Prevalence and Associated Factors of Diabetes Mellitus in Puerto Rican Adults: Behavioral Risk Factor Surveillance System, 1999

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Objective. **To estimate the self-reported weighted prevalence of diabetes mellitus among different population subgroups and determine associated factors in Puerto Rico.**

Methods. **Data gathered from the Behavioral Risk Factor Surveillance Survey (BRFSS) during 1999 was analyzed.**

Results. **The weighted prevalence in Puerto Rico in 1999 was 9.6% (95% CI: 8.5%-10.7%), highest than reported nationally. It was higher among individuals with increasing age, female sex, decreasing annual income, decreasing educational attainment, being non-employed, having a health care coverage, high blood pressure, high blood cholesterol, and increasing body mass index. Health behaviors and co-morbid conditions significantly associated with diabetes among individuals aged less than 65 years were high blood pressure, high blood cholesterol, obesity and low educational attainment. However, the only significant characteristic associated with diabetes in individuals aged 65 years or more was female sex. Analysis of the data gathered in the diabetes module revealed that nearly 35% were using insulin, 57.4% were using insulin once a day, 14.4% self-monitored their blood glucose one to three times per day, 18.3% reported they have heard of the glycosilated hemoglobin test, and of these, 71.8% had their test performed between one and six times within the past year. Nearly 42% reported their feet were checked and 54.1% had a dilated eye examination last year.**

Conclusion. **The high prevalence of diabetes in Puerto Rico underscores the need for developing integrated management strategies for improving quality of diabetes care.**

Key words: Diabetes, Prevalence, Puerto Ricans, Determinants.

The health status of Hispanic-Americans, particularly Mexican-Americans and Puerto Ricans, identifies an increased prevalence of diabetes and related complications compared to other ethnic groups in the United States. This increased prevalence may be partially attributed to poorer lifestyles or higher detection rates due to public awareness (1). Prevalence estimates of type 2 diabetes in Hispanics range from 9% to 11% of the population compared with 6% in non-Hispanic white Americans (2). Several investigations conducted over the past 15 years provide most of the information related with the incidence and progression of diabetes among Hispanic Americans (3-6).

The same risk factors that increase the risk of diabetes in other populations also operate in the Hispanic population such as genetic factors, obesity, and lifestyles. The San Antonio Heart Study (5) showed that the prevalence of diabetes among people who have first-degree relatives with diabetes was twice as great for Mexican-Americans with no family history of diabetes. In addition, Hispanics are more likely than non-Hispanic whites to be overweight and to have a decreased level of physical activity.

Diabetes mellitus has been acknowledged to be a serious public health problem in Puerto Ricans residing in the island. In 1997, diabetes ranked as the third leading cause of death in the island, accounting for nearly 7% of all deaths (7). During the same year, the prevalence of self-reported diabetes in Puerto Rico was 10.5% (95% CI: 9.1%-11.9%), a figure higher than reported nationally (8). In order to estimate the self-reported prevalence of diabetes mellitus among different population subgroups and determine associated factors in Puerto Rico, data gathered from the Behavioral Risk Factor Surveillance System (BRFSS) during 1999 was analyzed.

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Methods

The BRFSS is a random digit telephone survey, sponsored by the Centers for Disease Control and Prevention, conducted in all states of the nation and its territories. The objective of this survey is to gather uniform data on each state and territory regarding preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the civilian, non-institutionalized, adult (≥18 years) population (8,9). Information gathered by the BRFSS include the following: general health status, health care access and coverage, diabetes, exercise, tobacco use and prevention, smokeless tobacco use, fruits and vegetables consumption, weight control, demographics, women's health, HIV/AIDS, sexual behavior, family planning, health care utilization, oral health, preventive counseling services, hypertension and cholesterol awareness, colorectal cancer screening, immunization, injury control, alcohol consumption, cardiovascular disease, arthritis, quality of life, folic acid, firearms, and social context.

The BRFSS sampling scheme used by the vast majority of states during 1999 was a disproportionate stratified sample design where blocks of telephone numbers are classified into strata that are either likely or unlikely to yield residential numbers. Those telephone numbers in the likely stratum are sampled at a higher rate than numbers in the unlikely stratum. However, Puerto Rico used a simple random sample design, therefore, all households with telephone numbers in the surveillance population had an equal probability of being called to participate in the study (8, 9).

Frequency distributions for categorical variables and summary measures (mean ± standard deviation) for quantitative variables were computed. The prevalence of diabetes among different population subgroups was based on the response to the following question: Have you ever been told by a doctor that you have diabetes?

In order to compare the prevalence estimates obtained in the Puerto Rico BRFSS with states and other territories of the United States, a weighted prevalence was estimated as follows (10):

$$\hat{p} = \frac{\sum_{i=1}^{n} w_i x_i}{n}$$

$$\text{Var}(p) = \frac{\sum_{i=1}^{n} w_i^2}{n^2} \hat{p}(1-\hat{p})$$

where:

$x_i = 1$ if characteristic is present, 0 otherwise

$$w_i = \frac{f_i}{\sum_{i=1}^{n} f_i} n$$

f_i = weighting factor used in the BRFSS (variable called FINALWT). This factor for the Puerto Rican population is defined as the product of the following terms: (1) number of residential telephone numbers in the respondent's household, (2) number of adults in the respondent's household, and (3) relation of the number of people in an age-by-sex category in the territory and the number of respondents in that same age and sex category.

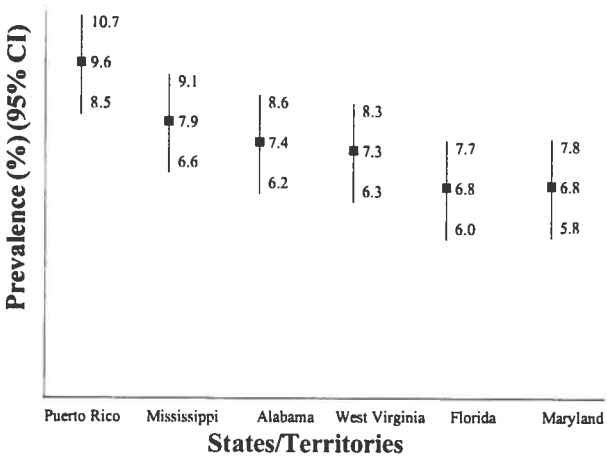
n = sample size accrued in Puerto Rico.

The weighting factor employed in the estimation was standardized to the sample size accrued in Puerto Rico in order to keep the equivalent precision of the estimates made for the different states and territories in the United States. These estimates were computed excluding all women who were told that they had diabetes only during pregnancy and all respondents with unknown information or those refusing to answer the question. To determine factors associated with the self-reported prevalence of diabetes, a simple unconditional logistic regression model was employed; then, to estimate adjusted weighted prevalence odds ratios through 95% confidence intervals (CI), a multiple unconditional logistic regression model was used (11). Criteria for selecting the independent variables for the multiple logistic regression model were based on significant associations in the simple logistic regression model and uncorrelated confounding variables.

Results

In 1999, the Puerto Rico Department of Health personnel conducted a total of 3,052 health interviews over the telephone. It was observed that the territories and states with the highest prevalence of diabetes were Puerto Rico (9.6%) followed by Mississippi (7.9%), Alabama (7.4%), West Virginia (7.3%), Florida (6.8%) and Maryland (6.8%) (Figure 1).

Table 1 shows the weighted prevalence estimate of self-reported diabetes and its 95% confidence intervals in specific population subgroups. Weighted prevalence of diabetes increased from 2.19% in persons aged 18-44 years to 26.19% in persons aged 65 years or more. Prevalence of diabetes was slightly higher in females (11.05%), individuals with an annual income less than $10,000 (16.41%), those with the lowest educational attainment (18.68%), and those who were unemployed (14.37%). Respondents living in the north (12.74%), east (12.44%) and northeast (11.03%) regions of Puerto Rico had the largest weighted prevalence of diabetes. The vast majority of adults surveyed had access to an ongoing source of primary health care (90.6%) (data not shown); as expected,



Source: Centers for Disease Control and Prevention. 1999 BRFSS Summary Prevalence Report.

Figure 1. Weighted prevalence (95% CI) of diabetes among the six leading states and territories of the United States during 1999

the prevalence of diabetes was highest among those who reported health care coverage (10.68%).

When the presence of selected co-morbid conditions among adults surveyed were investigated, it was observed that the prevalence of diabetes was higher in individuals who had been told that their blood pressure (19.34%) and blood cholesterol (19.21%) were high. When lifestyle and behavioral factors that affect health were investigated, a history of current smoking (5.74%), binge drinking (5.33%) and chronic drinking (5.95%) was less frequent among those that had been told they had diabetes. However, it

Table 1. Weighted prevalence (%) of self-reported diabetes in specific population subgroups in Puerto Rico, 1999

Characteristic	Prevalence of diabetes (%)	95% CI
Age group in years		
18-44	2.19	1.51-2.88
45-64	16.63	14.09-19.16
≥65	26.19	22.08-30.31
Sex		
Female	11.05	9.51-12.59
Male	8.15	6.73-9.56
Annual household income		
<$10,000	16.41	14.06-18.77
$10,000-$19,999	7.98	6.05-9.91
≥$20,000	5.12	3.46-6.77
Educational attainment		
Less than high school	18.68	16.01-21.35
High school graduate	7.13	5.34-8.92
Some college or college graduate	5.69	4.47-6.90

Continued

Table 1. Weighted prevalence (%) of self-reported diabetes in specific population subgroups in Puerto Rico, 1999

Characteristic	Prevalence of diabetes (%)	95% CI
Employment status		
Employed	3.96	2.93-5.00
Non-employed	14.37	12.68-16.06
Region of residence		
Metropolitan North	8.57	5.98-11.16
Mountain	9.08	6.26-11.90
Northeast	11.03	7.86-14.19
San Juan	8.46	5.57-11.36
East	12.44	8.91-15.96
North	12.74	9.05-16.43
West	9.02	5.27-12.77
Southwest	7.50	4.01-11.00
Southeast	6.68	3.20-10.17
Northwest	9.62	4.91-14.32
Health care coverage		
Yes	10.68	9.51-11.85
No	2.27	0.71-3.83
Awareness of high blood pressure*		
Yes	19.34	16.54-22.14
No	6.96	5.87-8.05
Awareness of high blood cholesterol†		
Yes	19.21	16.32-22.09
No	9.29	7.89-10.68
Smoking status		
Current smoker	5.74	3.50-7.98
Former / Never smoker	10.28	9.11-11.45
Binge drinking‡		
At risk	5.33	2.84-7.82
Not at risk	10.40	9.23-11.57
Chronic drinking‡		
At risk	5.95	0.95-10.95
Not at risk	10.01	8.90-11.13
Weight category		
Normal	7.11	5.61-8.61
Overweight	8.97	7.26-10.68
Obese	14.77	11.94-17.60

*Among respondents having their blood pressure checked; †Among respondents having their blood cholesterol checked; ‡Binge drinking refers to reported having 5+ drinks at least once on an occasion whereas chronic drinking refers to reported having 60+ drinks a month; ‡Weight was classified according to body mass index: Normal (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), and obese (≥30 kg/m²).

was observed that the prevalence of diabetes was higher among those who were overweight (8.97%) or obese (14.77%). The mean body mass index was 26.6 ± 4.9 kg/m², with a minimum value of 14.7 kg/m² and a maximum of 64.6 kg/m² (data not shown). When this parameter was analyzed by sex, the mean body mass index was significantly ($p=0.006$) higher in males (26.96 ± 4.53) than in females (26.46 ± 5.17).

Table 2 summarizes the prevalence odds ratio, a measure that describes the magnitude of the association between diabetes and study characteristics. Significant associations ($p<0.05$) were observed for increasing age, female sex, decreasing annual income, low educational attainment, non-employed status, having a health care coverage, awareness of high blood pressure, awareness of high blood cholesterol and obesity. On the other hand, the prevalence odds of diabetes were significantly lower ($p<0.05$) for those who reported current smoking and binge drinking compared with those who did not report these behaviors. However, chronic drinking and being overweight were not statistically associated with diabetes ($p>0.05$).

Table 2. Unadjusted weighted prevalence odds ratios (POR_w) and 95% confidence intervals (CI) between study characteristics and diabetes using a simple logistic regression model.

Characteristic	POR_w	95% CI
Age group in years		
18-44	1.00	-
45-64	8.90	6.15-12.87
≥65	15.84	10.78-23.27
Sex		
Female	1.40	1.10-1.79
Male	1.00	-
Annual income		
<$10,000	3.64	2.49-5.34
$10,000-$19,999	1.61	1.05-2.47
≥$20,000	1.00	-
Educational attainment		
Less than high school	3.81	2.86-5.08
High school graduate	1.27	0.90-1.81
Some college or college graduate	1.00	-
Employment status		
Employed	1.00	-
Non-employed	4.07	3.00-5.51
Health care coverage		
Yes	5.15	2.53-10.48
No	1.00	-
Awareness of high blood pressure*		
Yes	3.21	2.51-4.10
No	1.00	-
Awareness of high blood cholesterol†		
Yes	2.32	1.81-2.98
No	1.00	-
Current smoking status		
Current smoker	0.53	0.34-0.82
Former/never smoker	1.00	-
Binge drinking‡		
At risk	0.49	0.29-0.81
Not at risk	1.00	-
Chronic drinking‡		
At risk	0.57	0.23-1.40
Not at risk	1.00	-
Weight categoy (based on body mass index)§		
Normal	1.00	-
Overweight	1.29	0.95-1.75
Obese	2.26	1.65-3.12

*Among respondents having their blood pressure checked; †Among respondents having their blood cholesterol checked; ‡Binge drinking refers to reported having 5+ drinks at least once on an occasion whereas chronic drinking refers to reported having 60+ drinks a month; § Weight was classified according to body mass index: Normal (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), and obese (≥30 kg/m²).

A weighted multiple logistic regression model was fit to determine the association between the presence of diabetes with the following predictors: demographics, health behaviors, co-morbid conditions and interaction terms. The analysis showed significant interaction terms that involved age ($p<0.05$), implying that the magnitude of the prevalence odds ratios for diabetes according to high blood pressure, high blood cholesterol, weight category, current smoking, sex and educational attainment was different for each age group. As a consequence, two multiple logistic regression models were fitted, one for individuals aged less than 65 years and another for individuals aged 65 years or older, and no additional significant ($p>0.05$) interaction terms were observed in these two models. The variable binge drinking was excluded from the analysis since the sample size of individuals with diabetes who reported binge drinking was not sufficient to estimate the logistic regression coefficient associated with this variable.

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associated with this variable.

Among individuals aged less than 65 years, low educational attainment (adjusted POR_W=3.22, 95% CI=2.16-4.81), high blood pressure (adjusted POR_W=2.11, 95% CI: 1.46-3.04), high blood cholesterol (adjusted POR_W=2.12, 95% CI=1.48-3.03), and being obese (adjusted POR_W=1.76, 95% CI=1.13-2.75) were all significantly associated with a higher prevalence odds for diabetes ($p<0.05$) (Table 3). However, the only significant factor associated with the presence of diabetes among individuals aged 65 years or more was female sex (adjusted POR_w =1.70; 95% CI=1.04-2.80) (Table 4).

Table 3. Adjusted weighted prevalence odds ratios (POR_w) and 95% confidence intervals (CI) between diabetes, co-morbid conditions and health behaviors among individuals aged less than 65 years using a multiple logistic regression model

Characteristic	POR_w*	95% CI
Sex		
Female	1.04	0.73-1.48
Male	1.00	-
Educational attainment		
Less than high school	3.22	2.16-4.81
High school graduate	1.13	0.72-1.77
Some college or college graduate	1.00	-
Awareness of high blood pressure*		
Yes	2.11	1.46-3.04
No	1.00	-
Awareness of high blood cholesterol†		
Yes	2.12	1.48-3.03
No	1.00	-
Current smoking status		
Current smoker	0.64	0.35-1.16
Former/Never smoker	1.00	-
Weight category (based on body mass index) ‡		
Normal	1.00	-
Overweight	0.93	0.60-1.45
Obese	1.76	1.13-2.75

*Among respondents having their blood pressure checked; †Among respondents having their blood cholesterol checked; ‡Weight was classified according to body mass index: Normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), and obese (≥30 kg/m^2).

Table 5 summarizes the medical history gathered in the BRFSS diabetes module of individuals who had been told by a physician they had diabetes. Of these, more than half (59.31%) were aged 45 to 64 years at the time of diagnosis, with a mean age of 49.0 ± 13.4 years. Nearly 35% were using insulin, 57.4% used insulin once a day, 14.4% checked their blood glucose levels one to three

Table 4. Adjusted weighted prevalence odds ratios (POR_w) and 95% confidence intervals (CI) between diabetes, co-morbid conditions and health behaviors among individuals aged 65 years or more using a multiple logistic regression model.

Characteristic	POR_w*	95% CI
Sex		
Female	1.70	1.04-2.80
Male	1.00	-
Educational attainment		
Less than high school	1.38	0.75-2.55
High school graduate	1.13	0.52-2.44
Some college or college graduate	1.00	-
Awareness of high blood pressure*		
Yes	0.90	0.54-1.51
No	1.00	-
Awareness of high blood cholesterol†		
Yes	0.91	0.55-1.51
No	1.00	-
Current smoking status		
Current smoker	1.17	0.39-3.56
Former/Never smoker	1.00	-
Weight category (based on body mass index) ‡		
Normal	1.00	-
Overweight	1.08	0.63-1.87
Obese	1.38	0.71-2.66

*Among respondents having their blood pressure checked; †Among respondents having their blood cholesterol checked; ‡Weight was classified according to body mass index: Normal (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), and obese (≥30 kg/m^2).

times per day, and 92.3% visited a health professional due to their condition in the last year. When they were queried about glycosilated hemoglobin (HbA_{1C}), only 18.3% reported they have heard of such test. Of these, 71.8% reported they had the glycosilated hemoglobin checked between one and six times within the past year. Among those surveyed, 41.8% reported that their feet were checked for any sores or irritations by a health professional in the last year. In addition, 54.1% reported having a dilated eye examination within the past 12 months. Vision limitation in recognizing people or objects across the street (22.6%), in reading prints (29.4%) and in watching television (15.6%) was reported most of the time or all the time by study participants.

Table 5. Medical history of adults who reported ever being told by a doctor they had diabetes

Characteristic	Percentage
Age at diagnosis in years (n=349)	
<18	2.01
18-44	27.51
45-64	59.31
≥65	11.17
Current use of insulin (n=244)	
Yes	34.6
No	65.4
Frequency of insulin use (n=129)	
Once a day	57.4
Twice a day	38.0
Three or more times a day	3.1
Four times a week	1.6
Frequency of blood glucose evaluation (n=354)	
Never	33.1
1-3 times per day	14.4
1-6 times per week	23.1
1-7 times per month	14.7
1-12 times per year	14.7
Awareness of glycosylated hemoglobin (n=361)	
Yes	18.3
No	81.7
Number of visits to health professionals due to diabetes in the last year (n=340)	
None	7.7
1-3	15.0
4-6	31.2
7-9	5.0
10-12	39.4
13 or more	1.7
Number of times glycosylated hemoglobin was checked by a health professionals in the last year (n=46)	
1-3	54.4
4-6	17.4
7-9	2.2
10-12	13.0
None	13.0
Number of times feet were checked by a health professionals in the last year (n=290)	
None	58.2
1-3	18.3
4-6	12.4
7-9	2.8
10 or more	8.3

Continued

Table 5. Medical history of adults who reported ever being told by a doctor they had diabetes

Characteristic	Percentage
Last eye exam in which pupils were dilated (n=340)	
Within the past month	18.2
Within the past year	35.9
Within the past 2 years	12.7
Two or more years ago	17.0
Never	16.2
Time with vision limitation in recognizing people or objects across the street (n=371)	
All the time	12.4
Most of the time	10.2
Some of the time	15.9
A little bit of the time	9.2
None of the time	52.3
Time with vision limitation in reading print in a newspaper, magazine, recipe, menu or numbers on the telephone (n=371)	
All the time	17.8
Most of the time	11.6
Some of the time	16.7
A little bit of the time	10.5
None of the time	43.4
Time with vision limitation in watching television (n=371)	
All the time	8.1
Most of the time	7.5
Some of the time	13.2
A little bit of the time	9.2
None of the time	62.0

Discussion

Analysis of these data showed that compared with all states and other territories in the United States, Puerto Ricans residing in the island have a higher prevalence of diabetes. According to the BRFSS, Puerto Rico had a weighted prevalence of diabetes of 9.6% in 1999, which represents approximately 263,720 adults (≥18 years) living with diabetes. Moreover, the six leading states and territories of the United States having the largest prevalence of diabetes have either a large population of African-Americans or Hispanic-Americans, confirming that these ethnic groups are the most affected. Data derived from the Third National Health and Nutrition Examination Survey (NHANES III) estimated that the prevalence of undiagnosed diabetes was 44% (12). Assuming that the proportion of undiagnosed diabetes is accurate, then the prevalence of diabetes is even higher in Puerto Rico.

According to the National Health Interview Survey, the prevalence of diabetes is 1.3% at 18-44 years, 6.2% at 45-64 and 10.4% for those aged 65 years or more in the United States (13). Estimates obtained for Puerto Ricans in these age groups were 2.2%, 16.6% and 26.2%, respectively; therefore, the prevalences were 1.7 to 2.5 times higher in our population. This increased prevalence may suggest an important role of lifestyle factors, greater incidence of complications or higher detection rates, placing a large economic burden on society. Compared to Mexican-Americans and Cuban-Americans, Puerto Ricans have the largest African (37%) and Indian (18%) ancestry in their genetic pool (14). This genetic pool variation may partially explain the higher prevalence of diabetes in Puerto Ricans compared to other Hispanics in the United States.

The co-morbid conditions that were significantly associated with diabetes were high blood pressure, high blood cholesterol, and obesity after adjusting for sex and educational attainment in the younger group. These factors, however, were not significantly associated ($p>0.05$) with diabetes mellitus among those aged 65 years or more, probably due to information bias or a lower statistical power. These findings are consistent with previous studies that have shown that obesity is one of the strongest risk factors for diabetes (15-20). Dyslipidemia and hypertension have been associated to hyperinsulinemia as a consequence of insulin resistance in type 2 diabetic patients (1). Young and colleagues determined that Canadians with undiagnosed diabetes had an unfavorable lipid panel, higher blood pressure and obesity when compared to normoglycemic patients (21). On the other hand, Galuska and colleagues found that less than 50% of adults who had a body mass index greater than 30 kg/m^2 reported that their health care professional advised them to lose weight (22). Low educational attainment was significantly associated ($p<0.05$) with diabetes, therefore, this analysis underscores the need to develop effective educational strategies for altering or eliminating high risk behaviors since the presence of these characteristics interact to increase the risk for diabetes related complications such as coronary heart disease and stroke. Furthermore, efforts should also focus primarily in children and adolescents since recent national data that have revealed the presence of type 2 diabetes in U.S. adolescents (23-25).

Despite the American Diabetes Association has determined that monitoring metabolic parameters is essential to ensure an optimum management of the diabetic patient (25), the frequency of monitoring blood glucose levels and glycosilated hemoglobin reported in the studied population was relatively low. In addition to estimate plasma glucose control during the preceding three months, the Early Diabetes Intervention Program reported that glycosilated hemoglobin measurements enhanced the detection of diabetes in high-risk individuals with non-diagnostic or minimally elevated fasting plasma glucose (26). Although information bias may have occurred in the present study, this relatively low frequency of monitoring calls for exhaustive efforts to better manage patients with diabetes and instruct them in self glucose monitoring and treatment adherence.

Among persons who had been told by a doctor that they had diabetes, less than 55% had a dilated eye examination in the year prior to the interview and 38% reported visual limitations. These findings may reflect physicians' or patients' non-adherence to diabetes vision care guidelines. Baseline results from the Diabetic Retinopathy Awareness Program found that 35% of patients did not follow the vision care guidelines, two-thirds reported no eye examination, and one-third had an undilated examination (27). Among factors significantly associated with non-adherence in this study group included younger age, type 2 diabetes with or without insulin use, shorter duration, last eye examination performed by an optometrist or other non-ophthalmologist, less practical knowledge about the condition, and no prior formal diabetes education. Dismissing attachment in the setting of poor-patient provider communication has also been associated with poorer treatment adherence (28). In spite of the current knowledge that foot ulcerations and infections are among the serious foot complications related to diabetes, more than half (57.2%) of respondents reported that their feet had not been checked in the last year. Clinical practice guidelines for diabetic foot disorders have been developed to provide evidence-based guidance for general patterns of practice (29, 30).

These data are consistent with those obtained from the Health Care Financing Administration (HCFA) Diabetes National Project Overview that evaluated performance on Medicare quality indicators (31). Route monitoring and screening among diabetic patients was shown to be less than optimal, a finding consistent with previous studies (32-35). However, when compared to states of the nation, Puerto Rico ranked lowest in the rates of glycosilated hemoglobin and eye evaluations (41.2% and 54.1%, respectively). These findings are alarming since there is wealth of scientific evidence that lifestyle modifications and therapeutic interventions are effective in reducing the morbidity, mortality and economic burden on society of diabetes. Since most health care for diabetes occurs late in the disease's progression, the health care team should be encouraged to closely follow the American Diabetes Association management guidelines in order to reduce the prevalence of diabetes and diminish

complications (25,36). Implementation of these recommendations in clinical practice and education reinforcement of high-risk individuals and those already affected will ensure improvement of both duration and quality of life among Puerto Ricans. Various integrated management strategies for improving quality of diabetes care have been evaluated and provided optimistic results (37-40).

Analysis of data obtained through the BRFSS has several limitations. First, prevalence estimates obtained from telephone surveys may be underestimated in populations with low telephone coverage. This limitation is crucial since the presence of diabetes has been associated with a low educational attainment and annual income. Second, total prevalence can be underestimated since some individuals may have undiagnosed diabetes. Third, associated factors with diabetes such as poor diet and physical inactivity were not analyzed since these were not gathered in the 1999 BRFSS survey conducted in Puerto Rico.

Therefore, the need for improving the diabetes surveillance system and disseminating diabetes-related data is of utmost importance. Data from both primary healthcare sources and private institutions are needed in order to estimate with a higher degree of certainty the prevalence and to monitor temporal trends of diabetes in Puerto Rico. If factors related to non-adherence to diabetes care guidelines are identified, the target population may be sensitized regarding modification of these factors and therefore enhancing the early detection of diabetes related complications.

Resumen

Con el fin de estimar la prevalencia ponderada auto-reportada de diabetes mellitus en diferentes subgrupos poblacionales y determinar los factores asociados en Puerto Rico, se analizaron los datos obtenidos del *Behavioral Risk Factor Surveillance System* (BRFSS) durante el año 1999. La prevalencia ponderada en Puerto Rico para el 1999 fue 9.6% (8.5%-10.7%), la cual es más alta que la prevalencia reportada a nivel nacional. La prevalencia fue más alta entre individuos de edad avanzada, sexo femenino, bajo ingreso económico, bajo nivel de educación, desempleados, con cubierta de plan de médico, presión alta, colesterol alto y un alto índice de masa corporal. Las prácticas de salud y condiciones co-mórbidas asociadas significativamente con la diabetes entre individuos menores de 65 años fueron las siguientes: alta presión, nivel alto de colesterol, obesidad y bajo nivel educativo. Sin embargo, la única característica asociada significativamente con la diabetes en individuos de 65 años o más fue pertenecer al sexo femenino. El análisis de los datos obtenidos en el módulo de diabetes revelaron que aproximadamente 35% eran usuarios de insulina, 57.4% usaban la insulina una vez al día, 14.4% se medían su nivel de glucosa en sangre entre 1 y 3 veces al día, 18.3% informaron haber escuchado sobre la prueba de hemoglobina glicosilada, y de éstos, 71.8% se hicieron la prueba entre una y seis veces durante el año pasado. Alrededor del 42% informaron que sus pies fueron examinados y el 54.1% tuvo un examen de dilatación de pupilas durante el último año. La alta prevalencia de diabetes en Puerto Rico señala la necesidad de desarrollar estrategias de manejo integrado para mejorar la calidad de cuidado en personas con diabetes.

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