints, Table 1 shown the low mean value of adiponectin in patients as compared to healthy control. This shown an inverse relationship between Fetuin-A and adiponectin (P< 0.001). Fetuin-A is positively correlated with BMI, FBG, HbA1c, Insulin level and HOMA-IR. Adiponectin is negatively correlated with BMI, FBG, HbA1c, Insulin level and HOMA-IR. High fetuin –A level in obese type 2 diabetes as compared to healthy controls. Low adiponectin level is observed in type 2 diabetes as compared to healthy.

4. Discussion

This was a analytic cross-sectional study that compare fasting blood glucose, HbA1c, insulin resistance, fetuin-A and adiponectin in obese type 2 diabetes mellitus and healthy controls. Our study observed that high level of fasting blood glucose, HbA1c, insulin resistance and fetuin-A level in obese type 2 diabetes mellitus as compared to healthy controls. Joachim HI et al (2006), Norbert Stefan et al (2008), Beata Wojtysiak-Duma et al (2010), Ayako Ishibashi et al (2010), Aiyun Song et al (2011), Qi Sun et al (2013), Lamyaa Ismail Ahemed et al (2014), Shatha Rouf Moustafa (2016). They found that insulin resistance plays an important role in obese type 2 diabetes. Insulin resistance is a link between fetuin-A and obese type 2 diabetes.Fetuin-A induced insulin resistance by inhibiting insulin receptor auto phosphorylation in obese type 2 diabetes. Which indicates that fetuin-A correlated with pathophysiology of type 2 diabetes. Thus, measurement of plasma fetuin-A may be particularly important for the evaluation of the individuals with higher risk of type 2 diabetes. Nagwa Abdallah Ismail et al (2012) were evaluated adiponectin and fetuin-A were contrarily related. They found a critical relationship between the them and its possible affiliation with other research facility and clinical variables. They were observed higher serum level of fetuin –A in obese subjects. Our study also observed the low level of adiponectin in obese type 2 diabetes.Panpan Sun et al (2017), Kakali Ghosal et al (2015), Helma Karimi et al (2018) also observed the low level of adiponectin in obese type 2 diabetes mellitus. We also observed low adiponectin level and high level of fetuin A in obese type 2 diabetes. Zhongwei Zhou et al (2020) found the association between adipokine adiponectin and heptokine fetuin-A. They were observed that the serum level of adiponectin and fetuin –A were inversely related due to insulin resistance. Soumik Agarwal et al (2016) were reported that lowering of plasma adiponectin coincided with the higher fetuin-A level in high fat diet induced obese diabetic mice. Zhong-Wei Zhou et al (2017) were compared the serum Fetuin-A level in obese and non-obese subjects with and without type 2 diabetes mellitus. They were concluded that higher serum fetuin-A levels in obese type 2 diabetes as compared to non –obese patients. F.Roshanzamir et al (2018) were investigated mean levels of fetuin-A in obese type 2 diabetes. They found a significant relationship between the fetuin-A level with obese type 2 diabetes risk.

5. Conclusion

Obese type 2 diabetes mellitus increased in all over the world as well as in India. Fetuin-A and adiponectin are

antagonistic linked with each other in obese type 2 diabetes mellitus. However further study is needed to carried out in order to correlate and uncover the mechanism between fetuin-A and adiponectin in obese type 2 diabetes mellitus.

6. Conflict of Interest

There are no conflicts of interest in this article.

7. Source of Funding

None.

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