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Adiponectin levels and insulin resistance in Adolescents in India (Tamil Nadu)

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Abstract

There are few reports on the effects of ethnicity or gender (Male and Female) in the association between adiponectin and insulin resistance in adolescents of different ages. This study assessed associations between serum concentrations of adiponectin and parameters of insulin resistance in adolescents from 4 different Districts. A total of 65 adolescents were analyzed in this study; each was from one of 4 different Districts in Tamil Nadu State (Namakkal, Salem, Karur and Trichy in India)

Results

Adiponectin was higher in female than in male. Generally, adiponectin was lower in Asian as compared to Italian and American adolescents. These tendencies remained even after adjustment for body mass index (BMI) or waist circumstance (WC). Among adolescents, resistin was higher in female than in male. Significant correlations by non-parametric univariate correlation coefficients were found between adiponectin and homeostasis model assessment of insulin resistance (HOMA-IR), and fasting serum insulin levels in young Namakkal, Salem and Trichy female ($p < 0.01$, $p < 0.05$, $p < 0.05$, respectively). Correlations between serum adiponectin and HOMA-IR were also found among older male Salem, Namakkal and Karur ($p < 0.05$, $p < 0.01$, $p < 0.01$, respectively). In multiple regression analysis by forced entry method, adiponectin correlated with HOMA-IR in Namakkal and Salem male, and in all older female regardless of state of origin. There was no correlation between resistin and markers of insulin resistance in adolescents from any of the states.

Conclusions

We conclude that serum adiponectin concentrations are lower in Namakkal as compared to Salem and Karur adolescents and that adiponectin but not resistin contributes to differences in markers for insulin resistance in adolescents from different populations.

Keywords: Adiponectin, Resistin, Insulin resistance metabolic syndrome.

Introduction

Worldwide, there is an increase in the prevalence of obesity, insulin resistance, and metabolic syndrome among children, particularly within Asian countries [5]. As these children mature into adults, this raises concerns regarding their future risk of insulin resistance, type 2 diabetes, and cardiovascular diseases (CVD). Although obesity is a risk factor for insulin resistance and type 2 diabetes, not all obese people are insulin resistant and individuals have varying levels of insulin resistance for the same level of obesity [6].

It has been shown that the adipocytokines, adiponectin and resistin, can be predictors of all-cause mortality in diabetics especially after myocardial infarction [7,8]. Adiponectin has an important role in the development of metabolic syndrome [9,10]. Nishimura et al. [11] showed that adiponectin concentrations were lower in obese children and adolescents and significantly associated with higher body mass index (BMI) in children. Winer et al. [12] reported that adiponectin in obese children was strongly associated with markers of insulin resistance and of inflammation such as C-reactive protein, but this latter association was independent of insulin resistance.

Adiponectin is an adipocytokine that is closely associated with insulin resistance. Generally, insulin resistance is associated with lower serum adiponectin concentrations [1], and many studies have shown the strong inverse associations between adiponectin and insulin resistance or metabolic syndrome [2-4]. However, these findings stem from adolescents obesity-related studies, and there are no or few comparable international studies that show relationships between adipocytokines and insulin resistance in adolescents. The aim of our population-based comparison study was to investigate the potential associations between insulin resistance and serum concentrations of adiponectin and resistin, in young and older adolescents from 4 districts: Namakkal, Karur, Salem, and the Trichy. Our data indicates that adiponectin and resistin vary by age, gender, and country of origin. We also found significant correlations between adiponectin levels and markers of insulin resistance. Although, we hypothesized that older Indian adolescents would have higher insulin resistance, lower adiponectin, and higher resistin compared to District wise and our data did not confirm our initial hypothesis. Rather, our data indicates that female compared to male have lower adiponectin and higher resistant. The lower levels of serum adiponectin concentrations that we found in Namakkal children could contribute to differences in expression of metabolic syndrome and its associated risk factors in Salem vs Karur and Trichy children.

The aim of our population-based comparison study was to investigate the potential association between insulin resistance and adiponectin and resistant, in young and older adolescents from 4 districts in Tamil Nadu (India).Our hypotheses were that adiponectin and resistin concentrations would vary by age, BMI, gender, and country of origin. Specifically, because of higher predicted prevalence of overweight and obesity and higher insulin resistance, we hypothesized that Salem and Namakkal adolescents would have higher BMIs, lower adiponectin, and higher resistin compared to Karur and Trichy adolescents.

DATA

A total of 65 healthy adolescents from India with special reference from Tamil Nadu were enrolled in this study. Adolescents were assigned to 1 of 2 groups according to their sex (group 1 for male and 2 for female).

We used waist circumstances (WC), systolic and diastolic blood pressure (BP), triglyceride (TG) and high-density lipoprotein-cholesterol (HDL-C) and fasting plasma glucose as the parameters of metabolic syndrome in adolescent and fasting serum insulin levels and HOMA-IR as the parameters of insulin resistance. Risk factors associated with the metabolic syndrome followed criteria of the International Diabetes Federation (IDF). In Italy, BMI was used rather than the data of WC because of lack of data on WC.

Anthropometric parameters included height, body weight, WC, BMI and BMI Z-scores were calculated in all countries. Height was measured using a portable standiometer in India. In India, height was measured to the nearest 0.5 cm on a standardized height board. In the Tamil Nadu, height was measured using a rigid standiometer to the nearest centimeter.

We collected fasting blood samples after an overnight fast of more than 10 hours. Samples were separated into serum and/or plasma and were frozen. Samples from all districts were sent on dry ice and analyzed by the same methodologies in one laboratory at Chellam Clinic Labs, Paramathi Velur, Namakkal, Tamilnadu, India.

Statistical analysis

Data are presented as means ± standard error (SE). Analysis of variance (ANOVA) was used to compare concentrations of adipocytokine among adolescent from different districts. Student's *t*-tests were used to compare adipocytokines between male and female children and between Group 1 and Group 2. Non-parametric univariate correlation coefficients and Spearman's rank correlation coefficients were used to ascertain relationships between adiponectin, resisting, and other parameters. Multiple regression analyses were performed with fasting serum insulin levels or HOMA-IR as the dependent and serum adiponectin, resistin, and other factors of metabolic syndrome as independent variables with forced entry approaches. Differences were considered statistically significant at $p < 0.05$.

Results and Conclusion

The baseline clinical characteristics of the children from all 4 districts, including anthropometric parameters, BP, insulin resistance, and lipid and adipocytokine levels for male and female are shown in Tables 1 and 2 respectively. As shown in the table differences in anthropometrics, BP, and lipid levels were found among the groups in the different districts. Across all age groups and genders, Namakkal adolescents had higher weights, systolic/diastolic BPs, higher triglycerides, and lower HDL levels when compared to adolescents from the other districts ($p < 0.05$).

Table 1 : Multiple linear regression analysis of the selected variables with adiponectin as a dependent variable for both the gender

Model 1	Standardized Coefficients	Male			Female		
		Beta	t value	p value	Beta	t value	p value
1	Age	.024	.196	.847	.099	.316	.759
2	Fasting Plasma Glucose	-.275	-.423	.677	1.819	.415	.688
3	Post prandial blood glucose	-	-	-	-.690	-.727	.486
4	Fasting Insulin	-.026	-.043	.967	-	-	-
5	Total Cholesterol	-1.370	-1.729	.101	.766	.680	.514
6	HDL	-.251	-.898	.381	.334	.379	.714
7	Triglycerides	-.028	-.098	.923	.202	.454	.661
8	LDL	2.367	2.545	.020	-.856	-.596	.566
9	VLDL	.682	1.656	.115	-.072	-.132	.898
10	TC - HDL	-.360	-.682	.504	.466	.378	.714
11	LDL - HDL	-1.116	-2.089	.051	-.097	-.045	.965
12	BMI	-.576	-3.710	.002	-.368	-1.145	.282
13	Waist Circumference	-.071	-.500	.623	-.156	-.334	.746
14	Leptin	1.256	7.342	.000	.563	1.452	.181
15	Homa - IR	.262	.298	.769	-.857	-.138	.893
16	QUICKI	-.213	-.408	.688	.581	.517	.617
17	SGOT	.105	.308	.762	-.211	-.376	.716
18	SGPT	.109	.307	.762	-.206	-.420	.685
19	Hb1AC	.001	.004	.997	.544	.344	.739

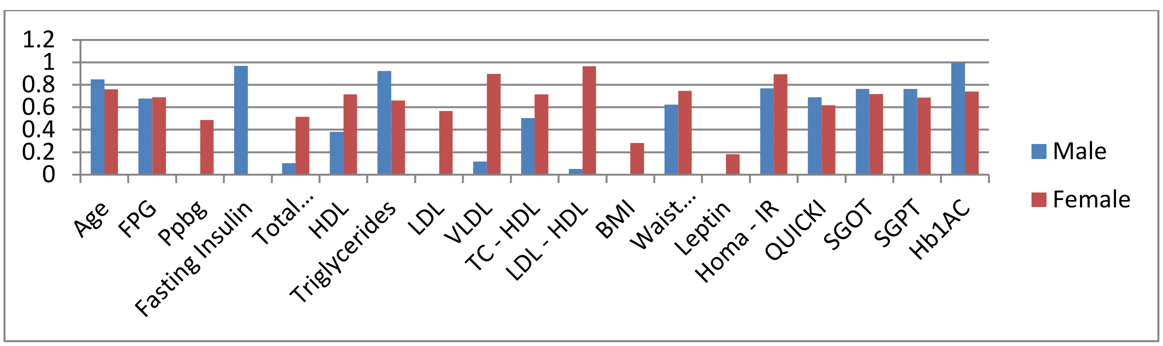

Figure 1: **Comparison selected variables with adiponectin as a dependent variable for both the gender**

Table 2: Comparison for students t test and standard error for both gender

	Male			Female			
Parameters	Std. Error	t	Sig	Std. Error	t	Sig	
Age	-	-	-	-	-	-	-
Fasting Plasma Glucose (FPG)	.065	-.423	.677	.327	.415	.688	
Fasting Insulin (FI)	.186	-.043	.967	.044	-.727	.486	

Total Cholesterol (TC)	.066	-1.729	.101	.127	.680	.514	
HDL	.085	-.898	.381	.330	.379	.714	
Triglycerides	.012	-.098	.923	.035	.454	.661	
LDL	.078	2.545	.020	.175	-.596	.566	
VLDL	.100	1.656	.115	.194	-.132	.898	
TC-HDL	1.324	-.682	.504	4.371	.378	.714	
LDL-HDL	1.591	-2.089	.051	10.539	-.045	.965	
Body Mass Index (BMI)	.161	-3.710	.002	.417	-1.145	.282	
Waist Circumference (WC)	.105	-.500	.623	.483	-.334	.746	
Leptin	.063	7.342	.000	.235	1.452	.181	
Homa IR	.255	.298	.769	1.790	-.138	.893	
QUICKI	206.269	-.408	.688	416.931	.517	.617	
SGOT	.141	.308	.762	.230	-.376	.716	
SGPT	.159	.307	.762	.233	-.420	.685	
Hb1AC	.197	.004	.997	13.997	.344	.739	

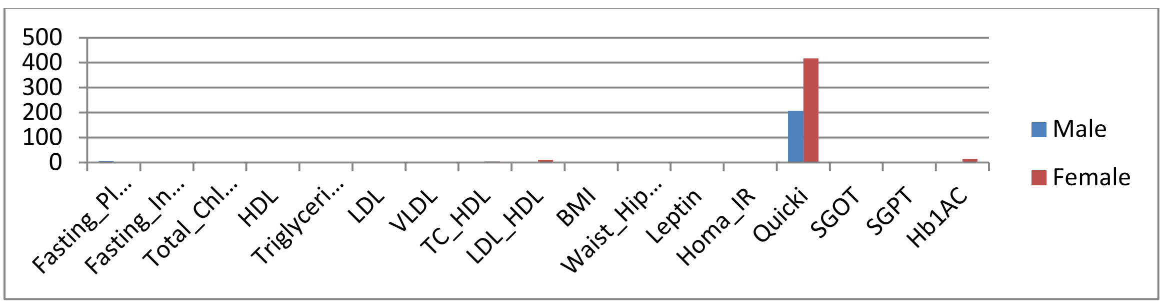

Figure 2: Difference of Standard error in both Genders

The relationship between resistin and insulin resistance has been controversial. In our study, multiple regression analyses showed that resistin was not associated with markers of insulin resistance in adolescents from any of the districts.

We found that serum adiponectin concentrations were or tended to be lower in people from Namakkal than in those from other districts. Furthermore, adiponectin was higher in younger children and female children than in older children and in male children, respectively. We also found an association between adiponectin and insulin resistance among older female children for all districts and in older male children. These findings suggest different roles for adiponectin in insulin resistance in different age, gender, and ethnic/racial groups. In contrast, serum resistin concentration seemed to be higher in People in Tamil Nadu but resistin had no or only weak associations with markers of insulin resistance. While our study is one of the few large international comparative studies demonstrating relationships between adipocytokines and factors associated with insulin resistance, further international comparative studies investigating genetic differences in adipocytokine levels and risk of insulin resistance are needed.

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Abbrevations