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Increased Fat and Cholesterol Intake and Relationship to Serum Lipid Levels Among HIV-Infected Patients in the Current Era of HAART

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ABSTRACT*:

Background: Limited information is available on fat and cholesterol intake in HIV-infected patients with metabolic abnormalities. Furthermore, the influence of diet on lipid parameters is unknown in this population. Dietary modification of fat intake may be an important metabolic strategy in HIV-infected patients at risk for cardiovascular disease.

Methods: We evaluated the relationship between macronutrient intake and metabolic parameters in 356 non-wasting, HIV-infected subjects (197 males, 159 females) as well as 162 community-derived controls (73 males, 89 females). HIV-positive and negative subjects who volunteered for metabolic studies between 1998-2005 at MGH were included. Dietary intake was determined from 4-day food records and 24-hour recall. Data were analyzed using fit modeling, controlling for age, race, gender, BMI (body mass index), socioeconomic status, and for study number as random effect.

Results: HIV-infected subjects were similar in age (42 ± 7 vs. 41 ± 10 yrs), race (56.3% vs. 61.1% Caucasian), and gender (55.3% vs. 45.1% male) but demonstrated hypertriglyceridemia (230±241 vs. 130±135 mg/dL, p<0.0001), low HDL levels (41±13 vs. 48±14 mg/dL, p<0.0001), peripheral lipoatrophy (total extremity fat, 8.3±5.2 vs. 12.4±6.2 kg, p=0.0008) and elevated fasting insulin levels (13±12 vs. 12±10 µIU/mL, p=0.03) (HIV vs. controls, respectively).

Assessment of dietary intake in this group of HIV-infected subjects demonstrated increased intake of total dietary fat (p<0.05), saturated fat (p=0.006), and cholesterol (p=0.006) as well as a greater percentage of calories from saturated fat (p=0.002) and from trans fat (p=0.02), despite similar caloric intake to the control subjects. A significantly higher percentage of HIV-infected subjects were above the 2005 USDA Recommended Dietary Guidelines for saturated fat (>10%/day) (76.0% HIV vs. 60.9% controls, p=0.003), and cholesterol (> 300 mg/day) (49.7% HIV vs. 37.9% controls, p=0.04). Saturated fat intake was strongly associated with triglyceride level [triglyceride level increased 8.7 mg/dL (parameter estimate) per gram of increased saturated fat intake, p=0.005] while total fat was inversely associated with triglyceride level [triglyceride level decreased 3.0 mg/dL (parameter estimate) per gram of increased total fat intake, p=0.02] among HIV-infected subjects.

Table 1: Demographics in HIV-Infected and Non-HIV-Infected Subjects

Variable	Means and Standard Deviations		P- value	P Value adjusted
	HIV+ (N=356)	Control (N=162)		
Demographics				
Age (y)	42±7	41±10	1.0	-
Gender (%)			1.0	-
Male	55.3	45.1		
Female	44.7	54.9		
Race (%)			0.53	-
Caucasian	56.3	61.1		
African American	28.4	25.3		
Hispanic	9.9	7.4		
Other	5.4	6.2		
% Individuals in Each Income Quartile based on Zipcode			0.45	-
1st	49.1	31.6		
2nd	22.8	30.3		
3rd	20.4	23.9		
4th	7.7	14.2		
% Having Private Insurance	20.7	31.9	0.0001	-
% Taking Lipid Lowering Drugs	12.1	9.9	0.18	-
HIV Parameters				
CD4 (#/mm^3)	444±254	871±286	<0.0001	<0.0001
Viral Load (copies/mL)	400 (50,5744)	-	-	-
Duration HIV (years)	8.5±4.8	-	-	-
Currently taking PI (%)	66.8	-	-	-
Currently taking NRTI (%)	93.2	-	-	-
Currently taking NNRTI (%)	37.5	-	-	-
% Currently not taking Antiretrovirals	11.2	-	-	-

Table 2: Dietary Intake in HIV-infected and Non-HIV-Infected Subjects

Variable	Means and Standard Deviations		P value	P value Adjusted
	HIV (N=356)	Control (N=162)		
Total Calories (kcal/d)	2235±798	2065±725	0.08	0.29
Carbohydrate (g/d)	273±107	249±93	0.31	0.92
Protein (g/d)	91±37	86±35	0.08	0.27
Fat (g/d)	87±37	79±37	0.02	0.048
Saturated Fat (g/d)	31±15	27±15	0.004	0.006
Monounsaturated Fat (g/d)	33±14	30±16	0.04	0.08
Polyunsaturated Fat (g/d)	17±8	16±8	0.36	0.67
Trans fat (g/d)	5±3	4±3	0.09	0.05
Cholesterol (mg/d)	342±187	294±209	0.004	0.006
Total Fiber (g/d)	17±9	18±9	0.09	0.03
Alcohol (g/d)	3±8	7±18	0.02	0.005

Figure 1: Percentage of Total Calories from Fat Components

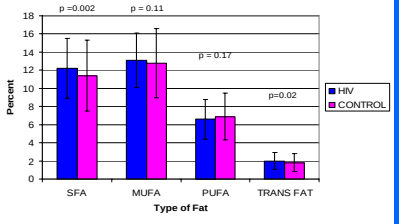

Figure 2: Percentage of Individuals Exceeding the 2005 USDA Recommended Dietary Guidelines

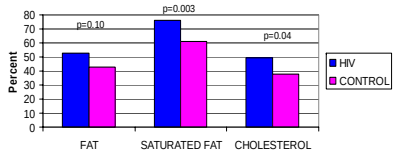

Table 3: Multiple Regression Modeling For the Relationship of Dietary Fat Intake to Serum Lipid Levels in HIV-Infected Individuals

Triglyceride (mg/dL)			HDL (mg/dL)			Cholesterol (mg/dL)		
Variable	Estimate	P value	Variable	Estimate	P value	Variable	Estimate	P value
Saturated Fat (g/d)	8.7	0.005	Age (yrs)	0.3	0.008	BMI (kg/m^2)	1.7	0.007
Total Fat (g/d)	-3.0	0.02	Gender (Male vs. Female)	-4.2	<0.0001	Gender (Male vs. Female)	7.6	0.04
Gender (Male vs. Female)	54.6	0.001	Race (Caucasian vs. Other)	-3.1	0.04			
			No Diabetes vs. Diabetes	3.3	0.02			
			Alcohol (g/d)	0.2	0.02			

Table 4: Body Composition, Energy, and Metabolic Parameters in HIV-Infected and Non-HIV-Infected Subjects

Variable	Means and Standard Deviations		P-value	P Value adjusted
	HIV+ (N=356)	Control (N=162)		
Body Composition and Energy Parameters				
BMI (kg/m^2)	26.8±5.2	28.7±7.1	0.86	0.80
Waist (cm)	94.7±12.8	96.9±18.3	0.15	0.52
Hip (cm)	99.8±11.4	107.4±14.4	0.02	0.02
Waist-to-Hip Ratio	0.95±0.07	0.90±0.08	<0.0001	<0.0001
CT SAT (cm^2)	225.5±149.2	320.1±190.2	0.05	0.07
CT VAT (cm^2)	125.4±69.0	131.0±86.4	0.04	0.24
CT VAT:SAT	0.82±0.84	0.43±0.23	0.001	0.002
Total Fat (kg)	20.4±10.0	26.1±13.5	0.08	0.13
Total Lean (kg)	55.7±11.1	55.0±13.3	0.06	0.40
Total Extremity Fat (kg)	8.3±5.2	12.4±6.2	0.0001	0.0008
Trunk: Total Extremity Fat	1.5±0.6	1.0±0.4	<0.0001	<0.0001
REE (kcal/d)	1730±363	1705±480	<0.0001	<0.0001
REE/Fat Free Mass (kcal/kg/d)	31.8±4.1	29.8±3.6	<0.0001	<0.0001
RQ	0.83±0.08	0.85±0.09	0.21	0.02
Metabolic Parameters				
Total Cholesterol (mg/dL)	196±52	178±37	0.07	0.003
Triglycerides (mg/dL)	230±241	130±135	0.001	<0.0001
HDL (mg/dL)	41±13	48±14	<0.0001	<0.0001
Fasting Glucose (mg/dL)	90±13	89±14	0.19	0.44
Glucose AUC (mg/dL x 120 min)	16980±3855	15224±3468	0.05	0.02
Fasting Insulin (µIU/mL)	13±12	12±10	0.03	0.03
% Meeting Criteria for Metabolic Syndrome	32.3	22.1	0.005	0.02

Conclusions: Increased intake of saturated fat is seen and contributes to hypertriglyceridemia among HIV-infected patients who have developed metabolic abnormalities. Increased saturated fat intake should be targeted for dietary modification in this population.

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* Data on poster have been updated since original abstract submission