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High Rates of Depressive Symptoms in Low-Income Urban Hispanics of Caribbean Origin with Poorly Controlled Diabetes: Correlates and Risk Factors

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Abstract

Little is known about diabetes and depression in disadvantaged urban Hispanic subgroups, particularly those of Caribbean origin. Using data from 360 urban Hispanics of Caribbean origin with poorly controlled diabetes, our objectives were to examine the prevalence and correlates of

depressive symptoms and depression using the Euro-D, and the association of depressive symptoms and depression with diabetes self-management and clinical parameters of diabetes control, employing multivariate analyses. The prevalence of depression was 52.8%. Higher levels of depressive symptoms were related to female gender ($p < .0001$), antidepressant use ($p < .0001$), stressful life events ($p < .0001$), SSI ($p = .0011$), lower education ($p < .0001$), lower statin use ($p = .0014$), and less walking ($p = .0152$). Depression (Euro-D > 3), was associated significantly with female gender (OR = 2.30, 95%CI = 1.38– 3.82), SSI (OR = 2.44, 95%CI = 1.45– 4.12), antidepressant use (OR = 2.94, 95%CI = 1.54– 5.64), and stressful life events (OR = 1.93, 95%CI = 1.52– 2.44). Depressive symptoms and depression were related to markers of adversity and two indicators of diabetes self-management, but not clinical parameters of diabetes control.

Keywords

Diabetes; depression; health disparities; Hispanics; urban; epidemiology

The risk of type 2 diabetes in Hispanic adults is about 1.5 times higher than in non-Hispanics Whites in nationally representative samples.^{1,2} Hispanics with type 2 diabetes also have diminished access to care and worse outcomes than non-Hispanic Whites.³ While depression is more prevalent among people with type 2 diabetes than in the general population,⁴ Hispanics with type 2 diabetes have a higher prevalence of comorbid depression than non-Hispanic Whites,² and their depression is more likely to be undertreated.⁵

Because depression in those with type 2 diabetes is associated with lower quality of life, poorer glycemic control, lower medication adherence, and higher risk of complications from diabetes,^{3,6,7} Hispanics with comorbid depression and type 2 diabetes are likely to experience a particularly pernicious course of illness and require additional attention for the clinical management of diabetes. However, most studies addressing comorbid depression and diabetes in Hispanics have not examined in detail specific Hispanic subgroups, such as those of Caribbean origin, and socioeconomically disadvantaged urban populations. These subgroups may differ substantially from Hispanics in nationally representative samples, and may have group-specific burdens and clinical needs associated with comorbid depression and diabetes.

We sought to elucidate clinically informative associations among depressive symptoms, depression, and diabetes management in Hispanics of Caribbean origin. We used baseline data from the Northern Manhattan Community Outreach Program (NOCHOP), comprising 360 Hispanics of Caribbean origin with poorly controlled diabetes (HbA1c $> 8.0\%$) residing in the Washington Heights-Inwood areas of Manhattan, home to the largest immigrant population of Hispanics originating from the Dominican Republic.⁸ The NOCHOP is a randomized controlled trial of a 12-month community health worker intervention to improve diabetes management Hispanics. Our objectives were to determine: 1) the prevalence and correlates of depressive symptoms among subjects enrolled in NOCHOP; 2) the associations among depressive symptoms, depression, and six of the seven American Association of Diabetes Educators (AADE) indicators of diabetes self-management (healthy eating, being

active, monitoring, taking medication, problem solving, reducing risks, and healthy coping); and 3) the associations among depressive symptoms, depression, and the clinical parameters of diabetes control, known as the ABCs (HbA1c, blood pressure, and LDL cholesterol). We hypothesized that depressive symptoms would be associated with poor diabetes self-management and with higher HbA1c levels, higher blood pressure, and higher cholesterol levels.

Methods

The NOCHOP study has been described in detail elsewhere.⁸ Briefly, NOCHOP study participants were recruited from the Ambulatory Care Network at Columbia University Medical Center (CUMC). Potential participants were eligible if they were Hispanic, aged 35–70 years, resided in Northern Manhattan or Western Bronx (based on ZIP code), and received an HbA1c test in the prior 12 months with a value greater than 8.0%. Potential participants were ineligible if they were deemed inappropriate by their PCP, had type 1 diabetes, had a life-threatening or severe and disabling illness, were first diagnosed with diabetes in the prior 12 months, planned to move out of the community within the following 12 months, were participating concurrently in another CVD or diabetes intervention trial, or had an arm circumference greater than 47cm. Of the 2,232 potential participants, 1,396 (62.5%) were screened initially as ineligible. Of the 836 (37.5%) who were screened initially as eligible, 145 (17.3%) were ultimately deemed ineligible, 174 (20.1%) were not interested, and 157 (18.8%) could not be reached. The initial screening yielded a sample of 360 participants who were randomized in the study and received an in-person baseline evaluation at CUMC. All participants provided written informed consent, and the research design, survey questions, and study procedures were approved by the Institutional Review Board at CUMC.

Measures

All survey measures were obtained from trained staff using a computer assisted patient interview (CAPI) system. Depressive symptoms and depression were measured using the 12-item Euro-D,⁹ an empirically validated instrument in English¹⁰ and Spanish.¹¹ Scores range from 0 to 12, with a maximum score of 12; a Euro-D score greater than this consistent with *DSM*-defined major depression assessed with the Diagnostic Interview Schedule.⁹ The Spanish version of Euro-D demonstrated 92% sensitivity and 77% specificity for a score greater than 3, and 77% sensitivity and 89% specificity for a score greater than 4.¹¹

Potential sociodemographic correlates of depression included age, gender, education (years), annual income (less than \$3,000; \$3,001–\$10,000; \$10,001–\$20,000; \$20,001 or more), current employment status (employed, unemployed, on disability, or other [retired, homemaker]), receipt of Supplemental Security Income (SSI) (yes/ no), and past-year stressful life events (count). Past-year stressful life events included marital separation or divorce, job loss or retirement, violence, major intra-family conflict, major personal injury or illness, death or major illness of a close family member, death of a spouse, or other major stress.

Indicators of diabetes self-management and their respective self-reported measures included: 1) healthy eating, measured with a food frequency questionnaire using an item assessing the frequency with which vegetables including carrots were consumed; 2) being active, measured with the International Physical Activity Questionnaire (IPAQ) using past-week moderate activity (MET-minutes/week) exclusive of walking, and IPAQ past-week walking (MET-minutes/week); 3) taking medication, measured with the 8-item Morisky Medication Adherence Scale¹² (scores range from 0 to 8, with 8 being the most adherent); 4) reducing risks, measured with dichotomous items querying whether the participant is currently taking statins (yes/no), taking aspirin (yes/no), and abstaining from smoking (smoking status: current, former, never); and 5) problem-solving and healthy coping, measured with the 9-item positive control subscale of the 22-item Perceived Diabetes Dietary Competence and Self-Efficacy Scale.¹³ The positive control subscale includes items such as, “I am able to do what it takes to control my diabetes,” “I succeed in the steps I take to control my diabetes,” “I am taking charge of my diabetes,” and “In taking care of my diabetes, I set certain goals for changing my eating habits.” These items were scored with a 4-point Likert scale ranging from “disagree a lot” to “agree a lot.”

As described elsewhere,⁸ HbA1c levels and plasma LDL cholesterol levels were measured after overnight fasting. Blood pressure was measured after resting for 15 minutes; three measurements were obtained, and the average of the last two measurements was used.

Statistical analyses

First, descriptive statistics were calculated for all study variables using SPSS Statistics (version 19.0, IBM Corporation, 2010). Second, we analyzed the psychometric properties of the Euro-D and the Morisky Medication Adherence Scale and its three subscales for this sample. Third, to identify unique correlates of depressive symptoms, multivariate regression analysis with mixed effects modeling using SAS proc mixed (version 9.3, SAS Institute Inc., 2011) was employed to account for the correlation between subjects within a primary care physician, given the sample recruitment strategy; the analysis was conditioned on all variables entered into the model. Fourth, binary logistic regression with stepwise entry of covariates using SPSS (version 19.0, IBM Corporation, 2010) was employed to examine associations among depression (Euro-D score > 3) and significant correlates identified in our mixed model multivariate regression analyses of depressive symptoms, adjusted for the all other uniquely identified correlates entered into the model. Two participants did not complete the assessment of depression, limiting the present analyses to 358 subjects.

Results

Socio-demographic, clinical, and health behavior characteristics of the sample are presented in Table 1. The sample was largely female, socioeconomically disadvantaged according to multiple indicators, and received social services. Most participants were clinically obese, and HbA1c levels reflected poor glycemic control; other cardiovascular risk factors were largely within normal ranges. While most of the sample took statins and aspirin, medication adherence overall was low.

Forty-nine participants (13.7%) reported no depressive symptoms, 120 (33.6%) reported 1–3 symptoms, 95 (26.5%) reported 4–6 symptoms, 69 (19.3%) reported 7–9 symptoms, and 25 (7.0%) reported 10–12 symptoms. The mean Euro-D score was 4.27 (SD = 3.23). The prevalence of depression (estimated as a Euro-D score > 3) in this sample was 52.8%.

For this sample, Cronbach's alpha for the Euro-D depression scale was 0.84 and the explained common variance (ECV) was 36.08% with eigenvalues of 4.33 and 1.10. Cronbach's alpha for the Morisky Medication Adherence Scale was 0.71, and the ECV was 35.56% with eigenvalues of 2.85 and 1.07. Cronbach's alpha for the positive control subscale of the Perceived Diabetes Dietary Competence Scale was 0.81; the ECV was 41.6% with eigenvalues of 3.70 and 1.12. For the negative competence subscale, Cronbach's alpha was 0.75 and the ECV was 46.29% with one eigenvalue (over 1) of 2.78. For the negative control subscale Cronbach's alpha was 0.82 and the ECV 58.19% with one eigenvalue (over 1) of 2.91.

As illustrated in Table 2, in mixed model multivariate regression analyses conditioned on all other variables in the model, depressive symptoms, as measured by the Euro-D score (intercept = 6.47, $p = .0026$), were predicted significantly by female gender ($\beta = 1.28$, $p < .0001$), antidepressant use ($\beta = 1.30$, $p < .0001$), and past-year stressful life events ($\beta = 0.99$, $p < .0001$). Receipt of SSI benefits was also significantly, albeit more modestly, associated with higher levels of depressive symptoms ($\beta = 0.08$, $p = .0011$). Depressive symptoms were negatively associated with the number of years of education ($\beta = -0.10$, $p < .0001$).

Depressive symptoms were associated significantly with only two of the six AADE self care behaviors; depressive symptoms were negatively associated with an indicator of taking medication, statin use ($\beta = -0.82$, $p = .0014$), and with an indicator of being active, past-week walking ($\beta = -0.0005$, $p = .0152$). Depressive symptoms were not significantly associated with any of the clinical parameters of diabetes self-management, known as the ABCs (HbA1C levels, blood pressure, and cholesterol).

Table 3 presents the results of binary logistic regression analyses of significant depressive symptom correlates identified in multivariate mixed model analyses and clinical depression, as measured by a Euro-D score greater than 3. Clinical depression was strongly and significantly associated with female gender (OR = 2.30, 95%CI = 1.38–3.82), receipt of SSI (OR = 2.44, 95%CI = 1.45–4.12), antidepressant use (OR = 2.94, 95%CI = 1.54–5.64), and past-year stressful life events (OR = 1.93, 95%CI = 1.52–2.44), but not with the years of education, statin use, or past-week walking.

Discussion

In this sample of 358 economically disadvantaged, Caribbean-origin Hispanics with poorly controlled type 2 diabetes in Northern Manhattan, depression was found in over half of the sample; only 21.4% reported taking antidepressants. Depressive symptoms were significantly associated cross-sectionally with some indicators of diabetes self-management, but not with clinical parameters of diabetes control. Unique correlates of depressive symptoms in this population included being female, lower education level, receiving SSI,

lower statin use, antidepressant use, past-year stressful life events, and lower past-week walking scores. Of these correlates of depressive symptoms, only being female, receiving SSI, antidepressant use, and past-year stressful life events were significantly associated with clinical depression, as measured with the Euro-D.

Prior studies have shown that depression is more prevalent in people with diabetes than in the general population; a 2001 meta-analysis estimated depression to be twice as common in those with type 2 diabetes.⁴ Indeed, many symptoms overlap.^{14,15} Comorbid depression and type 2 diabetes are more common in Hispanics than in non-Hispanic Whites, according to analyses of data from the 2006 Behavioral Risk Factor Surveillance System (BRFSS), and depression in Hispanics is both underdiagnosed and undertreated.² Furthermore, a number of studies have shown that depression is associated with poorer glycemic control, lower quality of life, lower medication adherence, and higher risk of complications from diabetes.^{3,6,7} This in turn may worsen depressive symptoms.^{15–17}

Our results depart from prior reports in several key areas. First, the prevalence of depression in our sample, primarily comprising Hispanics of Caribbean origin, is markedly higher than the prevalence reported in national surveys; the prevalence of depression in our sample was 52.8%, while undiagnosed depression among Hispanics with diabetes in the 2006 BRFSS was 13.9%.² However, Hispanics in the BRFSS were a heterogeneous group; each state has a unique composition of Hispanic subgroups. Moreover, Hispanics included in the BRFSS were not as economically disadvantaged as the Hispanic subgroup included in this report. Therefore, there are no benchmark epidemiological data for our subgroup of Hispanics, most of whom were of Dominican origin. Still, the high prevalence of depression in this sample is consistent with other published studies with Northern Manhattan community samples. For example, at the baseline evaluation in the Informatics in Diabetes Education and Telemedicine (IDEATel) study,¹⁸ of 616 Hispanic participants of Caribbean origin, 54% had a Euro-D score greater than 3, and 41% had a score greater than 4.¹⁹ It is unclear the degree to which national origin and/or the Northern Manhattan context in which this population resides contributes to the high burden of depressive symptoms and their under-treatment.

Similarly, the low rate overall of antidepressant use in this sample (21.4%) is consistent with other recent reports indicating under-treatment of depression in minority samples.⁵ However, both depressive symptoms and clinical depression were significantly associated with antidepressant use in our sample. Among the 186 subjects with a Euro-D score greater than 3, which is consistent with a diagnosis of major depression, 60 (32.3%) were taking an antidepressant. Similarly, among the 77 participants taking antidepressants, 60 (77.9%) had a Euro-D score greater than 3. Thus, it appears that antidepressant use in this sample was consistent with clinical need.

Second, in contrast to a number of studies,^{6,7,17,20} depressive symptoms were not associated significantly with clinical parameters of diabetes control, although systolic blood pressure approached significance. However, our sample was limited to poorly controlled diabetes (HbA1c > 8.0%). It is possible that limited variation in the clinical parameters of diabetes control attenuated the correlations with depressive symptoms and observed associations with depression reported by other studies. This is consistent with a prior report using a larger

sample of Hispanics drawn from the same care network in Northern Manhattan, which demonstrated a weak association between depression and HbA1c and no association with the prospective course of HbA1c.^{6,17,19,20}

Third, in this particular sample of Hispanics, medication non-adherence was not associated significantly with depressive symptoms, nor with clinical depression, in contrast to other studies.⁷ However, few other studies have focused on socioeconomically disadvantaged urban populations, none have focused on Hispanics, and to our knowledge, none have included Hispanic subgroups of Caribbean origin. Our measure of medication adherence, the 8-item Morisky Medication Adherence Scale (MMAS), has demonstrated acceptable reliability (Cronbach's $\alpha = 0.83$) and both concurrent and predictive validity in low-income minority patients with hypertension.¹² Spanish was the primary language for the vast majority (85.8%) of our study participants; a recent study of socioeconomically disadvantaged Hispanics with diabetes in Texas reported the Spanish translation of the MMAS demonstrated acceptable reliability (Cronbach's $\alpha = 0.76$). In this particular Hispanic subgroup, 64 (17.9%) had a Morisky score of 6 or greater, indicating at least moderate medication adherence or better.¹² It is possible that perceptions of medication adherence are enhanced in this particular subgroup of Hispanics. While self-report questionnaires assessing medication adherence like the MMAS are modestly correlated with objective measures, the gold-standard measure of adherence, the Medication Event Monitoring System, has been shown to produce lower estimates of adherence.²¹

This study has several limitations. First, it was a cross-sectional baseline analysis of a randomized controlled trial (RCT) sample, and is representative only of participants in a clinical trial. However, these trial participants are drawn from a community-based care network in Northern Manhattan and the Western Bronx, which provides services to a large and growing population of urban Hispanics, mainly from the Dominican Republic, that has not been well represented in the literature addressing diabetes and depression. Second, with the exception of biological measures, all measures were self-reported. However, these self-report measures have been validated and demonstrate good psychometric properties.^{9,10} Third, given the high prevalence of depression in our sample, odds ratios deviating greatly from the null should be interpreted with caution, as they may be inflated compared with the risk ratio. However, the chance of quantitative inflation does not affect the qualitative interpretation of our findings.²²

In summary, we identified correlates of prevalent depressive symptoms. Several of those variables were also associated with clinical depression in this large and growing socioeconomically disadvantaged urban Hispanic subgroup of Caribbean origin with poorly controlled diabetes. While depressive symptoms were related to some socio-demographic indicators of adversity and diabetes self-management, they were not related to clinical parameters of diabetes control. It is necessary to examine these associations in longitudinal analyses using objective (i.e., not self-reported) measures of process of care, and to examine further whether treatment of depression among people with poorly controlled diabetes improves measures of process of care and diabetes control, which will provide important information for clinical care.

Notes

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Table 1**SOCIO-DEMOGRAPHIC, CLINICAL, AND HEALTH BEHAVIORAL CHARACTERISTICS OF THE NOCHOP SAMPLE (N = 358)**

Age (years, mean (SD))	57.6 (7.8)
Gender (% female)	61.7
Marital Status (%)	
Single/Never Married	17.3
Living with Sig Other	4.7
Married	32.4
Separated/Divorced/Widowed	45.2
Nativity (% foreign born)	97.2
Primary Language (% Spanish)	85.8
Annual Income (%)	
Less than \$3,000	10.9
\$3,001–\$10,000	44.4
\$10,001–\$20,000	33.0
\$20,001 or more	10.6
Education (years, mean (SD))	8.43 (3.87)
Employment Status (%)	
Employed	18.2
Unemployed	29.0
On Disability	45.8
Other (Retired, Homemaker)	16.8
Social Services (%)	
Receives SSI	62.6
Medicaid	88.8
Medicare	29.9
Body Mass Index (mean (SD))	31.61 (6.60)
HbA1c (mmHg, mean (SD))	8.67 (1.64)
Systolic blood pressure (mmHg, mean (SD))	136.41 (17.82)
Diastolic blood pressure (mmHg, mean (SD))	80.97 (9.80)
Total cholesterol (mean (SD))	170.21 (41.05)
LDL (mg/ dL, mean (SD))	97.21 (34.53)
Triglycerides (mg/ dL, mean (SD))	147.37 (85.43)
Euro-D score (mean (SD))	4.27 (3.23)
Past year life events/ stressors (mean (SD))	1.18 (1.17)
Smoking (%)	
Never	55.0
Former	33.6
Current	10.8
Morisky Medication Adherence Scale (mean (SD))	2.83 (2.47)
Aspirin use (%)	65.6

Statin use (%)	53.3
Antidepressant use (%)	21.4

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Table 2

MULTIVARIATE CORRELATES OF DEPRESSIVE SYMPTOMS, MEASURED BY THE EURO-D SCORE

	Estimate	Standard Error	p-value
Intercept	6.4681	2.1127	0.0026
Age	-0.0267	0.0201	0.1850
Gender (female)	1.2815	0.3176	<0.0001
Education (years)	-0.1002	0.0389	0.0109
Annual income	0.0032	0.0160	0.8426
Employment status	0.1378	0.1051	0.1918
Receives SSI (Supplementary Security Income)	0.0881	0.0264	0.0011
HbA1c	-0.0485	0.0876	0.5809
LDL Cholesterol	0.0040	0.0044	0.3597
Systolic blood pressure	-0.0154	0.0083	0.0650
Body Mass Index	0.0240	0.0228	0.2945
Morisky medication adherence	0.0323	0.0496	0.5166
Takes aspirin (yes/no)	-0.4695	0.2647	0.0782
Takes statins (yes/no)	-0.8182	0.2519	0.0014
Takes antidepressants (yes/no)	1.3045	0.2683	<0.0001
Past year life events/ stressors (count)	0.9921	0.1249	<0.0001
Vegetable consumption	-0.0196	0.0201	0.3299
Perceived Diabetes Dietary Competence: Positive Competence	0.0001	0.0003	0.7182
Perceived Diabetes Dietary Competence: Negative Control	-0.0326	0.0496	0.5129
IPAQ: Moderate Activities (MET-minutes/ week)	0.0001	0.0003	0.8416
IPAQ: Walking (MET-minutes/week)	-0.0005	0.0002	0.0152

Table 3

MULTIVARIATE ASSOCIATIONS OF CLINICAL DEPRESSION (EURO-D SCORE >3) WITH CORRELATES OF DEPRESSIVE SYMPTOMS: ODDS RATIOS AND 95% CONFIDENCE INTERVALS

	Odds Ratio	95% Confidence Interval
Gender (female)	2.30	1.39–3.82
Education (years)	0.98	0.92–1.05
SSI benefits (yes/no)	2.44	1.45–4.12
Statin use (yes/no)	0.64	0.39–1.05
Antidepressant use (yes/no)	2.95	1.54–5.64
Past-year stressful life events	1.93	1.52–2.44
IPAQ walking (MET-minutes/week)	1.00	0.99–1.00