

Insulin Resistance, Dyslipidemia, & Inflammation in Adolescents with Elevated Blood Pressure

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Introduction

- Insulin Resistance – an insensitivity of the peripheral tissues (e.g., muscle, liver, adipose tissue) to the effects of insulin.
 - Associated with the incidence of type 2 diabetes and cardiovascular disease (Hanley et al., 2002; Rutter et al., 2005)
- Hyperinsulinemic-euglycemic clamp vs. Homeostasis model assessment of insulin resistance (HOMA – IR)
 - Highly correlated (Conwell et al., 2004; Keskin et al., 2005)
- $HOMA (IR) = [Fasting\ insulin\ (\mu U/ml) \times Fasting\ glucose\ (mmol/l)] / 22.5$

Introduction continued

- Prevalence of insulin resistance is significantly higher among obese adolescents compared to normal-weight adolescents (Lee et al., 2006).
- Elevated levels of triglycerides and low levels of HDL have been associated with insulin resistance (Reaven, 2002).
- Insulin resistance has been associated with interleukin (IL)-6 in obese children and adolescents (Yeste et al., 2007).

Purpose

To examine the relationship between insulin resistance and body size, lipids, and inflammation in adolescents with elevated blood pressure (blood pressure $\geq 90^{\text{th}}$ percentile for age, height, and gender).

Methods

- Participants
 - 141 adolescents, 15-17 years old
 - 107 Boys; 34 Girls
 - 50% Hispanics; 32% Blacks; 10% Whites; and 8% 'Other'
- Procedures
 - Blood pressure measurements
 - Body size measurements
 - Fasting cholesterol, triglycerides, LDL, HDL, IL-6, fibrinogen, insulin, and glucose

Means (SD)

	Schwartz et al., 2014
Parent Education – years	13.2 (2.7)
Systolic Blood Pressure – mm Hg	124.7 (12.2)
Diastolic Blood Pressure – mm Hg	73.3 (11.6)
Body Mass Index – kg/m ²	29.4 (7.4)
Waist circumference - inches	37.1 (7.2)
Cholesterol – mg/dl	162.7 (29.9)
Triglycerides – mg/dl	89.4 (73.4)
HDL – mg/dl	45.5 (9.4)
LDL – mg/dl	100.1 (26.2)
HOMA	2.8 (2.6)
IL-6 – pg/ml	1.7 (1.6)
Fibrinogen – mg/dl	296.5 (108.1)

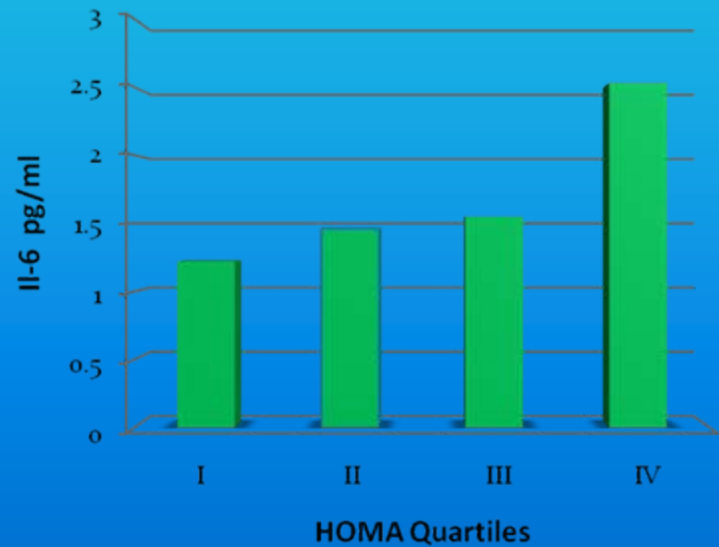
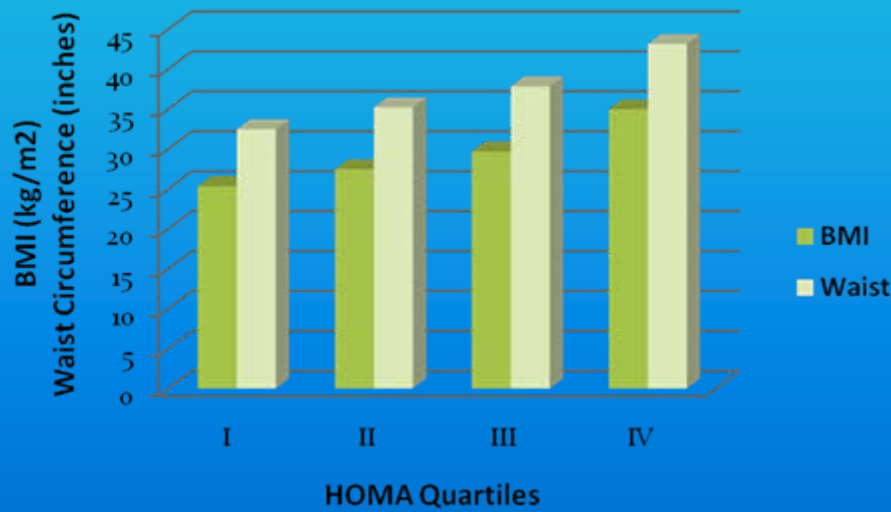
HOMA Quartiles

Insulin resistance was defined as HOMA (IR) value ≥ 3.41 based on the top quartile (Lee et al., 2006)

- I. 0.37 - 1.33
- II. 1.34 - 1.94
- III. 1.95 - 3.40
- IV. 3.41-18.53 (insulin resistant group)

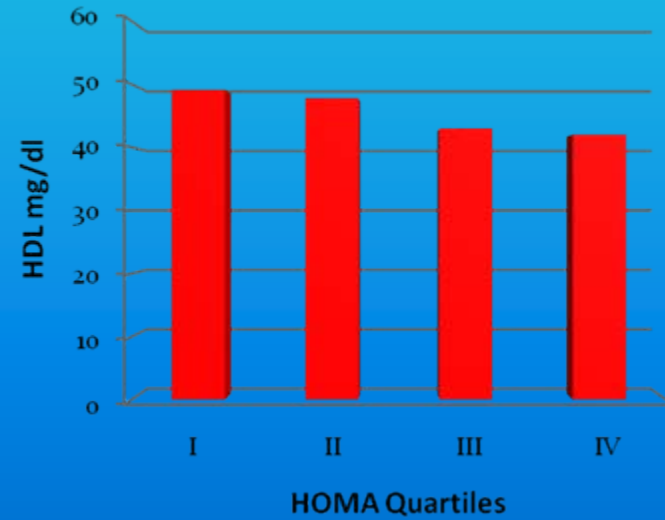
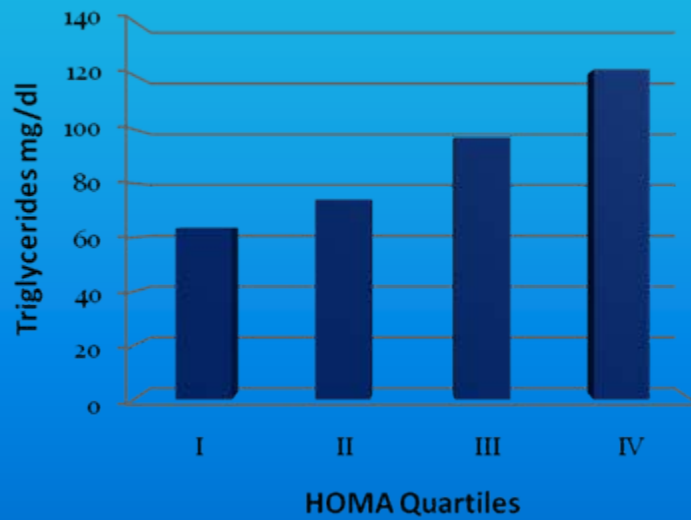
Results

Insulin resistant adolescents had higher IL-6 [F(3) = 4.75, $p < .01$], BMI [F(3) = 14.15, $p < .001$] and waist circumference [F(3) = 18.90, $p < .001$] compared to adolescents in HOMA groups I, II, and III.

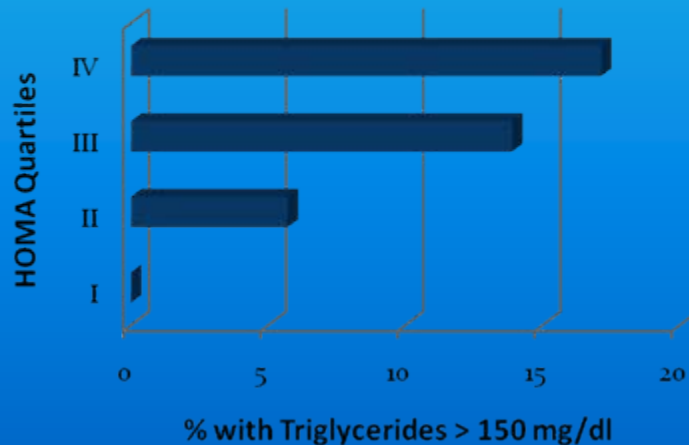
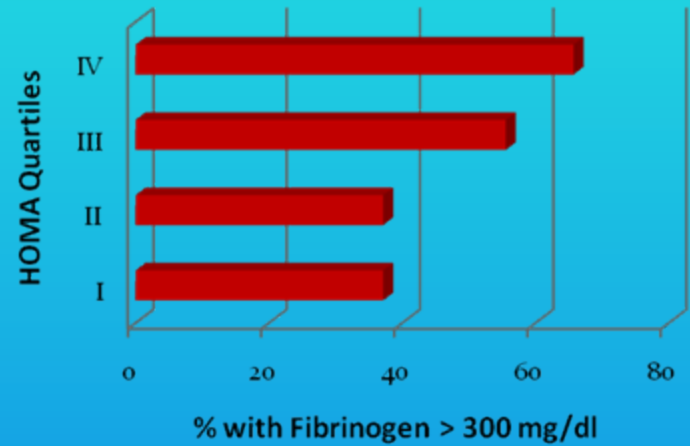
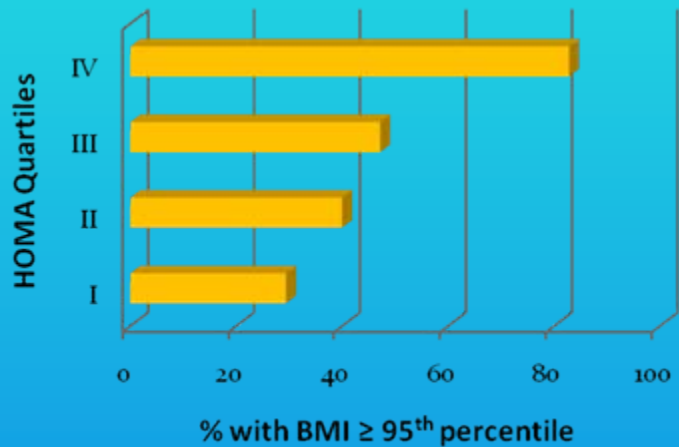


Results

- Insulin resistant adolescents had higher triglycerides [$F(3) = 4.76, p < .01$] and lower HDL [$F(3) = 5.25, p < .01$] compared to groups I and II.



Prevalence of Clinically Significant Risk Factors



Conclusions

- Findings from this study suggest that insulin resistance in adolescents is associated with increased prevalence of clinically significant values for obesity, dyslipidemia, and inflammation.
- Future health interventions should target adolescents with both insulin resistance and elevated blood pressure given the increased risk for cardiovascular disease and diabetes.

Conclusions continued

- Future studies may include using cluster analysis to incorporate behavioral and cognitive components such as cardiorespiratory fitness, physical activity, dietary intake, and perceived stress in order to develop tailored behavioral health interventions.