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Factors associated with antidepressant use among low-income racially and ethnically diverse patients with type 2 diabetes

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ABSTRACT

Objective: Depression is common in patients with type 2 diabetes and associated with poor diabetes-related outcomes. We evaluated the factors associated with antidepressant use in a low-income, racially and ethnically diverse sample of patients with type 2 diabetes.
Research design and methods: We performed a cross-sectional study of baseline data from participants in a cluster randomized trial evaluating a health literacy intervention for diabetes care in safety net clinics. Depressive symptoms were measured by the Center for Epidemiological Studies Depression Scale (CES-D); antidepressant use was abstracted from medication lists. Multivariable mixed effects logistic regression was used to evaluate the relationship between antidepressant use and race/ethnicity adjusting for depressive symptoms, age, gender, income, and health literacy.
Results: Of 403 participants, 58% were non-Hispanic White, 18% were non-Hispanic Black, and 24% were Hispanic. Median age was 51 years old; 60% were female, 52% of participants had a positive screen for depression, and 18% were on antidepressants. Black and Hispanic participants were significantly less likely to be on an antidepressant compared with white participants, adjusted odds ratios 0.31 (95% CI: 0.12 to 0.80) and 0.26 (95% CI: 0.10 to 0.74), respectively.
Conclusions: In this vulnerable population with type 2 diabetes, we found a high prevalence of depressive symptoms, and a small proportion of participants were on an antidepressant. Black and Hispanic participants were significantly less likely to be treated with an antidepressant. Our findings suggest depression may be inadequately treated in low-income, uninsured patients with type 2 diabetes, especially racial and ethnic minorities.

1. Introduction

Although depression affects approximately a quarter of patients with type 2 diabetes and is associated with worse glycemic control and diabetes-related outcomes, limited evidence exists of the patient characteristics that influence whether depression is treated in this population.[1–3] Adults with type 2 diabetes are twice as likely as adults in the general population to experience psychological distress, including depression.[1] A bidirectional relationship has been demonstrated between diabetes and depression.[4] In patients with type 2 diabetes, depression has been shown to negatively affect self-care behaviors, treatment adherence, and glycemic control and is associated with higher rates of diabetes-related complications and all-cause mortality.[5–9] Treatment with antidepressant medications in patients with diabetes has been shown to improve depressive symptoms; though, evidence on the effects of antidepressant treatment on glycemic control is mixed.[10–12]

Important differences in diabetes and diabetes-related outcomes exist between racial and ethnic groups in the United States. Black and Hispanic populations have a higher lifetime risk for developing diabetes compared with the White population (74% higher for Blacks and 68%

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higher for Hispanics).[13] Racial and ethnic minorities also have increased risk for diabetes related complications and poorer glycemic control compared with Whites.[14,15] Findings of prevalence of depression by race or ethnicity among patients with diabetes have been mixed. Some studies have shown lower prevalence of depression among non-Hispanic Black and Hispanic patients compared to non-Hispanic White patients[16,17]; other studies have shown similar prevalence of depression across these groups.[18,19]

Black and Hispanic patients with depression, not limited to those with diabetes, are less likely to receive mental health treatment for depression, including antidepressant medications, compared with non-Hispanic Whites.[20–23] Among patients with diabetes, Blacks have similar rates of depression and depressive symptoms and are less likely to be treated for depression compared with non-Hispanic Whites.[17,24,25] The treatment of depression has not been thoroughly explored in Hispanic patients with diabetes related to non-Hispanic Whites. While uninsured individuals have higher rates of depression relative to individuals with health insurance, uninsured patients are significantly less likely to receive treatment for depression (antidepressant, psychotherapy, or both) compared with patients with health insurance.[23,25] The use of antidepressant medications in low-income patients with diabetes has been studied, but the majority of these patients were insured.[17] The treatment of depression in low-income and primarily uninsured population of patients with diabetes has not been studied. Our study aimed to evaluate factors associated with antidepressant use in a low-income, primarily uninsured, racially and ethnically diverse sample of patients with type 2 diabetes to identify patients at risk for untreated depression.

2. Methods

2.1. Design and setting

This is a cross-sectional study of baseline data from participants enrolled in a cluster-randomized trial, the Partnership to Improve Diabetes Education (PRIDE) study.[26] PRIDE was a trial to evaluate the efficacy of a health literacy intervention on improving glycemic control that was conducted at ten state health department clinics in middle Tennessee. The Tennessee Department of Health operates primary care clinics across the state caring for predominantly uninsured patients. Study approval was obtained from the institutional review boards of the Tennessee Department of Health and Vanderbilt University.

2.2. Participants

Patients who received care at any one of the ten study sites were recruited for the study during clinic hours or by communication from clinic staff. Participants were enrolled between July 5, 2011 and April 29, 2013. Participants were eligible for inclusion in the study if they met the following criteria: age 18–85 years, English and/or Spanish speaking, a clinical diagnosis of Type 2 Diabetes, poor glycemic control (most recent hemoglobin A1C [HbA1c] ≥ 7.5% [58.5 mmol/mol]), and participant agreement to participate in the study for the full two years duration. Participants were excluded for poor visual acuity (>20/50 using Rosenbaum Pocket Screener), clinically significant dementia or psychosis, or anticipated life expectancy <2 years. Participants were compensated $20 following baseline data collection.

2.3. Data collection

After informed consent was obtained by bilingual research staff in the participant's preferred language, participants provided sociodemographic data including age, gender, race, ethnicity, education, income, and insurance status. Clinical data, including HbA1c, years since type 2 diabetes diagnosis, body mass index (BMI), low-density lipoprotein (LDL), blood pressure, and medication use were abstracted from the medical record and recorded by research staff.

2.4. Measures

2.4.1. Depressive symptoms

The Center for Epidemiologic Studies Depression scale (CES-D) was used to measure depressive symptoms; it is a 20-item self-report scale designed to measure current depressive symptomatology in the general population.[27] It addresses the following symptoms: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Participants indicate the frequency of symptoms within the preceding week by choosing from scale of 0 to 3; 0 is “rarely or none of the time (<1 day)” and 3 is “most or all of the time (5–7 days)”. A higher score indicates presence of greater depressive symptoms; a score of ≥16 is accepted as a positive screen, suggesting possible depression.[28] This measure has shown high internal consistency in the general population (Cronbach's alpha 0.85) and in this study (Cronbach's alpha 0.91).[27,29] Additionally, the CES-D has been studied, including through use of confirmatory factor analysis, in non-Hispanic White, Black, and Hispanic populations; it has been shown to be a valid and reliable instrument to assess depressive symptoms across these groups.[30,31]

2.4.2. Patient characteristics

Age, gender, race, and ethnicity were self-reported. Participants were placed into one of four categories – non-Hispanic White (White), non-Hispanic Black (Black), Hispanic, or non-Hispanic other. Additional self-reported variables were collected including years of education, income level by category, smoking status, if the participant had previously been seen at the clinic, and the number of clinic visits in the preceding three months. Health literacy of participants was assessed using the Short Test of Functional Health Literacy in Adults (S-TOFHLA). The S-TOFHLA produces a continuous score from 0 to 36; this can be categorized into “inadequate” (0–16), “marginal”,[17–22] and “adequate”[23–36] health literacy skills.[32] Good internal consistency for S-TOFHLA with Cronbach's alpha of 0.97 has been reported in the literature.[32]

2.4.3. Antidepressant use

At the time of enrollment, participant medication lists were abstracted from their medical record using a standardized form. These medication lists were reviewed by a single investigator to detect if an antidepressant medication was included. Participants were classified as taking an antidepressant if their medication list contained any of the following medications: a selective serotonin reuptake inhibitor (ex. fluoxetine, sertraline, citalopram), a serotonin-norepinephrine reuptake inhibitor (ex. venlafaxine, duloxetine), a tricyclic antidepressant (ex. amitriptyline, nortriptyline), or an atypical antidepressant (ex. bupropion, mirtazapine).

2.5. Statistical methods

We describe our sample using percentiles and percentages for continuous and categorical variables, respectively. In unadjusted analyses, we compared depressive symptoms (i.e., CES-D scores) and antidepressant usage across groups of participants by gender, racial/ethnic group, income level, and health literacy status (adequate versus marginal or inadequate). For the continuous CES-D scores we compared subgroups using Wilcoxon rank-sum and Kruskal Wallis tests; for antidepressant use, a binary variable, we used Chi-squared tests. We constructed a multivariable mixed effect logistic regression model, with clinic as the random effect, to evaluate the race/ethnicity association with antidepressant use while adjusting for: age, gender, health literacy, income, number of clinic

visits during the last 3 months, and the CES-D score. We used predictive mean matching to multiply impute missing data (4%) values with 10 imputation datasets and we combined results using Rubin's rule. We conducted post-hoc analysis to evaluate number of clinic visits during the last 3 months by race/ethnicity using Kruskal Wallis test. All analyses were completed using Stata Statistical Software: Release 14, College Station, TX: StataCorp LP and R version 3.6.0 (http://www.r-project.org), and hypothesis tests were conducted using 2-sided tests, 0.05 significance levels.

3. Results

Of 573 subjects approached, 410 (72%) were eligible and agreed to enroll in the PRIDE study. Of these, 403 were included in this analysis and are described in Table 1. We excluded seven participants classified as "other" race/ethnicity because none were on an antidepressant. The median age of the sample was 51 years, 60% of participants were female, and 58%, 18%, and 24% were non-Hispanic White, non-Hispanic Black, and Hispanic, respectively. Almost all participants (96%) were uninsured, and 54% reported an annual income of less than $10,000. The majority of participants reported they were previously been seen at the clinic (97%). Most participants had adequate health literacy per S-TOFHLA evaluation (84%), and as expected based on inclusion criteria participants had poor glycemic control with median A1C of 9.2%. The median CES-D score was 16, and 52% had a positive depression screen (CES-D score ≥16). Of the 400 participants with available antidepressant usage data, 73 (18%) were prescribed an antidepressant. The most commonly prescribed antidepressants were selective serotonin reuptake inhibitors (61 or 73); fluoxetine and citalopram were the most commonly prescribed of this class. While 52% of participants had a positive depression screen, only 18% (73 of 400) of the total sample were prescribed an antidepressant.

Table 1
Participant characteristics.

	All participants ($N = 403$)
Age (years), median [10th to 90th percentile]	51 [36 to 61]
Female gender, N (%)	243 (60)
Race/ethnicity, N (%)	
Non-Hispanic White	233 (58)
Non-Hispanic Black	71 (18)
Hispanic	98 (24)
Income, N (%)	
<$10,000	214 (54)
≥$10,000	185 (46)
Highest level of education completed (years), median [10th to 90th percentile]	12 [6 to 14]
Type of health insurance, N (%)	
Uninsured	383 (96)
Medicaid	10 (2)
Medicare	7 (2)
Health literacy (s-TOFHLA), N (%)	
Inadequate or marginal	65 (16)
Adequate	331 (84)
Duration of diabetes (years), median [10th to 90th percentile]	7 [1 to 20]
Current smoker, N (%)	285 (71)
HbA1C % (mmol/mol)	9.2 [77]
BMI (kg/m^2), median [10th to 90th percentile]	34 [27 to 47]
LDL (mg/dl), median [10th to 90th percentile]	103 [57 to 187]
Systolic blood pressure (mmHg), median [10th to 90th percentile]	132 [110 to 158]
CES-D score, median [10th to 90th percentile]	16 [4 to 37]
Current antidepressant use, N (%)	73 (18)
Previously received care at the clinic, N (%)	390 (97)
Number of clinic visits during the last 3 months, N (%)	
0	93 (23)
1	117 (29)
2	88 (22)
≥3	104 (26)
Antidepressants used, N (%)	
Selective serotonin reuptake inhibitor	61 (15.1)
Serotonin-norepinephrine reuptake inhibitor	8 (2.0)
Tricyclic antidepressant	3 (0.7)
Atypical antidepressant	1 (0.2)

Abbreviations: s-TOFHLA: Short Test of Functional Health Literacy in Adults; BMI: body mass index, calculated as weight in kilograms divided by height in meters squared; LDL: Low-density lipoprotein; CES-D score: Center for Epidemiological Studies Depression score.

In unadjusted analyses shown in Table 2, non-Hispanic white, non-Hispanic black, and Hispanic participants had median CES-D scores of 17, 16, and 13, respectively ($P = 0.02$ based on the Kruskal Wallis Test). Fewer Black (8%) and Hispanic (6%) participants were on antidepressant medications compared with White (26%) participants, $P < 0.001$. A higher proportion of female participants were taking an antidepressant compared with males, 22% vs. 12% ($P = 0.01$). Fewer participants with marginal or inadequate health literacy were prescribed an antidepressant than participants with adequate health literacy, 9% vs. 20% ($P = 0.048$). We did not find a significant difference in antidepressant use based on income level.

In adjusted analysis shown in Table 3, non-Hispanic Black and Hispanic participants were significantly less likely to be on an antidepressant medication compared with Non-Hispanic White participants (OR with 95% CI: 0.31 (0.12, 0.79) and 0.27 (0.10, 0.75), respectively). Females were more likely to be on an antidepressant compared with males (OR with 95% CI: 1.92 (1.04 to 3.55)). Age, income, health literacy, and number of recent clinic visits were not independently associated with antidepressant use. Given the difference in antidepressant use among non-Hispanic Black, Hispanic, and non-Hispanic White participants, we evaluated the number of clinic visits during the prior three months by race/ethnicity. Both non-Hispanic Black and non-Hispanic White participants had a median number of visits of 2 (2 [10th percentile 0, 90th percentile 5] and 2 [0, 4], respectively), and Hispanic participants had a median of 1 (0, 3) visit in the last 3 months, $P < 0.01$.

4. Discussion

We found a high prevalence of depressive symptoms in this sample of low-income, racially and ethnically diverse patients with type 2 diabetes, and only a small proportion of patients were on an antidepressant. This is important because depression is related to poor glycemic control and outcomes in patients with type 2 diabetes. Non-Hispanic Black and Hispanic participants were significantly less likely to be treated with an antidepressant, compared with non-Hispanic White participants even when accounting for differences in levels of depressive symptoms, health literacy, and income between these groups.

This study adds to the evidence base by describing the prevalence of depressive symptoms and antidepressant use among racial and ethnic minorities who are primarily uninsured, receive care in a safety-net clinic, and have limited access to mental health care services. Our findings are congruent with those from prior studies that have shown that Black and Hispanic adults are less likely to be on an antidepressant.[25,33] Additionally, prior work in adults with type 2 diabetes has demonstrated similar patterns of Black and Mexican American adults with type 2 diabetes less likely to be on an antidepressant than non-Hispanic Whites.[17,34] Our study builds upon what has been previously reported by including Hispanics, not limited to those of Mexican American ethnicity. Our adjusted analysis was able to account for important possible confounders in this relationship, including gender, health literacy, and depressive symptoms.

Multiple factors may play a role in our finding that non-Hispanic Blacks and Hispanics with type 2 diabetes are less likely to be on an antidepressant than non-Hispanic Whites. Disparities in the diagnosis and treatment of depression in racial and ethnic minorities have been demonstrated in various populations within the United States, not limited to patients with type 2 diabetes. Blacks and Hispanics are less likely to

Table 2
Depressive symptoms and antidepressant use by participants' characteristics.

	CES-D score, Median [10th to 90th percentile]	*P* value[a]	Antidepressant use, N (%)	*P* value[b]
Gender				
Male	15 [2 to 36]	0.01	19 (12)	0.01
Female	18 [5 to 38]		54 (22)	
Race/ethnicity				
Non-Hispanic Whites	17 [5 to 38]	0.02	61 (26)	<0.001
Non-Hispanic Blacks	16 [5 to 31]		6 (8)	
Hispanics	13 [1 to 32]		6 (6)	
Income				
<$10,000	19 [5 to 38]	0.004	39 (18)	0.91
≥$10,000	14 [3 to 34]		34 (19)	
Health literacy				
Inadequate, marginal	20 [2 to 37]	0.18	6 (9)	0.48
Adequate	15 [4 to 36]		64 (20)	
Number of clinic visits during the last 3 months				
0	11 [1 to 32]	0.002	9 (10)	0.11
1	17 [5 to 37]		24 (21)	
2	15 [5 to 34]		16 (18)	
≥3	19 [8 to 41]		24 (23)	

Data are expressed as N (%) or median [10th to 90th percentile].
P values were calculated using the Pearson Chi-square test for categorical variables, the Wilcoxon rank sum test or Kruskal Wallis test for continuous variables.
[a] *P* value were calculated to examine whether CES-D score were statistically significant different by gender, race, income status, number of clinic visits during the last 3 months, and health literacy.
[b] *P* value were calculated to examine whether anti-depressant usage were statistically significant different by gender, race, income status, number of clinic visits during the last 3 months, and health literacy.

receive a diagnosis of depression.[35] Blacks and Hispanics diagnosed with depression are less likely to receive antidepressant treatment or guideline-concordant treatment for depression compared with Whites.[21,36,37] Furthermore, preferences for depression treatment vary among racial and ethnic groups. Among primary care patients (not limited to those with type 2 diabetes), Blacks and Hispanics are more likely to prefer treatment with psychotherapy over treatment with an antidepressant.[38] Cultural factors may play a role as Blacks and Hispanics are less likely to believe antidepressants to be an acceptable or effective treatment for depression and are more likely to seek help for depression from nonmedical providers, including pastors or counselors, than Whites.[39,40] Attitudes and behaviors of healthcare providers related to prescription of antidepressant medications may factor in to our findings as implicit bias against Black and Hispanics has been demonstrated among health care providers; Blacks and Hispanics have been shown to receive different mental health treatment recommendations.[41–43]

Table 3
Factors associated with antidepressant use, adjusted mixed effect logistic regression analysis.

	Odds ratio (95% CI)
Age year (10 years increase)	1.20 (0.88 to 1.65)
Female gender (Male as reference)	1.92(1.04 to 3.55)
Race/ethnicity (Non-Hispanic White as reference)	
Non-Hispanic Black	0.31 (0.12 to 0.79)
Hispanic	0.25 (0.09 to 0.71)
Health literacy (for one interquartile range increase)	1.48 (0.42 to 5.17)
Depressive symptoms (for one interquartile range increase)	2.23 (1.51 to 3.29)
Income (<$10,000 as reference) ≥$10,000	1.17 (0.67 to 2.09)
Number of clinic visits during the last 3 months (1 visit increase)	1.11 (0.85 to 1.45)

Mixed effect logistic regression with clinic as random effects were used to exam the relationship between race/ethnicity and antidepressant usage.
Age, gender, race, health literacy, depressive symptoms, number of clinic visits during the last 3 months, and income were included in the model as covariates.
Missing data was multiply imputed using predictive mean matching. 10 datasets were imputed; results were combined using Rubin's rule.

4.1. Limitations

Our study has several limitations. Since this was a cross-sectional study, it is not possible to make inferences about causal relationships or to track depressive symptoms and/or antidepressant use over time. The CES-D is a screening tool, not a diagnostic measure; a positive depression screen, while suggestive, is not equivalent to a clinical diagnosis of depression. Our study is limited to evaluating antidepressant medications and does not consider other treatments for depression, such as cognitive behavioral therapy. We were unable to assess whether patients had taken an antidepressant previously or whether patients had declined an antidepressant prescription. Also, we did not evaluate patient attitudes or beliefs about antidepressant medications. Additionally, we did not collect data regarding how long patients had been receiving care at the participating clinics or regarding participant comorbid medical conditions; thus, we are unable to account for these factors in our regression analysis.

4.2. Conclusions

The high prevalence of depressive symptoms in this low-income, primarily uninsured population is important given the association of depression and poor diabetes-related outcomes. Antidepressant medications are effective in treating depressive symptoms in patients with diabetes with mixed evidence of their effect on glycemic control.[11,12] Our results demonstrate that Black and Hispanic patients are at risk to have untreated depression, which may worsen the known disparities in diabetes outcomes for these populations compared with White patients. To mitigate downstream effects of depression on outcomes in patients with type 2 diabetes, it is important to assess patients for depression and treat this condition appropriately in vulnerable populations, particularly racial and ethnic minorities.

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