ORIGINAL ARTICLE

STUDY OF CORRELATION OF SERUM ADIPONECTIN CONCENTRATION WITH DIFFERENT LIPID PROFILE COMPONENTS

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ABSTRACT

Adiponectin is a hormone, secreted from adipose tissue. It is inversely correlated with body fat mass. This hormone has also anti-inflammatory and ant-iatherogenic properties. This study was purposed to explore the relationship between serum adiponectin concentration and lipid profile. This cross-sectional analytical study was carried out in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University (BSMMU) from March 2016 to February 2017. By non-probability sampling, a total of 156 study subjects were selected from apparently healthy adult individuals attending outpatient department of BSMMU. Serum adiponectin level positively correlated with serum HDL cholesterol **(r=0.246, p value 0.002)** concentrations and negatively correlated with serum total cholesterol **(r=-0.171, p value 0.033)** and serum triacylglycerol level **(r=-0.3, p value 0.00)**. So, from this study it can be concluded that adiponectin has an important role in the metabolism of lipid profile components and responsible for controlling the concentration of serum lipid profile components. When adiponectin concentration of blood increases it is responsible for raised serum HDL-C concentration and decreased total cholesterol and triacylglycerol concentration.

Key words: Adiponectin, Total cholesterol (TC), High density lipoprotein (HDL), Very low density lipoprotein (VLDL), Serum lipid profile, Triacylglycerol (TG), Body mass index (BMI)

Introduction

Obesity is becoming a global epidemic in both children and adult. It is associated with numerous complications, such as cardiovascular disease, type 2 diabetes, hypertension, etc. It is a medical condition in which excess body fat accumulates to the extent that it contributes to adipocyte inflammation. This adipocyte inflammation ultimately leads to different metabolic complications like dyslipidemia, type 2 diabetes mellitus and also other co-morbidities. Obesity can be evaluated indirectly by body mass index (BMI), can also be expressed in terms of fat distribution by waist hip ratio, waist circumference[1]. Imbalance of serum lipid profile components are very common in obese individuals, which is known as dyslipidemia[2].

Dyslipidemia is the imbalance of lipids such as cholesterol, low density lipoprotein cholesterol (LDL-C), triglycerides, and high-density lipoprotein Cholesterol (HDL-C) in blood. This condition is not only related to obesity but also can result from improper diet, tobacco exposure, or genetic factors etc, that hamper lipid metabolism or create adipocyte inflammation. Dyslipidemia may cause cardiovascular disease and may also be responsible for different inflammatory and metabolic disorders[3].

Adiponectin which is exclusively produced by adipocyte[4] inhibits hepatic glucose production, enhances glucose uptake in muscle, increases fatty acid oxidation in both liver and muscle to increase energy expenditure in vitro[5]. Adiponectin inhibits macrophage conversion to foam cells and reduces oxidation of LDL-C, that specifically adorn its anti-atherogenic beauty. Adiponectin is a cytokine and is inversely associated with obesity, constitutes 10% of total plasma proteins. Expression of adiponectin receptors (Adipo R1 and Adipo R2) are correlated with insulin sensitivity. In adipocyte inflammation, serum adiponectin concentration may decrease, which ultimately leads to hypertension, heart diseases, type 2 diabetes mellitus and other types of inflammatory disorders[5].

Because of the fundamental role of serum adiponectin level in inflammation and also the importance of dyslipidemia in development of cardiovascular disease, the aim of the study was to evaluate the relationship between the serum adiponectin concentration with the blood lipid profile components. In future, it may help to introduce newer treatment or preventive protocol to improve health and welfare of patients as well.

Materials and Methods

This cross-sectional analytical study wasconducted in the Department of Biochemistry and Molecular Biology, Bangabandhu Sheikh Mujib Medical University (BSMMU) from March 2016 to February 2017. After receiving Institutional Review Board approval from BSMMU, by non-probability sampling, a total of 156 study subjects of both sexes, age range between 20 to 60 years were selected from apparently healthy adult individuals attending outpatient departmentof BSMMU. The subjects with BMI less than 18.5 kg/m^2, pregnancy, previous history of stroke, IHD, chronic liver disease, chronic kidney disease and malignancy were excluded. Initial evaluation was done by history taking. Height and weight were recorded in preformed data sheet.

With all aseptic precautions, fasting blood Samples were collected from each study subject. HDL-C was measured using enzymatic color test (Beckman Coulter Inc.,USA); triglyceride and total cholesterol were measured using enzymatic methods (Beckman Coulter Inc., USA). Low-density lipoprotein (LDL)-cholesterol was calculated using Friedewald's equation in blood Samples with triglycerides below 400 mg/de. Adiponectin concentrations were measured by using ELISA (R & D system, USA). The study subjects were classified differently according to age distribution, sex and concentration of lipid profile components. The statistical analysis was carried out using the software IBM SPSS version 22.0. Quantitative data were expressed as mean. Student t test was performed to compare the concentrations of different lipid profile components between age groups and genders. To see the correlation between adiponectin and lipid profile components, student t test and Pearson's correlation coefficient tests were performed. P value ≤ 0.05 was regarded as significant.

Results

There were significantly raised serum total cholesterol and serum triacylglycerol concentration in higher age group ($\geq$35 years). On the other hand, male subjects had significantly higher serum total cholesterol and triacylglycerol than females but had significantly low serum HDL-cholesterol than female subjects (Table I).

Table II shows the adiponectin concentrations were also compared with different lipid profile components and also with different age groups, BMI and sex. Mean adiponectin concentration was significantly (0.000) decreased in higher BMI (≥25). Mean adiponectin concentrations were also found decreased in higher serum LDL-cholesterol (0.05) and serum triacylglycerol levels (0.004).

To better understand how the adiponectin concentration correlates with the different lipid profile components, Pearsons correlation test was performed (Table III). According to the analysis, serum adiponectin level showed significant negative correlation with serum total cholesterol (r=-0.171; p-value 0.033) and serum triacylglycerol level (r=-0.3; p-value 0.00). Again adiponectin showed a significant positive correlation with serum HDL level (r= 0.246, p value 0.002).

Table I: Comparison of mean of lipid profile components between different age groups and sex

Lipid profile components (mg/dL)	Mean conc. of lipid profile components in different groups (mg/dL)					
	Age groups in years		p-values	Sex		p-values
	20-35 (N=72)	≥ 35 (N=84)		Male (N=72)	Female (N=84)	
Total cholesterol	190.4	207.5	0.05	209.1	190.6	0.042
HDL-cholesterol	38.5	38.9	0.733	35.8	41.2	0.000
LDL-cholesterol	126	130.9	0.364	132.9	124.9	0.128
Triacylglycerol	159.4	190	0.015	203.3	152.3	0.000

HDL-C, high density lipoprotein cholesterol, LDL-C, low density lipoprotein cholesterol. Continuous variables were expressed as mean; student t test was performed to see the level of significance. p-value ≤ 0.05 was regarded as significant.

Table II: Comparison of mean adiponectin levels between subjects of two age groups,between male and female, between normal and overweight subjects and between levels of lipid profile parameters

General parameters		Frequency (N=156)	Adiponectin conc (µg/mL)	pvalues
Age	20-34 years	72	33.9	0.887
	≥ 34 years	84	34.6	
Sex	Male	72	28.7	0.171
	Female	84	39.1	
BMI	25	50	42.5	0.000
	≥ 25	106	30.4	
Total cholesterol	<220 mg/dL	104	36.4	0.282
	≥ 220 mg/dL	84	29.9	
HDL-cholesterol	< 40	85	29.5	0.016
	≥ 40	70	40.3	
LDL-cholesterol	< 130	83	37.5	0.05
	130	73	30.3	
Triacylglycerol	< 150	66	42.57	0.004
	≥ 150	90	28.21	

BMI, body mass index; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol. Continuous variables were expressed as mean; student t-test was performed to see the level of significance. p-value 0.05 was regarded as significant.

Table III: Correlation of adiponectin with different lipid profile components

Adiponectin vs	Pearson's correlation	P-values
Total Cholesterol	-0.171*	0.033
HDL-cholesterol	0.246**	0.002
LDL-cholesterol	-0.110	0.171
Triacylglycerol	-0.300**	0.00

**Correlation is significant at 0.05 level (2-tailed test)*
*** Correlation is significant at 0.01 level (2-tailed test)*

Discussion

This current research was a one-year cross-sectional analysis that was done in Bangabandhu Sheikh Mujib Medical University to scrutinize the relationship between the adiponectin and different lipid profile components.

In this cross-sectional analytical study, almost all lipid profile components showed different values for each age groups and gender. More specifically, total cholesterol and triacylglycerol were significantly raised in older age group whereas serum HDL-C and LDL-C concentrations were found not dependent on age. Again there were significant differences in total cholesterol, LDL-C and HDL-C concentration between male and female. Females showed to have more HDL-C concentration than male. A study conducted by Hardi Darmawan, Irfanuddin in the year 2007, also found the strong association with different lipid profile components with age and sex[7]. But they also mentioned that distribution of different lipid profile components among subjects of different age group and sex also associated with some factors like, obesity, central obesity, sedentary lifestyle. Even Barit LH in 1992, found stronger associations of obesity and blood lipids in men than in women of the same age. They also mentioned that, young obese subjects had hypercholesterolemia than older age groups[8]. So, distribution of lipid profile components among different age groups and sex would depend on life style, body size, body fat distribution and also on eating habits. If these factors are not considered the result would create biasness, which is a limitation of this study.

Adiponectin secreted from adipose tissue has been recognized as key regulators of various metabolic events. In adipocyte inflammation, adiponectin concentration decreases also associated with insulin resistance type 2 DM, dyslipidemia, hypertension[9].

In our study, adiponectin showed significant negative correlation with total cholesterol and triacylglycerol whereas significant positive correlation with HDL-C concentration (Table III).We also found negative correlation between adiponectin and serum LDL-C cholesterol but that was stasistically nonsignificant. Eynattenet al also described positive correlation between adiponectin and HDL-C and inverse relationship with TG and TC/HDL ratio[10]. On the other hand Wagner et al and Galoneze et al also found direct association of adiponectin with HDL-C and negative correlation with triacylglycerol[11,12]. They also mentioned that, serum adiponectin concentration correlates with HDL-C, independent of BMI and insulin resistance. Adiponectin increases the activity of peroxisome proliferation activated receptor α ligand (PPARα) in both skeletal muscle and liver[12]. Adiponectin is also an important factor for catabolism of Apo A_1 regardless of insulin sensitivity. So adiponectin regulates HDL-C concentration by decreasing both HDL-C catabolism and hepatic lipase activity[10]. Adiponectin also reduces triacylglycerol storage in skeletal muscle by increasing fatty acid oxidation through AMP kinase activity[13]. Even elevation of adiponectin R2 receptor is also associated with decreasing VLDL cholesterol and triacylglycerol levels. Some studies showed that accumulation of triacylglycerol and cholesterol in macrophage foam cells can be lessened by lowering the oxidized LDL and increasing the HDL-cholesterol concentration by increasing expression of adiponectin in macrophage foam cells. Adiponectin also reduces the hepatic secretion of apo B and apo E and controls the lipid metabolism[14]. So, from this study we can say that, adiponectin has an important role in the metabolism of lipid profile components and is responsible for controlling the concentrations of serum lipid profile components.

Limitations of this study is, we have collected our sample from apparently healthy population attending outpatient department of BSMMU. So, the study population does not represent the whole Bangladeshi population. Even sample size is also small and also the history related to life style of the study population was not taken.

Findings of this current research is indicative of positive correlation between adiponectin and serum HDL cholesterol concentration whereas adiponectin showed inverse relationship with total cholesterol and triacylglycerol. When adiponectin concentration of blood increases it is responsible for raised serum HDL-C concentration and decreased total cholesterol and triacylglycerol concentration.

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