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Original Article

The comparison of chemerin, adiponectin and lipid profile indices in obese and non-obese adolescents

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ABSTRACT

Aims: The growing prevalence of obesity and its related metabolic disorders in adolescents shows the necessity of urgent focus on the related factors. Adipocytes secretions and their pro- or anti-inflammatory roles play effective roles in adipocytes metabolism. We assessed the relation between adiponectin, chemerin and lipid profile in hit phase of life.
Methods: This case–control study conducted on 78 adolescent girls, divided based on BMI percentile. Serum chemerin, adiponectin, lipid profile and body fat mass were measured. Data were analyzed using Pearson correlation test. The interactive relation between these variables was assessed using Structural Equation Modeling (SEM). Data were analyzed using SPSS software and AMOS software.
Results: Chemerin were correlated significantly with triglyceride ($r = 0.584$ versus $r = 0.319$), HDL-cholestrol ($r = -0.323$ versus $r = -0.335$), LDL-cholestrol ($r = 0.368$ versus $r = 0.327$) and fat mass ($r = 0.372$ versus $r = 0.357$) in obese versus non-obese girls; while the mentioned correlation were non-significant with total cholesterol in obese group ($r = 0.233$ versus $r = 0.336$). Furthermore, there were significant association between adiponectin and triglyceride ($r = -0.404$ versus $r = -0.317$), HDL-cholesterol ($r = 0.332$ versus $r = 0.316$) and fat mass ($r = -0.529$ versus $r = -0.346$) in obese versus non-obese girls, respectively.
Conclusion: There were positive associations between lipid profile components and serum chemerin levels. Adiponectin levels were in positive correlation with HDL-cholesterol concentrations. Chemerin showed positive correlations with potent health threatening components of lipid profile including triglyceride and cholesterol levels in adolescents.

1. Introduction

Obesity is a pandemic problem which is known as a major cause of several metabolic disorders, including insulin resistance, diabetes mellitus, cardiovascular disorders, hypertension and hyperlipidemia [1]. Unfortunately, the prevalence of obesity and its related diseases are growing, dramatically in adolescents [2]. It is established that probability of obesity in adulthood is much higher in obese adolescents than non-obese adolescents, and this association is more prominent in girl adolescents than boys [3]. Obesity is defined as excess accumulation of white adipose tissue mass. The role of this tissue as energy source and an active endocrine organ can be mediated through its secreted adipokines [1,4,5].

Chemerin is one of the proinflammatory adipokines with autocrine and paracrine roles in cell differentiation and lipolysis [1,6]. These roles are mediated through reducing cyclic adenosine monophosphate (cAMP) accumulation, and stimulating calcium release, in adipocytes. In the other word, chemerin can regulate enzyme functions of lipid metabolism.

Adiponectin as one of the most important serum adipokine with anti-inflammatory and anti-atherogenic roles can suppress adipocytes differentiation [7,8] through enhancing cAMP cell storage and activating phosphorylation reactions [9]. Focus on the relation between these key adipokines and accumulated fat mass, as the major source of obesity can be helpful in order to find practical approach to manage its related outcomes. Some of the previous studies were performed on the association between serum

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adiponectin concentration and lipid profile [10,11], while the interactive relations between serum chemerin levels, adiponectin concentration and these parameters were not assessed in Iranian girl adolescents, previously. The aim of the present study was to assess the relationship between serum chemerin, adiponectin concentrations and lipid profile in obese and non-obese girl adolescents.

2. Methods

This is a case–control study which was conducted between August 2014 and December 2014. The study was approved by Ethic Committee of Tehran University of Medical Science, Tehran, Iran. The informed consents were taken from participants' parents and the adolescents. Seventy eight healthy and non-smoker girl adolescents, between 12 and 18 years old were selected from Sadigheh-Tahereh Hospital, Isfahan, Iran. Subjects were determined based on CDC percentiles of BMI according to age and sex [2,12,13]. Girls with BMI higher than 95th percentile were selected as obese adolescents and non-obese girls were defined as having BMI between 5 and 85th percentile [15]. BMI was calculated via dividing participants' weight by the square of height (kg/m^2) [14]. Their body fat mass was measured by bioelectrical impedance analysis (BioScan 916 Maltron, Rayleigh, UK) [13]. Participants were matched based on sex and age group. The exclusion criteria were defined as having any history of chronic, inflammatory, infective, metabolic or endocrine disorders, or taking any medications or supplements during the last year.

Body weight was measured using Seca scale (Seca Model 770, Hamburg, Germany) with 0.1 kg accuracy, in barefoot and light dress. Height was assessed using calibrated Seca meter to the nearest 0.1 centimeter, without shoes and in standard position [2]. Adolescents pubertal stage was assessed according to the standard Tanner stage criteria [14,16]. All of the measurements were performed, by general physicians and informed experts.

Blood samples were collected, after 10 h of overnight fast, from the antecubital venous, between 08:00 and 09:30 a.m. The subjects were advised to relax for 30 min before sampling, and blood samples were taken in sitting position and according to standard protocol. Blood samples were centrifuged for 15 min at $4500 \times g$ within 30 min of collection, and samples were frozen at $-70\,^{\circ}C$ [17]. Serum chemerin concentrations were measured using an enzyme-linked immunosorbent assay (ELISA) [BioVendor Research and Diagnostic Products, Inc., Modrice, Czech Republic]. The detection limit of this kit was 0.13 μg/l, and its intra-assay and inter-assay coefficient variation (CV) were 7% and 6.9%, respectively [18,19]. Serum adiponectin was measured using ELISA method, Orgenium Laboratories, Inc. (AviBion Human Adiponectin), Acrp30 (ELISA Kit, Helsinki, Finland) and the intra- and inter-assay CVs were ≤10% and ≤12%, respectively [14]. LDL-cholestrol and HDL-cholestrol, triglyceride and total cholestrol levels were assessed using enzymatic kits (Pars Azmoon Inc, Tehran, Iran). Measurements were done using a calibrated Selectra autoanalyzer; and its intra- and inter-assay variability was lower than 2%.

3. Statistical analyses

Quantitative variables were shown in mean and standard deviation. Normality of variables distribution was checked, using Kolmogrov–Smirnov test. These variables were compared using independent student's *t*-test. The homogeneity of variances between two groups was checked, using Leven test. Pearson correlation test was used to assess the bivariate association of the variables values. Structural Equation Modeling (SEM) was performed to assess the direct, indirect and total effects of chemerin, adiponectin, and lipid profile parameters. Goodness of model fit was checked, via comparative fit index (CFI) and normed fit index (NFI). Fit indices between 0.90 and 1.0 were defined as appropriate model fitness. Root mean square error of approximation (RMSEA) lower than 0.05 was defined as acceptable value. Data were analyzed using SPSS software (version15.0) (SPSS Inc Chicago, IL) and AMOS software (version 16) (ADC, Chicago, IL). *P* value < 0.05 was set as a significant threshold.

4. Results

Clinical and metabolic characteristics of obese and non-obese girl adolescents were shown in Table 1. All of the participants were in post-pubertal stage (stage V). There was a positive association between chemerin concentrations and body fat mass in obese and non-obese girls (*P* value < 0.05). The correlation between adiponectin levels and body fat mass was negative in both groups ($P < 0.05$). There was a positive correlation between serum chemerin and triglyceride levels, in obese and non-obese adolescents. Adiponectin levels showed a negative correlation with serum triglyceride levels in non-obese girl ($P < 0.05$). Serum triglyceride levels were higher in obese girls than the other adolescent group ($P < 0.05$). We also observed a negative correlation between chemerin concentration and HDL-cholestrol levels, in obese and non-obese girl adolescents. The correlation between adiponectin levels and serum HDL-cholestrol was positive in both groups ($P < 0.05$). The correlation between chemerin concentrations and LDL-cholesterol levels were positive in obese and non-obese girls. The adiponectin concentrations showed a significant negative correlation with serum LDL-cholesterol, in non-obese girls. LDL-cholesterol levels were higher in obese adolescents than non-obese group ($P < 0.05$).

Serum adiponectin levels showed negative correlation with total cholesterol levels in non-obese girl adolescent. The correlation coefficients of chemerin and adiponectin concentrations with anthropometric and biochemical values are shown in Tables 2 and 3, respectively. Chemerin concentrations showed direct relation with BFM, LDL and TG levels. However, adiponectin reflected negative relation with these mentioned variables. Estimated values for the standardized regression weights of the relations between chemerin, and adiponectin levels with BFM, and several lipid profile parameters are presented in Table 4. Final saturated fit model indices were in acceptable ranges, it reflected that there were positive total effects between chemerin and BFM, TG, and LDL-cholesterol levels. However, there were negative total effects between adiponectin and BFM, TG, LDL-cholesterol.

Table 1
Clinical and metabolic characteristics of obese and non-obese girl adolescents.

Variables	Groups		*P* value
	Obese adolescents $n = 38$	Non-obese adolescents $n = 41$	
Age (year)	13.9 ± 1.8	14.63 ± 2.22	0.107
Body fat mass (kg)	27.25 ± 4.08	11.84 ± 3.24	<0.001*
TG (mg/dl)	121.97 ± 33.72	82.56 ± 19.60	<0.001*
Total cholesterol (mg /dl)	161.60 ± 16.22	156.18 ± 21.14	0.201
HDL-cholesterol (mg /dl)	59.38 ± 8.73	58.64 ± 6.32	0.670
LDL-cholesterol (mg /dl)	86.90 ± 8.09	76.91 ± 14.77	<0.001*
Adiponectin (μg/ml)	4.79 ± 0.95	5.20 ± 0.54	0.023*
Chemerin (μg /L)	443.14 ± 47.37	408.06 ± 66.45	0.008*

Results are presented as mean ± standard deviation.
Abbreviations: TG: triglyceride; HDL: high density lipoprotein; LDL: low density lipoprotein.
* Statistically significant differences between variables in obese and non-obese participants in *P* value <0.05. The comparisons were performed using independent student's *t*-test