Patient profiles and their relationship with the CES-D scale at the Diabetes Center for Puerto Rico

JOSÉ R. RODRÍGUEZ, MD, MPH, PhD, FAAETS *1; ROSA JANET RODRÍGUEZ, MPH, MS, PhD *.1
ORVILLE M. DISDIER, BS, MS *2

Purpose: **The prevalence of diabetes mellitus in Puerto Ricans has been identified and reported as being disproportionately higher as compared to other metabolic pathologies. Recently, diabetes has been identified as the third cause of mortality in Puerto Rico (Puerto Rico Health Department, Vital Statistics Annual Report, 1999-2001). The Research Center, Education and Medical Services for Diabetes in Puerto Rico (also known as the "Centro de Diabetes para Puerto Rico" [CDPR]) is a public corporation in the island created by the government to reduce diabetes prevalence, mortality and morbidity.**

Method: **The CDPR offers Diabetes Self Management Educational Training Program Schools for patients (DSMETPS) island wide. The research design was an ex-post facto. As part of the process, patients are administered an extensive socio-demographic and health information questionnaire, which also includes the CES-D (a symptomatology depressive scale). This study pretends to describe the diabetic patient profiles (n=27) using information from the DSMETPS of the CDPR and explore the association with the CES-D. Variables such as patients' needs, knowledge and understanding of the condition (i.e., pathology management, type and medications utilized and exercise and nutritional patterns), patient attitudes to diabetes and their relations with the CES-D were explored.**

Results: **Results show a negative association, controlling for age and gender, between patients diabetic education/knowledge and CES-D score.**

Conclusions: **Diabetes educators in Puerto Rico need to identify depressive symptomatology in order to prevent mental health complications in their patients since this may affect their future treatment and prognosis. An interdisciplinary team is recommended to improve the effectivity of the intervention.**

Key words: Depressive symptomatology, Puerto Rico, Diabetes, Patient profile

Diabetes mellitus is a serious metabolic disease caused by an inherited and/or acquired deficiency in the production of insulin by the pancreas (1). Such deficiency results in an increased concentration of glucose in the blood, which damages particularly, blood vessels, kidneys, and nerves. This desease has a high mortality and morbidity rate, especially in undiagnosed patients. The number of Americans with diabetes has been estimated to be 18.2 million people (2) and over half million in Puerto Rico (3).

It has been documented that diabetes disproportionately affects Hispanics in the United States (4). In the United States, diabetes prevalence among Hispanics is approximately twice that of non-Hispanic whites (5). Moreover, according to the Puerto Rico Health Department (6), diabetes mellitus is the third cause of death for the adult population in the island. It is estimated that this rate will increase significantly in the next years. Generally, rates are high in African and Hispanic persons (7).

In Puerto Rico, the most common diabetes type is Type 2, affecting more than half of the diabetes population. If uncontrolled, this pathology may have negative future consequences, not only for the patient itself, but also for the general community in terms of health costs. Definitively, this may imply economic hardship and serious social implications for the whole society. In Puerto Rico, the first five mortality causes in 2001 were heart disease, cancer, hypertensive disease, diabetes mellitus, and cerebrovascular diseases (6,8). In 2001, a total of 28,794 deaths were reported; of these, 8.3 % were caused by diabetes, occupying the third position between the major causes of death (9). Diabetes is a serious and costly health

1. From the Diabetes Center for Puerto Rico, Research Division, San Juan Puerto Rico, 2. Puerto Rico Health Department, San Juan, Puerto Rico

Address correspondence to: José R. Rodriguez, MD, MPH, PhD; PMB # 87, P.O. Box 70344, San Juan PR 00936-8344.

problem that, disproportionately, affects the United States and particular ethnic populations (i.e., Hispanics, Pina Indians) (7,10,11). It also has been associated to other serious health complications such as blindness, amputations and cardiovascular and renal diseases. It is estimated that 50%-75% of people with diabetes mellitus will develop serious long-term complications (10). Furthermore, diabetes mellitus has been linked to an increase in depressive symptomatology and clinical depression. Among diabetic patients, depression is twice as common as compared with persons without diabetes (12).

The linkage between diabetes and depression. Several lines of evidence suggest that depression influences glucose metabolism and risk of diabetes (13). Prevalence of clinically significant depression is twice as high in individuals with diabetes than in those without diabetes (14). Research has demostrated that depression is associated with poor glycemic control and hyperglycemia in patients with type 1 or type 2 diabetes (15), impaired insulin sensitivity, and hyperinsulinemia (16). Two current studies (17,18) reported that depressive symptoms were associated with an increased incidence of diabetes. Although each study used a nonstandard measure of depressive symptoms, in one study, the association was limited to respondents with less than a high school education (17). Two studies found that diabetes was twice as likely to develop in depressed individuals as compared with nondepressed individuals over a 13 and 8 years of follow-up, respectively. However, both studies were limited by a low incidence rates of diabetes in their samples (19,20). Thus, although evidence is conflicting, depression may contribute to metabolic abnormalities preceding the development of diabetes (21). For example, depressed patients with normal glucose tolerance had lower insulin sensitivity and higher insulin resistance relative to nondepressed control subjects (22). In another study, prevalence of depression was lowest at the highest levels of insulin resistance among nondiabetic women (23).

Few studies examining depression and risk of diabetes have included African Americans and other minorities (17,24) although prevalence and incidence of diabetes are highest in these populations (25,26). Limited research exist that explored the relationship between depressive symptoms and insulin resistance in the development of diabetes within a multiethnic community sample of middle-aged women participating in a longitudinal study of women's health and aging; this research concluded that depressive symptomatology was significantly relate with overall levels of insulin resistance and excess risk of diabetes over 3 years of follow-up (27). The previous conditions were most likely observed in African Americans and Hispanics, populations that are at a higher risk of diabetes than Caucasians (25).

According to the National Institute of Health, depression in diabetic patients can lead to a poorer physical and mental functioning (28). It is related to obesity, decreased physical activity, poorer glycemic control and decreased adherence to prescriptions (12). Also depression in these patients is linked mainly to single women, low education and income level, and being Hispanic (29). It is estimated that millions of people suffer some form of depression every year. The cause of depression in diabetic patients is unclear, but frequently clinical depression is commonly undiagnosed or hard to diagnoses due to the co-morbidity of both conditions. This is an important factor to consider when assessing diabetes patients and outlining treatments for their condition in order to improve and enhance their life quality.

Purpose of the Study. To examine and determine whether depression, as measure by the Center for Epidemiological Studies Depression Scale (CES-D), is associated with patients' health information, needs, knowledge and understanding of Diabetes Type 2 (i.e. pathology management, type and medications utilized, and exercise and nutritional patterns) at the CDPR.

Method

Measure of Socio-Demographic Health Information. The CDPR uses a socio-demographic and extensive health information questionnaire (333 variables) to screen patient's needs, behaviors, and attitudes related to Diabetes Mellitus Type 2. The questionnaire has been checked for content validity by an expert panel of six professionals who work at the CDPR. (i.e., epidemiologist, exercise physiology technician, dietitians and endocrinologist).

Measurement of depressive symptoms. The 20-item Center for Epidemiological Studies Depression Scale (CES-D) was used to measure depressive symptomatology. The scale includes a four-point frequency format (rarely, some or little of the time, occasionally and most or all of the time). The CES-D is well validated, has been used extensively in prior research (30), and has good test-retest reliability in ethnically diverse populations (3,31,32). A score of [greater than or equal to] 16 on the CES-D is considered indicative of clinically significant depressive symptomatology. For simplify analyses presentation, the CES-D results were categorize, as "depressed" and "nondepressed", remembering that his categorization did not constituted a depressive clinical diagnosis.

Research design and analysis. A Secondary Data Analysis was performed with 27 patients at the CDPR in

the last 6 months. Descriptive percentages were calculated for specific age range and sex groups, and *t* –test were performed to determine whether differences between groups were statistically significant. CES-D scores were explored to see if there was any association with the Diabetes Patients Type 2 Questionnaire (DPT2Q). In order to explore the correlation between depressive symptomatology, as measured by the CES-D and the DPT2Q, four variable clusters were created within a hierarchical linear regression equation that included socio-demographics information, attitudes, diabetes knowledge/ understanding, and health information. Statistical analyses (descriptive and correlational) were performed using SPSS.

Results

Twenty seven questionnaires were analyzed. The socio-demographic analysis resulted in the following:

- Gender distribution: 74% are females and 26% are males.
- Range of age: 62-72 years old (37%), 51-61 years old (33.3%), 40-50 years old (18.5%), and 29-39 years old (3.7%).
- Marital Status: Married (55.6%), single (18.5%), divorced (14.8%), and widow (11.1%).
- Occupation: Housewife (44.4%), Retired (11.1%), disability (11.1%), and others (33.4%).
- Educational level: 12th grade (30%), 6th through 9th grade (18.5%) university /no graduated (20%), and Bachelor degree (15%).
- Of the total sample, 84.6 % have a familiar with diabetes, and 52 % and 32% have regular and poor knowledge about diabetes respectively. In addition 74% never receive education in diabetes (Figure 1).

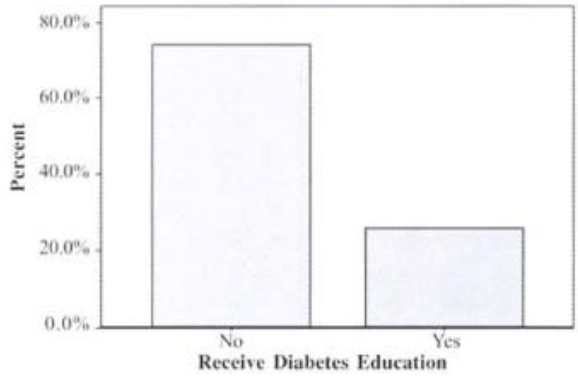


Figure 1. Percentages of Patients Receive Diabetes Education

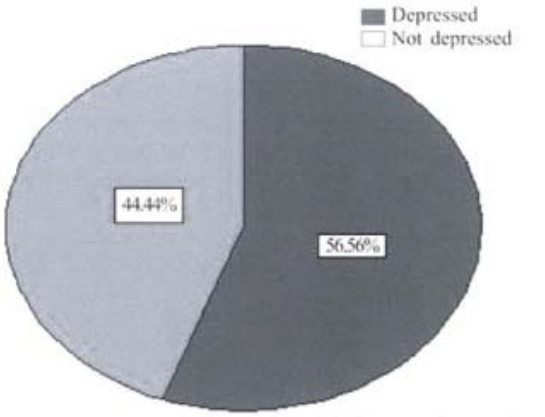
Reported attitudes related to diabetes and CES-D scores. Diabetes Attitudes Scale of the CDPR (DAS-CDPR) has an excellent content validity index (Alpha Cronbach =.98). The DAS-CDPR is a 17 items instrument in a five points Likert scale format (completely agree, agree, no opinion, disagree and completely disagree) that tries to explore patients attitudes and how is related to CES-D scores. Relevant scale results appear in Table 1.

Table 1. Attitudes Related to CES-D Scores

ITEM (Response range=completely agree/agree)	Percent (%)
"diabetes affect all aspect of their life"	70
"diabetes have an emotional impact in their life"	42.3
"diabetes control is a hard experience"	74
"felt frustration"	66.6
"people with diabetes may have a normal life"	81
"they need to take decision about diabetes"	70
"diabetes health team need to give information about diabetes programs"	89
"diabetes persons must decide their treatments"	48
"diabetes health team must be trained in communication tasks"	85
"diabetes health team need to know about how diabetes daily care effects their patients"	78
"diabetes educators need to know about diabetes treatment and need to learning teaching strategies"	85

Reported CES-D results. In this study, we used the Spanish translation of the CES-D. A score of 16 or greater is considered "depressed". In the sample: 56.56% are "depressed" * and 44.44% are "not depressed"* (Figure 2). Some relevant CES-D patient outcomes follow in Table 2.

Hierarchical regression analysis. Hierarchical Regression Analysis with multiple clusters was performed



Footnote* The categories constitute depressive symptomatology and not a clinical diagnosis

Figure 2. CES-D Scores, Depressed vs. Non Depresssed*

Table 2. Patients Relevant Response Percentages in CES-D Items

ITEM	Percent (%)
"felt that are as good as other people"	78
"felt sad"	74
"felt Depressed"	74
"hopeful about future"	66.7
"crying spells"	59
"not get going"	59
"sleep are restless"	55.5
"felt alone"	51.8
"everything that they doing have an effort"	51.5
"felt fearful"	44.4
"problem to keep in mind on what their doing"	44
"talk less than usual"	41
"failure at least sometime in their life"	33
"people dislike them"	33

Table 3. Hierarchical Regression Equation (4 Cluster Steps)

Cluster	*R*	R^2	*DR*
Step 1			
Socio-demographic	719*	.517	.517
Step 2			
Attitudes	.773*	.597	.072
Step 3			
Knowledge/Understanding	.902*	.814	.202
Step 4			
Health Information	1.00*	1.00	1.00

Note: Cluster variables composition may be solicited to Dr. Jose Rodriguez, via electronic mail: jrrodz@coqui.net
*p <.05.

(Table 3). Four clusters were composed: the first one included socio-demographic information (21 variables); the second one included diabetes patient's attitudes (17 variables); the third one took into consideration knowledge /understanding of patients (14 variables); and the fourth and last cluster, included patient health information (31 variables). The regression equation used predicts 100% of the criteria variable (CES-D total score) in the best optimized/fixed model according to the best mathematical equation model identify at a 95% confidence interval.

Equation: $Y_i = x_1b_1 + x_2b_2 + x_3b_3 + x_4b_4 + e_i$

The best predictable variables in the equation are: "religion", "marital status", "education", "relatives with diabetes", "time with diabetes diagnosis/ condition", "gender", and "my wife help me with the diabetes condition". When we used the previous variables, they can explain 34% of the CES-D scores in our sample. We need to remember that we have a limitation in sampling (n = 27) that may affect these results, especially with the predictable equation. Nevertheless, this gives us a general understanding of what predictable variables are relevant to deal with the control of depressive symptomatology in diabetes type 2 patients.

Socio-demographic, diabetes attitudes, knowledge/ understanding and health information clusters and there association with the CES-D scores (Table 4 and 5). Follow the main types of association encountered within socio-demographic, diabetes attitudes, knowledge/ understanding and health information clusters and the CES-D scores.

Matching by age and gender a strong and significant negative association appears between patients who "want to receive education in diabetes" and patients who "receive education in diabetes" (r = -1.00, p=. 000). In addition, it was found a negative strong and significant association between "complication due diabetes", and "ophthalmologic problems" with "education in diabetes" (r = -1.00, p =. 000). Furthermore, there is a high, significant negative association with attitudinal item "strict glycemic control and continue enjoy life" with patients had "received diet or exercise education" (r = -1.00, p= .000). CES-D score have a negative, strong, and significant association with had "receive education about diabetes and/or stress" (r = -.98, p = .023); also they have a negative and significant association with "receive education for high blood sugar problems" (r= -.98, p= .022).

T test was performed to check statistical differences between genders. No significant differences were found, however, when tested for age, t test was significant in the 29 to 50 years age range for subjects that "receive education for complication due to diabetes" and had "received education for high blood sugar problems" (t (25) = 331.07, p= .000).

Conclusions/Discussion

Depression, as measured by the Center for Epidemiological Studies Depression Scale (CES-D), is associated with patients' health information, needs, knowledge and understanding of diabetes mellitus type 2, (DMT2) in typical ways. As found in this study, positive attitudes, knowledge and understanding of the DMT2 condition help to prevent their depressive symptomatology. This is consistent with the literature in this field. However, some attitudinal items (i.e., strict glycemic control and enjoying life), obtain a negative, strong, and significant association with diabetes education that can be explained by the possibility of social indirect knowledge and a misunderstanding of the condition.

Implications and Recommendations. More research

Table 4. Significant Index Correlations of Specific Clusters Items Controlling by Age

Items	Type of association* (Controlling by age)	Index
"which person help patients with their diabetes" and "marital status"	high moderate, positive, and significant	(r = .74, p = .002)
"diabetes modified my life perception", and CES-D total score	moderate, negative and significant	(r = -.48, p= .033)
"patients receive education about diabetes", and "high levels in cholesterol"	high, negative and significant	(r = -.91, p = .031)
"how did your mood affect your daily ingestion plan" with patients "receive diabetes education"	positive, strong, and significant	(r =.94, p = .017)
"receive diabetes education" with the CES-D scores	negative, strong, and significant	(r = -.98, p =.004)
"strict glycemic control and continue enjoy life" with patients that had "receive exercises education"	high, negative and significant	(r = -.98, p = .004)
"high blood pressure levels" with "receive education in stress relieve strategies"	negative, strong and significant	(r = -.94, p = .016)
"high blood pressure levels" with "receive education in diabetes complications"	negative, strong and significant	(r = -. 91, p = .032)
" strict diabetes glycemic control and continue enjoy life" with "receive education about diabetes"	negative, strong, and significant	(r = -1.00, p = .000)

*Types of associations is according to Champion (1981).

is suggested to explore minority DMT2 patient's attitudes and how they may affect mental health status, including depression. Further research is needed to explore more deeply the influence in which the predictable variables obtained in this research help to explain depression. We recommend the development of public policies that support the creation of programs that offer sensitive strategies, especially for minorities, that help to change negative attitudes and behaviors of DMT2 patients. This study also demonstrated the positive impact that diabetes educators have in the management and control of patient conditions. The diabetes educator teaching strategies obtain a high, positive, and significant association with patients that had received education in diabetes (in their native language, Spanish). This is an important finding, since it demonstrates that cultural sensitive strategies effectiveness in the diabetes educator program at the CDPR are successful and useful for the prevention of diabetes associated conditions in minorities.

Resumen

Propósito: La prevalencia de diabetes mellitus en puertorriqueños ha sido identificada y reportada como desproporcionalmente alta si se compara con otras enfermedades metabólicas (CDC, 2002; Pérez, Pérez & Suárez, 2001). Recientemente, diabetes ha sido identificada como la tercera causa de mortalidad en Puerto rico (Departamento de Salud, Reporte anual de estadísticas vitales, 1999-2001). El Centro de Diabetes para Puerto Rico (CDPR) es una corporación pública creada por el gobierno para reducir la prevalencia de diabetes, mortalidad y morbilidad.

Metodología: El CDPR ofrece un Programa de Adiestramiento Educativo para el Auto-Manejo de la Diabetes (PAEAD) en diferentes municipios a través de la isla. El diseño que se utilizo fue uno ex post facto. Como parte del proceso, a los pacientes se les administra un extenso cuestionario demográfico y de salud, que incluye el CES-D (escala de sintomatología depresiva). El siguiente proyecto de investigación describe los perfiles de 27 pacientes (n=27) usando información del PAEAD del CDPR y explorando su asociación con el CES-D. Variables tales como necesidades del paciente, conocimiento y entendimiento de su condición (i.e. manejo de la patología, tipo de medicamentos utilizados y patrones de ejercicio, y nutrición), actitudes hacia la diabetes y su relación con el CES-D fueron explorados.

Resultados: Los hallazgos muestran una asociación inversa controlando para edad y genero, entre pacientes

Table 5. Significant Index Correlations of Specific Clusters Items Controlling by Gender

Items	Type of association* (Controlling by gender)	Index
"marital status", and "somebody help diabetes patients with their condition"	positive, high, and significant	(r = .72, p = .005)
"how many times eat outside" and "receive education about diabetes"	negative, strong and significant	(r = -.91, p = .029)
"chronic complication" with "receive education about diabetes"	negative, strong, and significant	(r = -1.00, p = .000)
ophthalmic problems" with "receive education about diabetes"	negative, strong, and significant	(r = -1.00, p = .000)
"diabetes educator teaching strategies" with "receive education in diabetes"	high, positive, and significant	(r = 1.00, p = .000)
"my mood affect my eating behaviors" with "receive education in diabetes"	positive, strong, and significant	(r = .95, p = .013)
"my mood affect my eating behavior" with "receive education in stress relieve strategies"	positive, strong, and significant	(r = .93, p = .012)
"strict glycemic control and continue enjoy life" with "receive education in diabetes"	negative, strong, and significant	(r = -1.00, p = .000)

*Types of associations is according to Champion (1981).

con educación/entendimiento de su condición y las puntuaciones del CES-D.

Conclusiones: Los educadores en diabetes en Puerto Rico necesitan proveer adiestramiento educativo adecuado para el manejo de la diabetes. Al así hacerse, se tiende a disminuir la sintomatología depresiva. Esto tiene serias implicaciones, como lo es el prevenir complicaciones de salud mental en los pacientes diabéticos que puede afectar su tratamiento futuro y prognóstico. El equipo de intervención debe ser interdisciplinario para que sea mas efectivo.

References

1. World Health Organization. *Diabetes Mellitus* (Fact Sheet No. 138). Geneva; April, 2002. WHO Media Centre.
2. CDC. Preventive Care Practices Among Adults with Diabetes-Puerto Rico, 2000-2002. *MMRW. 2004; 53* (44), 1047-1050.
3. Rodríguez, J. R. & Rodríguez, R.J. Antología de Investigaciones del Centro de Diabetes para Puerto Rico. Centro de Diabetes para Puerto Rico, Estado
4. CDC. Self-reported prevalence of Diabetes among Hispanics-United States, 1994-97. *MMWR.* 1999; *48*, 8-12.
5. Melnik, T.A., Hosler, A.S., Sekhobo, J.P. Duffy, T.P., Tierney, E.F, Engelgau, M.M. & Geiss, L.S. Diabetes prevalence among Puerto Rican adults in New York City. *American Journal of Public Health.* 2004; *94* (3) 434-7.
6. *Puerto Rico Health Department: Office of Health Statistics. Puerto Rico Annual Report for Vital Statistics.* (1999-2001). Estado Libre Asociado de Puerto Rico, San Juan, Puerto Rico.
7. Tucker, K.L., Bermúdez, O.I. & Castañeda, C. Type 2 Diabetes is prevalent and poorly controlled among Hispanic elders of Caribbean origin. *American Journal of Public Health.* 2000; *90* (7) 1288-93.
8. Puerto Rico Health Department. *Causas de mortalidad: Evolución anual 1989-2001.* Available at: http://www.tendenciaspr.com Accessed October 12, 2004.
9. CDPR. Tendencias en la mortalidad por diabetes, Puerto Rico, 1999-2001. *Boletín Informativo Centro de Diabetes para Puerto Rico. San Juan, Puerto Rico. Centro de Manejo de Datos; 2004.*
10. Kaholokula, J.K., Haynes, S.N, Grandinetti, A. & Chang, H.K. Biological, psychosocial and sociodemographic variables associated with depressive symptoms in person with type 2 diabetes. *Journal of Behavioral Medicine. 2003; 26* (5), 435-58.
11. Haan, M.N., Mungas, D.M., González, H.M., rtiz, T.A., Acharya, A. & Jagus, W.J. Prevalence of Dementia in Older Latinos: the influence of type 2 Diabetes Mellitus, stroke and genetic factor. *Journal of American Geriatric Society.* 2003; *51* (2), 169-77.
12. Lin, E.H.B., Katon, W., Von Korff, M., Rutter, C., Simon, G.E., Oliver, M., Ciechanowski, P., Ludman, E.J, Bush, T. & Young, B. Relationship of depression and diabetes self-care, medication adherence and preventive care. *Diabetes Care.* 2004; *27* (9), 2154-2160.
13. Musselman, D.L., Betan, E.,Larsen, H. & Phillips, L.S. Relationship of depression to diabetes types 1 and 2: epidemiology, biology and treatment. *Biol. Psychiatry. 2003; 54*, 317-329.
14. Anderson, R.J., Freedland, K.E., Clouse, R.E., Lustman, P.J. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. *Diabetes Care. 2001; 27*, 1069-1078.
15. Lustman, P.J., Anderson, R.J., Freedland, K.E., de Groot, M., Carney, R.M., Clouse, R.E. Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care. 2000; 23*, 934-942.
16. Okamura, F., Tashiro A., Utumi, A., Imai,T., Suchi, T., Tamura, D., Sato, Y., Suzuki, S., Hongo, M. Insulin resistance in patients with depression and its changes during the clinical course of depression: minimal model analysis. *Metab. Clin. Exp. 2000; 49*, 1255-1260.
17. Carnethon, M.R., Kinder, L.S., Fair, J.M., Stafford, R.S. & Fortmann, S.P. Symptoms of depression as a risk factor for incident diabetes: findings from the National Health and Nutrition Examination Epidemiologic Follow-up Study, 1971-

1992. *American Journal Epidemiology, 2003; 158*, 416-423.
18. Golden, S.H., Williams J.E., Ford D.E., Yeh H-C, Sanford, C.P., Nieto, F.J. & Brancati, F.L. Depressive symptoms and the risk of type 2 diabetes. *Diabetes Care. 2004; 27*, 429-435.
19. Eaton, W.W., Armenian, H., Gallo, J., Pratt,L., Ford, D. Depression and risk for onset of type 2 diabetes: a prospective population-based study. *Diabetes Care. 1996; 19*, 1097-1102.
20. Kawakami,N., Takatsuka,N., Shimizu, H., Ishibashi,H. Depressive symptoms and occurrence of type 2 diabetes among Japanese men. *Diabetes Care.* 1999; 22, 1071-1076.
21. Talbot,F. & Nouwen, A.A review of the relationship between depression and diabetes in adults: is there a link? *Diabetes Care. 2000; 23*, 1550-1562.
22. Chiba, M., Suzuki, S., Hinokio, Y., Iria, M., Satoh, Y., Tashiro, A., Utsumi, A., Awata, T., Hongo, M. & Toyota, T. Tyrosine hydroxylase gene microsatellite polymorphism associated with insulin resistance in depressive disorder. *Metabolism. 2000; 49*, 1145-1149.
23. Lawlor, D.A., Davey Smith, G. & Ebrahim, S. Association of insulin resistance with depression: cross sectional findings from the British Women's Heart and Health Study. BMJ. *20003; 327*, 1383-1384.
24. De Groot, M. & Lustman, P.J. Depression among African-Americans with diabetes: a dearth of studies. *Diabetes Care. 2001; 24*, 407-408.
25. Davidson, M.B. The disproportionate burden of diabetes in African-American and Hispanic populations. *Ethn Dis. 2001; 11*, 148-151.
26. Pérez, R., Pérez, C.M. & Suárez , E.L. Trends in Diabetes Mellitus Mortality in Puerto Rico: 1980-1997. *PRHSJ.* 2001; *20*(1), 19-24.
27. Everson, S, Meyer, P., Powell, L.,Pandey,D.,Torrens, J., Kravitz, H. , Bromberger, J. & Matthews, K. Depressive symptoms, insulin resistance, and risk of diabetes in women at midlife. Diabetes Care. 2004; 27, 418-423
28. National Institute of Mental Health. *Depression and diabetes* (NIH Publication 02-5005). Bethesda, MD: May 2004.US Government Printing Office.
29. Arroyo, C.,Hu, F.B., Ryan, L.M., Kawachi, I., Colditz,G.A., Speizer, F.B. & Manson, J. Depressive symptoms and risk of type 2 diabetes in women. *Diabetes Care.* 2004; 27(1), 129-133.
30. González, V., Stewart, A., Ritter, P. & Lorig, K. Translation and validation of arthritis outcome measures into Spanish. *Arthritis and Rheumatism.* 1995; *38* (10) 1429-1446.
31. Roberts, R.E. (1980). Reliability of the CES-D scale in different ethnic contexts. *Psychial U Res. 1980; Vol.* (2)125-134.
32. Mahard, R. The CES-D as a measure of depressive mood in the elderly Puerto Rican population. *Journal of Gerontology.* 1988; *43*(1) 24-5.