



Lean versus obese diabetes mellitus patients in the United States minority population



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ABSTRACT

Objective: To identify special characteristics in large group of lean diabetes minority patients in comparison to obese type 2 diabetes.

Methods: 1784 lean (BMI <25) diabetes patients were identified and compared with 8630 obese (BMI ≥30) patients. Patients with Type 1 Diabetes (N = 523) were excluded. Patient data, including demographics, psychosocial factors, insulin use, and complications was analyzed.

Results: In lean compared to obese, there was male predominance (62% vs 48%, $p < 0.001$), higher prevalence of insulin use (49% vs 44%, $p = 0.001$), lower TG/HDL (2.28 vs 3.4, $p < 0.001$), and higher prevalence of alcoholism (5.7% vs 2.4%, $p < 0.001$) and pancreatitis (3.6% vs 0.9%, $p < 0.001$). In both groups, African Americans and Latinos were the prevalent ethnicities (38%, 34% vs. 53%, 31%).

When comparing patients within the lean group who were on insulin (49%) to those on oral medications, there were more males (65% vs. 59%, $p < 0.001$), earlier age of onset (40 ± 14 vs. 47 ± 12 , $p < 0.001$), lower BMI (22.1 ± 2 vs. 22.6 ± 1.7 , $p < 0.001$) and lower TG/HDL (2.18 vs. 2.42, $p = 0.021$).

Conclusions: A subset of diabetes patients in the United States minority population are lean and may have rapid beta cell failure. The etiology is not clear and acquired factors, genetics, and autoimmunity may be contributory.

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1. Introduction

The worldwide prevalence of diabetes has risen drastically over the past two decades, from an estimated 30 million cases in 1985 to 177 million in 2000. Based upon current trends, greater than 360 million individuals will have diabetes by the year 2030 (Powers, 2010). This worldwide explosion of diabetes has been attributed to the increased prevalence of obesity. However, the contribution of nontraditional forms of diabetes to the increased prevalence of diabetes has not been addressed.

We discovered at the Cook County Diabetes Center (CCDC), a large diabetes center serving an uninsured and underinsured minority population in Chicago, that 13% of 18,000 patients with diabetes mellitus are lean (BMI <25 but >17). An internet search did not identify any publications addressing this phenomenon in lean, minority patients in the United States. To determine if these lean

diabetes patients have special clinical and pathophysiological characteristics, we compared them to obese diabetes patients after excluding the type 1 diabetes patients.

2. Methods

2.1. Design and Study Population

1784 lean (BMI <25 but >17) diabetes patients were identified and compared with 8630 obese (BMI ≥30) diabetes patients. Data was obtained from the database of the CCDC. The database was initiated in the year 2000 and consists of ~18,000 patients for a total of 90,000 visits. The data from individual patient visits was recorded then electronically extracted and transferred to SPSS (Statistical Package for the Social Sciences) for statistical analysis. Patient data at presentation, including demographics, psychosocial factors, insulin use, and complications was analyzed. For patients in whom viable follow-up data were available, longitudinal analysis was performed.

Patients were divided into two groups based upon available BMI: Lean diabetes group: BMI <25 but >17 and obese diabetes group: ≥30. Patients with an intermediate BMI of 25 to 29 were excluded to allow creation of two study groups with distinct BMI differences.

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Patients with Type 1 Diabetes (N = 523) were excluded. Patients were classified as having Type 1 diabetes by their endocrinologists if they had the combination of laboratory presence of islet cell antibodies and/or clinical characteristics of young age at diagnosis, lean body mass, history of diabetic ketoacidosis, and insulin dependence at diagnosis. The presence of autoimmunity in the lean group was evaluated by reviewing the clinical charts of the lean patients for the presence of anti-islet cell antibodies including GAD-65 and IA-2.

2.2. Statistical Analysis

All analyses were performed with SPSS 21.0. (SPSS Inc., Chicago, IL). Baseline characteristics are presented as means $\pm$ SD for

normally distributed values and by medians. Comparisons between groups were made using t-tests. For non-parametric data, the Mann-Whitney test was used. Chi-square was used for analysis of categorical variables. For multivariate analysis, binary logistic regression was used.

3. Results

3.1. Patient Characteristics in the Lean vs Obese (Table 1)

The average BMI was 22.4 ± 1.8 in the lean group compared to 37.4 ± 6.9 in the obese group (p-value <0.001). The mean waist circumference (available in half the study group proportionately) was 85.5 cm in the lean and 114.5 cm for the obese. Within the lean, the

Table 1
Lean versus Obese Diabetes Patients.

	Lean	Obese	P value
N	1784	8630	
BMI (median) ^a	23	35.6	P < 0.001
	22.4 ± 1.8	37.4 ± 6.9	
Waist circumference (median in cm) ^a	85.5	114.5	P < 0.001 ^{f,g}
Males/Females	86.6/85.6	116.5/114.4	
Central obesity (%) ^b			
Males (>102 cm)/Females (>88cm)	3.1/37.1	82.7/98.2	P < 0.001 ^{f,g}
Male/Female % ^b	62/38	48/52	P < 0.001
Age at Diagnosis (y)	43.6 ± 13.6	43.6 ± 12.2	NS
Age at Presentation (y) ^c	50.4 ± 12.9	49.1 ± 11.8	P < 0.001
Duration of DM at presentation			
Median (y) ^a	4	3	P < 0.001
% diagnosed within 1 year ^a	30	34	
AA/Latino/Asian/Other (%) ^b	38/34/17/11	53/31/4/12	P < 0.001
DM in first degree relatives (%) ^b	56	62	P < 0.001
3 or more 1st degree relatives (%)	1.2	1.3	NS
Insulin Use (%) ^b	49	44	P = 0.001
Insulin Use (%) in patients diagnosed within 1 year ^b	35%	25.8	P = 0.001
Insulin daily dose in units (median) ^a	38	57	P < 0.001
Insulin daily dose per kg (units/kg) ^c	0.6 ± 0.37	0.57 ± 0.43	NS
TG/HDL ratio (median) ^a	2.28	3.4	P < 0.001
SBP/DBP (mmHg) ^c	$129 \pm 23/74 \pm 12$	$137 \pm 22/76 \pm 12$	P < 0.001
A1C at presentation (%) ^c	10.6 ± 2.9	9.9 ± 2.5	P < 0.001
Complications of DM ^b			
Microvascular ^b			
Retinopathy (%)	21.4	18.8	NS
Neuropathy (%)	29.4	28.7	NS
Foot lesions (%)	21.3	20.7	NS
Albuminuria (%)	38	35	NS
Macrovascular ^b			
Peripheral vascular disease (%)	5.6	6.4	NS
Coronary Heart Disease (%)	8.5	11.9	P < 0.001
Stroke	2.5	2.7	NS
Social Factors ^b			
Current Smoking%	30.5	22	P < 0.001 ^{d,e,f,g}
Males/females %	28.8/16.4	21.4/13.6	
Alcohol%	5.7	2.4	P < 0.001 ^{d,e,f}
Males/females %	8.4/1.7	4.2/1.0	NS ^g
Drugs%	3.3	2.6	NS ^{d,f,g}
Males/females %	3.9/2.3	3.8/1.7	P < 0.001 ^e
Depression%	4.6	7.1	P < 0.001 ^e
Males/females %	4.2/5.9	5.5/8.8	NS ^{d,f}
History of Pancreatitis % ^b	3.6	0.9	P = 0.014 ^g
Males/females %	4.5/2	1.3/0.6	P < 0.001 ^f
			P < 0.007 ^d
			P < 0.002 ^e
			p = 0.001 ^g

Data are % or means $\pm$ SD.

^a Mann-Whitney analysis (nonparametric).

^b Pearson's Chi-Square (categorical variables).

^c Two sample t test (normally distributed).

^d Comparison of males vs females in lean group (Chi-Square).

^e Comparison of males vs females in obese group (Chi-Square).

^f Comparison of lean males vs obese males (Chi-Square).

^g Comparison of lean females vs obese females (Chi-Square).

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