The Importance of HDL for Identifying Insulin Resistance in Non-Hispanic Black Women: NHANES 1999 -2004

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Abstract

The dyslipidemia of insulin resistance is a combination of high TG (≥150 mg/dL) and low HDL (Men<40, Women<50 mg/dL). However, non-Hispanic blacks (NHB) usually have lower TG and higher HDL levels than non-Hispanic whites (NHW) and Mexican Americans (MA). Our goal was to compare the prevalence of abnormal TG and HDL levels in insulin-resistant NHB, NHW and MA. Participants were 3692 non-diabetic adults from NHANES 1999-2004, age ≥ 20y (mean 46y). The cohort was divided into tertiles of homeostasis model assessment (HOMA). Insulin resistance was defined by the upper tertile of HOMA (≥2.59). Mean TG in NHB, NHW and MA were: 100, 132 and 142 mg/dL respectively. Mean HDL in NHB, NHW and MA were: 54, 51 and 49 mg/dL. All comparisons to NHB were significant, P<.001. The percent of insulin-resistant NHB, NHW and MA men with TG≥150 mg/dL were: 27, 52, 52 (comparisons to NHB were significant, *P*<.001). The percent of insulin-resistant NHB, NHW and MA men with HDL<40mg/dL were: 32, 46, 40 (Comparison of NHB v. NHW, P<0.001, NHB v. MA, P=.11). The percent of insulin resistant women with TG≥150 mg/dL were: 19, 48, 45 and HDL<50 mg/dL were: 49, 64, 65 (See Figure). Therefore, insulin-resistant NHB are more likely than NHW and MA to have normal TG and HDL levels. However, for insulin-resistant NHB women HDL is substantially more likely than TG to be abnormal. When exploring insulin resistance status, particularly in NHB women, it appears that greater consideration should be given to HDL levels than TG.

Introduction

- The dyslipidemia of insulin resistance is a combination of high TG (≥150 mg/dL) and low HDL (Men<40, Women<50 mg/dL).
- However, non-Hispanic blacks usually have lower TG and higher HDL levels than non-Hispanic whites and Mexican Americans.
- Therefore, whether the concept of dyslipidemia of insulin resistance is applicable in non-Hispanic blacks is unknown.

Objective

To compare the prevalence of abnormal TG (≥ 150mg/dL) and HDL (men < 40, women < 50mg/dL) levels in insulin resistant non-Hispanic blacks, non-Hispanic whites and Mexican Americans.

Methods

Participants:
- 3692 non-diabetic adults from NHANES 1999 – 2004

Insulin Resistance Determination:
- The cohort was divided into tertiles of homeostasis model assessment (HOMA)
- HOMA = [Fasting glucose (mmol/L) x Fasting Insulin (μU/mL)]/22.5
- Insulin resistance was defined by the upper tertile of HOMA (>2.59)

Statistical tests:
- One sample t-test
- Chi-square
- All estimates weighted and adjusted for NHANES complex sample design

Results

Table 1: Metabolic Characteristics of Study Population

	Blacks (mean ± SE) n=804	Whites (mean ± SE) n=1973	Hispanics (mean ± SE) n=972	P-value
Age (years)	40.5 ± 0.5	44 ± 0.5	35.8 ± 0.5	a**, b***c***
BMI (kg/m^2)	29.3± 0.3	27.3± 0.2	28.3 ±0.3	a***, b**,c***
Fasting Glucose (mg/dL)	93.1 ± 0.38	95.3 ± 0.3	95.9 ±0.4	a***, b***
Fasting Insulin (uU/mL)	11.7 ± 0.3	10.4 ± 0.3	12.1 ±0.4	a**,c***
HOMA	2.8 ± 0.1	2.5 ± 0.1	2.9 ±0.1	a*,c***
Triglyceride (mg/dL)	98.6 ± 2.8	130. 3 ± 2.0	134.9 ± 3.9	a***, b***
HDL Cholesterol (mg/dL)	53.9 ± 0.6	51 ± 0.5	48.1 ± 0.4	a**, b***c***

[a] Blacks vs. Whites, [b] Blacks vs. Hispanics, [c] Whites vs. Hispanics, * ≤ 0.05, ** ≤ 0.01, *** ≤ 0.001

Table 2A: Men - TG Levels by Ethnicity and Insulin Sensitivity Status

	Insulin Sensitive (HOMA < 2.59)	Insulin Resistant (HOMA ≥ 2.59)	P-value
Blacks	93.3 ± 2.7	132.5 ± 7.7	<0.001
Whites	121.8 ± 3.3	177.1 ± 4.7	<0.001
Hispanics	122.7 ± 4.2	176.8 ± 8	<0.001

Table 2B: Women - TG Levels by Ethnicity and Insulin Sensitivity Status

	Insulin Sensitive (HOMA < 2.59)	Insulin Resistant (HOMA ≥ 2.59)	P-value
Blacks	81 ± 2.3	111.9 ± 5	<0.001
Whites	103.8 ± 1.8	163.2 ± 4	<0.001
Hispanics	120 ± 4.3	152 ± 4.4	<0.001

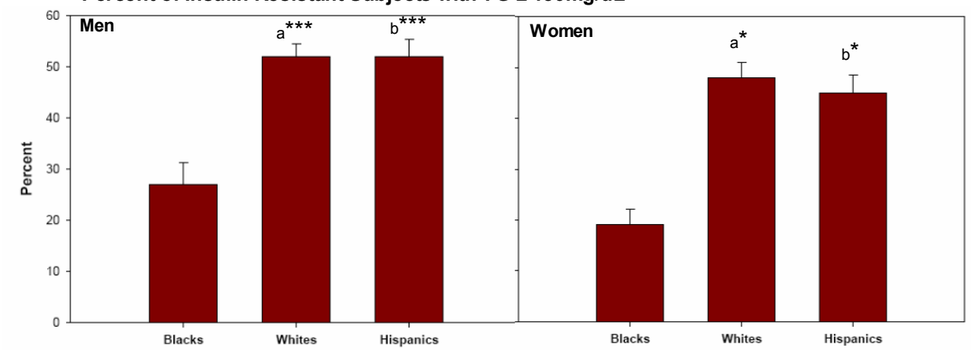
Table 2C: Men – HDL Levels by Ethnicity and Insulin Sensitivity Status

	Insulin Sensitive (HOMA < 2.59)	Insulin Resistant (HOMA ≥ 2.59)	P-value
Blacks	54.9± 0.8	45.3 ± 0.9	<0.001
Whites	49.6 ± 0.6	41.8 ± 0.7	<0.001
Hispanics	48.9± 0.5	43.1 ± 0.6	<0.001

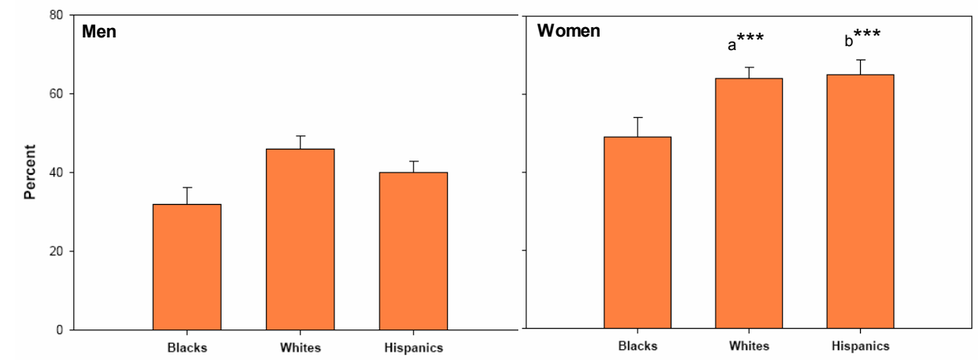
Table 2D: Women - HDL Levels by Ethnicity and Insulin Sensitivity Status

	Insulin Sensitive (HOMA < 2.59)	Insulin Resistant (HOMA ≥ 2.59)	P-value
Blacks	60.6 ± 1	51 ± 1	<0.001
Whites	59.7 ± 0.7	47.2 ± 0.7	<0.001
Hispanics	56 ± 0.7	47.5± 0.7	<0.001

Percent of Insulin Resistant Subjects with TG ≥ 150mg/dL



Percent of Insulin Resistant Subjects with HDL< 40mg/dL(Men) or 50mg/dL(Women)



[a] Blacks vs. Whites, [b] Blacks vs. Hispanics, [c] Whites vs. Hispanics, * ≤ 0.05, ** ≤ 0.01, *** ≤ 0.001

Conclusions

- Insulin resistant non-Hispanic blacks are more likely than non-Hispanic whites and Mexican Americans to have normal TG and HDL levels.
- For insulin resistant non-Hispanic black women, HDL is substantially more likely than TG to be abnormal.
- When exploring insulin resistance status, particularly in non-Hispanic black women, greater consideration should be given to HDL levels than TG.