
Diabetes, Obesity and Non-Optimum Blood Pressure Levels in a Group of Employees of the University of Puerto Rico, Medical Sciences Campus, 2003

ORVILLE M. DISDIER-FLORES, MS; LUIS A. RODRÍGUEZ-LUGO, MS

Objective. To estimate the proportion of diabetes, obesity and non-optimum blood pressure levels in a group of employees of the University of Puerto Rico Medical Sciences Campus that participated in a diabetes health fair at the "Centro de Diabetes para Puerto Rico".

Methods. A total of 113 participants of the diabetes health fair completed a questionnaire to obtain demographic characteristics and the frequency of self-reported diabetes. The nursing staff examined the participants in order to obtain the following clinical characteristics: body mass index, blood pressure and blood glucose levels.

Results. The proportion of self-reported diabetes, obesity (≥ 30 kg/m²) and non-optimum blood pressure levels (systolic ≥ 20 mm/Hg or diastolic ≥ 80 mm/Hg) were 15.4% (95% CI: 8.5% - 25.7%), 80.0% (95% CI:

70.8%-86.9%) and 70.5% (95%CI: 61.1%-78.6%), respectively. Although it was not statistically significant, diabetes was higher among females (15.4%) compared to males (12.0%). All participants with self-reported diabetes were overweight or obese, and 91.7% showed non-optimum blood pressure levels. A significant positive correlation ($p < 0.001$) was observed between blood pressure levels and body mass index ($r = 0.3$).

Conclusions. The percentage of persons with diabetes, obesity, and non-optimum blood pressure levels in this sample of Medical Sciences Campus employees underscores the need for confirming these results in a larger study and developing strategies focused on reducing health risks in this population.

Key words. Diabetes, Obesity, Blood pressure, Employees, Medical Sciences Campus, Puerto Rico

Diabetes mellitus, obesity and hypertension are critical health problems for individuals and society. Studies performed in several countries have consistently observed an association between an elevated body mass index and hypertension with increased risk of developing diabetes (1).

Diabetes mellitus is a chronic metabolic disorder characterized by elevation of blood glucose resulting from defects in insulin secretion associated with long-term damage and/or dysfunction of organs (2-3). The worldwide prevalence of diabetes for all age-groups was estimated to be 2.4% in 2000 (4). Recently, several studies conducted in the Puerto Rican population have shown a high prevalence of diabetes. Analysis of the data gathered from

the 1999 Behavioral Risk Factor Surveillance System (BRFSS), a random digit telephone survey, revealed a diabetes-weighted prevalence in the adult (≥ 18 years) population of 9.6% (95% CI: 8.5%-10.7%) (5). More recently, a study aimed at examining health disparities between diabetic patients receiving services in private and public health sectors during the year 2000, estimated an overall prevalence of diabetes of 4.9% (95% CI: 4.8%-5.0%) (6).

Several epidemiological studies consistently had shown a prevalence hypertension of 20%-30% in adult populations of industrialized countries (7). The weighed prevalence of hypertension in Puerto Rico was estimated in 20.9% (95% CI: 19.1%-22.7%) in 1997 and 26.2% (95% CI: 24.5%-28.0%) in 1999. When compared to the 52 participating states and territories in the U.S., Puerto Rico occupied the 45th position in 1997 and 13th position in 1999 (8). Obesity has reached epidemic proportions in the United States and continues to increase (9). The Puerto Rico BRFSS found that overweight-obesity weighed prevalence increased from 52.0% in 1996 to 58.7% in 2000 (10). The aim of this study was to estimate the proportion

From the Diabetes Center of Puerto Rico, Puerto Rico Medical Center, Rio Piedras, Puerto Rico 00935

Address correspondence to: Orville M. Disdier Flores, MS, Diabetes Center of Puerto Rico, PMB #87 PO Box 70344, San Juan, Puerto Rico, 00936-8344. Phone: (787) 773-8283, ext. 291, 224. Fax: (787) 773-8303. E-mail: Odisdier@rcm.upr.edu

of diabetes, obesity and non-optimum blood pressure levels among employees of the University of Puerto Rico Medical Sciences Campus that participated in a diabetes health fair at the Diabetes Center.

Methods

A total of 113 employees participated in the Puerto Rico Diabetes Center (PRDC) health fair and completed a questionnaire to obtain demographic characteristics and history of diabetes. The nursing staff examined the participants in order to obtain the following clinical characteristics: body mass index (BMI), systolic and diastolic blood pressure levels and blood glucose levels. The BMI was classified according to the 1998 NIH Clinical Guidelines (11), and the blood pressure levels were classified according the 2003 JNC-7 Report (12). Frequency distributions, percentages and their 95% confidence intervals were computed for categorical variables. For quantitative variables, summary measures (mean \pm standard deviation) were computed. To determine factors associated with a self-report of diabetes, obesity and non-optimum blood pressure levels, a simple unconditional logistic regression model was employed and prevalence odds ratios were calculated. Data analysis was performed using SAS PC version 8.2 (Cary, NC, USA. SAS Institute Inc., 1999-2001).

Results

The participants' age ranged from 22 to 64 years with a mean of 43.9 ± 11.3 . The distribution by sex showed a higher proportion of females (59.1%) than males (40.9%).

The self-reported percentage of diabetes was 15.4% (95% CI: 8.5% - 25.7%). The highest percentage was observed among those aged 55 years and over (29.4%) and females (15.4%).

In terms of the body mass index the vast majority of individuals were overweight or obese (80.0%, 95% CI: 70.8% - 86.9%). Overweight and obesity ratio were 5 of 10 and 3 of 10, respectively. There were not significant weight differences between age groups. Although, not statistically significant, the female group showed the lowest

Table 2. Overweight/obesity and Non-optimum Blood Pressure Levels Among Adults With Self-reported Diabetes

Characteristic	Percentage of Adults with Diabetes	95% CI
Body mass index (n = 71) *		
Normal	-	-
Overweight / obese	100.0	-
Systolic blood pressure (n = 77) †		
Optimum	16.7	2.9 - 41.1
Non-optimum	83.3	62.3 - 100
Diastolic blood pressure (n = 77) ‡		
Optimum	50.0	21.7 - 78.3
Non-optimum	50.0	21.7 - 78.3
Blood pressure (n = 77) §		
Optimum	8.3	0.4 - 40.2
Non-optimum	91.7	76.0 - 100

* Weight was classified according to body mass index: Normal (18.5 - 24.9 kg/m²), overweight / obese (≥ 25.0 kg/m²). † Systolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (<120 mm/Hg), non-optimum (≥ 120 mm/Hg). ‡ Diastolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (<80 mm/Hg), non-optimum (≥ 80 mm/Hg). § Percentage of individuals with either non-optimum systolic blood pressure or non-optimum diastolic blood pressure.

Table 1. Non-optimum Blood Pressure Levels Percentage by Age and Sex Groups

Characteristic	Systolic blood pressure levels*	95% CI	Diastolic blood pressure levels†	95% CI	Percentage of non-optimum systolic or diastolic blood pressure levels‡	95% CI
Age group in years (n = 112)						
≤ 34	51.7	33.5 - 70.0	41.4	23.5 - 59.3	62.1	44.4 - 79.7
35 - 44	44.8	26.7 - 62.9	48.3	30.1 - 66.5	72.4	56.1 - 88.7
45 - 54	65.6	49.2 - 82.0	56.3	39.1 - 73.6	68.8	52.7 - 84.8
≥ 55	81.8	65.7 - 97.9	40.9	20.7 - 63.7	81.8	65.7 - 97.9
Sex (n = 110)						
Male	66.7	52.9 - 80.4	48.9	34.3 - 63.5	71.1	57.9 - 84.4
Female	53.9	41.7 - 66.0	44.6	32.5 - 56.7	69.2	58.0 - 80.5

* Systolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (< 120 mm/Hg), non-optimum (≥ 120 mm/Hg). † Diastolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (< 80 mm/Hg), non-optimum (≥ 80 mm/Hg). ‡ Percentage of individuals with either non-optimum systolic blood pressure or non-optimum diastolic blood pressure.

overweight-obesity percentage compared to the male group (75.0% and 86.1%, respectively).

Analysis of systolic and diastolic blood pressures revealed that 59.8% (95% CI: 50.1% - 68.8%) of adults had non-optimum systolic blood pressure levels, 47.3% (95% CI: 37.9% - 56.9%) had non-optimum diastolic blood pressure levels and 81.8% (95% CI: 65.7% - 97.9%) had either systolic or diastolic non-optimum blood pressure levels. Non-optimum systolic blood pressure was highest among individuals aged 55 years or older. Both systolic and diastolic blood pressures were higher among males (Table 3). In addition, a significant positive correlation was observed between blood pressure levels and body mass index ($r=0.3, p<0.001$).

Table 2 shows the distribution of overweight/obesity and non-optimum blood pressure levels among participants who self-reported diabetes. All individuals who were overweight/obese self-reported diabetes and, nearly 92% (95% CI: 76.0% - 100%) showed non-optimum blood pressure levels (83.3% for non-optimum systolic blood pressure and 50% for non-optimum diastolic blood pressure level).

Table 3. Prevalence Odds Ratios (POR) and 95% Confidence Intervals (CI) Between Non-optimum Blood Pressure Levels, Age and Sex Using a Simple Logistic Regression Model

Characteristic	Non-optimum systolic blood pressure levels*		Non-optimum diastolic blood pressure levels†		Non-optimum blood pressure levels‡	
	POR	95% CI	POR	95% CI	POR	95% CI
Age group in years (n = 112)						
≤ 44	1.0	-	1.0	-	1.0	-
45 - 54	2.1	0.8 - 5.0	1.6	0.7 - 3.8	1.1	0.4 - 2.7
≥ 55	4.8	1.4 - 16.0	0.9	0.3 - 2.3	2.2	0.7 - 7.4
Sex (n = 110)						
Male	1.7	0.8 - 3.8		1.2	1.1	0.5 - 2.2
Female	1.0	-	1.0	-	1.0	-

* Systolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (< 120 mm/Hg), pre-hypertension (120 - 139 mm/Hg), hypertension stage 1 (140 - 159 mm/Hg), and hypertension stage 2 (≥160 mm/Hg).

† Diastolic blood pressure levels were classified according to the JNC VII 2003 classification: Optimum (< 80 mm/Hg), pre-hypertension (80 - 89 mm/Hg), hypertension stage 1 (90 - 99 mm/Hg), and hypertension stage 2 (≥100 mm/Hg).

‡ Percentage of individuals with either non-optimum systolic blood pressure or non-optimum diastolic blood pressure.

In order to describe the magnitude of the association, between diabetes, non-optimum blood pressure, the study characteristics and co-morbid conditions, prevalence odds ratios were calculated. Although, age and sex were not statistically significant factors, the diabetes prevalence odds increased with age and higher diabetes odd was observed in the female group. Non-optimum systolic, diastolic and overall blood pressure levels odds also increased with age but the female group showed almost twice the male odds.

Discussion

The association between diabetes, obesity and hypertension has been widely established by several studies. The risk of type 2 diabetes increased with age also with obesity and occurs more frequently in individuals with hypertension (13). In the other hand, being overweight or obese is a risk factor for type 2 diabetes, hypertension, coronary heart disease, lower life expectancy, reduced quality of life, osteoarthritis, respiratory impairment, and diminished mobility (12, 14). Also, evidence suggests that obesity is a risk factor for endometrial, breast, prostate and colon cancer (9).

Higher percentages of diabetes, non-optimum blood pressure levels and overweight / obesity were observed in the study sample. Although the study was based on a convenience sample, the proportion of employees who self reported diabetes was consistent with 2002 Puerto Rico BRFSS unweighted-data self-reported diabetes percentage of 13.0% which is very similar to the 15.4% observed in this study. Also, the BRFSS unweighted-data

shows very similar higher percentages for females compared to males and a clear tendency to increase with age (5).

Recent findings from the National Health and Nutrition Examination Survey showed that 3 out of 10 adults in the United States are obese (9), a ratio similar to the observed in the study sample. On the other hand, the observed high percentage of overweight-obese employees exceeds the prevalence for the general adult population obtained from the 2000 Puerto Rico BRFSS by approximately 20%.

This may suggest a lack of physical activity and excess caloric intake in this group of employees.

Although, the methodology used did not provide enough information for an appropriate hypertension diagnosis, large percentage of non-optimum blood pressure levels might be an indicator of poor awareness in this population. The non-optimum blood pressure levels observed in this study were three times higher than the 26% risk of hypertension reported in 1999 by the Puerto Rico BRFSS (10). The fact that nearly all the study subjects with diabetes were overweight or obese and had non-normal blood pressure highlights a lack of screening for chronic diseases in this adult population. Preventive measures should include medical care from a physician-coordinated team and a management plan. This plan should also emphasize therapeutic alliance among the patient and his/her family and include self-management diabetes education programs.

Resumen

Con el fin de estimar la proporción de diabetes, obesidad y presión sanguínea no-óptima un total de 113 empleados del Recinto de Ciencias Médicas de la Universidad de Puerto Rico, que participaron en una feria de salud y diabetes, fueron entrevistados y examinados. Las características demográficas y la frecuencia auto-informada de diabetes fue obtenida mediante un cuestionario auto-administrado. El personal de enfermería examinó a los participantes con el fin de obtener las siguientes características clínicas: el índice de masa corporal, la presión sanguínea y los niveles de glucosa en sangre. Los resultados demostraron una proporción de diabetes auto-informada, obesidad y niveles de presión sanguínea no-óptima de 15.4% (95% CI: 8.5% - 25.7%), 80.0% (95% CI: 70.8% - 86.9%) y 70.5% (95% CI: 61.1% - 78.6%), respectivamente. Aunque la diferencia no fue estadísticamente significativa la proporción de diabetes fue mayor en las mujeres (15.4%) en comparación con los hombres (12.0%). Prácticamente todos los participantes que informaron tener diabetes estaban sobrepeso u obesos y el 91.7% presentaron niveles de presión sanguínea anormales. Estos resultados señalan la necesidad en esta población adulta de cernimiento y medidas preventivas para la diabetes y otras enfermedades crónicas relacionadas.

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