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ETHNIC DIFFERENCES IN THE TREATMENT OF DEPRESSION IN PATIENTS WITH ISCHEMIC HEART DISEASE

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Abstract

Objective—To examine ethnic differences in depressive symptoms and antidepressant treatment in a cohort of patients undergoing diagnostic coronary angiography.

Background—Coronary heart disease (CHD) is the leading cause of mortality in the US, with an excess of mortality in African Americans. Traditional risk factors occur more frequently among African Americans but do not fully account for this increased risk. Elevated depressive symptoms have been shown to be associated with higher morbidity and mortality in CHD patients.

Methods—A consecutive series of 864 patients (727 Caucasians, 137 African Americans) completed the Beck Depression Inventory (BDI) to assess depressive symptoms. Data describing cardiovascular risk factors and type of medications including antidepressants were obtained from chart review at the time of study enrollment.

Results—There was no difference in the severity of depressive symptoms between Caucasians (p =.50); the prevalence of elevated depressive symptoms also was similar for African Americans (35%) and Caucasians (27%) (p =.20). However, the rate of antidepressant use was 21% for Caucasians but only 11.7% for African Americans (p =.016). The odds ratio for ethnicity (African American vs. Caucasian) in predicting antidepressant use was 0.43 (95% CI=0.24–0.76, p=0.004) after adjustment for BDI scores.

Conclusions—African Americans with CHD are less likely to be treated with anti-depressant medications compared to Caucasians, despite having similar levels of depression. The ethnic differences in the psychopharmacological management of depression suggests that more careful assessment of depression, especially in African Americans, is necessary to optimize care of patients with CHD.

Keywords

African-Americans; depression; coronary disease; ethnicity

Coronary heart disease (CHD) is the leading cause of death in both Caucasians and African Americans in the United States and is especially significant for African Americans compared to other ethnic groups. [1–5] This excess in cardiovascular mortality among African Americans may be attributed to such factors as a higher prevalence of traditional risk factors [6 7] and greater

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likelihood that those risk factors are poorly controlled [8], greater delay in seeking medical care [7], and disparities in medical treatment [9, 10], including differences in health care access and health care utilization, leading to treatment delays and increased disease severity at the time of diagnosis.[11 12]

Depression has emerged as a new and important psychosocial risk factor in which the prevalence of major depression (MDD) has been estimated to be 15–20% [13 14] with up to an additional 20% of CHD patients reporting elevated depressive symptoms.[15] Importantly, depression also is associated with a 2- to 3-fold increase in risk of morbidity and mortality in patients with CHD.[16–20] In recognition of the importance of depression, the American College of Cardiology and the American Heart Association recently recommended that depressive symptoms should be routinely assessed (Class I recommendation), so that proper interventions can be instituted (Class IIa recommendation)[21] Despite this recommendation, depression is often under-recognized and under-treated, especially in patients with medical illness.[22–24]

Studies that have compared ethnic differences in non-cardiac populations suggest that African Americans are particularly vulnerable to under-treatment of depression, with treatment rates 33–50% less than those of Caucasians.[25–28] Little is known about ethnic differences in the prevalence and pharmacologic treatment of depression in patients with CHD. Therefore, the purpose of this study was to examine racial disparities in depressive symptoms and psychopharmacologic treatment in a cohort of CHD patients undergoing diagnostic coronary angiography.

METHODS

Study Patients

Participants were recruited from the Diagnostic Cardiac Catheterization Laboratory at Duke University Medical Center between April 1999 and June 2002. Patients were part of a larger prospective investigation known as the VAGUS (Very Anxious Group Under Scrutiny) study, which was designed to evaluate the effects of anxiety on mortality in CHD patients. The protocol was approved by the Duke University Medical Center Institutional Review Board and all patients provided written informed consent before participating in the research protocol. Participants had significant coronary artery disease (CAD) defined as at least 75% occlusion of one coronary artery. In addition, patients were required to be in normal sinus rhythm at the time of enrollment, which was necessary to assess heart rate variability (HRV) aspect of the VAGUS study,

Initially, 9162 patients underwent left heart cardiac catheterization and 8028 charts were available for screening. Approximately 75% of the screened patients did not qualify for the study. The two main reasons for exclusion were insignificant CAD (n=2549 patients) and factors affecting HRV (n=2895). Factors affecting HRV included acute myocardial infarction (MI) or revascularization procedure during the previous 30 days (n=2159) and abnormal cardiac rhythm (n=736). An additional 627 patients were not approached because of medical, complications that could compromise patients' ability to provide written informed consent (e.g., ventilator-dependency, stroke-related aphasia, inability to speak English, and acute psychosis). Approximately half of the remaining eligible patients declined to participate (n=1003). Of the 955 enrolled patients, 34 patients were unable to complete any items on the Beck Depression Inventory (BDI) due to time constraints, leaving 921 patients with useable information. Ethnicity was primarily Caucasian (79%, n=727), with 15% African-Americans (n=137), 5% Native American (n=44), and 1% Asian or Hispanic (n=13). Because of the relatively small number of patients in the Native American, Asian, and Hispanic categories, the present analysis focused only on the subset of 864 patients representing the Caucasian and African-American patients.

Assessment of Depression

Depressive symptomatology was assessed by the Beck Depression Inventory (BDI). [29] The BDI is a 21-item self-report questionnaire that measures characteristic symptoms of depression including negative affect, cognitions, and somatic symptoms. The BDI is widely used in cardiac populations and has been shown to have prognostic value. [15,18]

Clinical and Demographic Characteristics

Cardiac catheterization results were used to determine left ventricular ejection fraction (LVEF) and CAD severity. Data describing current comorbid conditions, CHD treatment plan (medical management, percutaneous transluminal coronary angioplasty, or coronary bypass grafting surgery), cardiovascular risk factors (lipids, smoking history, body weight, diabetes, hypertension) and type of medications, including antidepressants and other psychotropic medications, were obtained from patient chart review at the time of study enrollment.

Data analysis

Background characteristics of African Americans and Caucasian Americans were compared using the Pearson Chi-Square test for categorical variables and the Wilcoxon test for continuous data. Five patients had missing data: one patient had missing data for blood pressure; one patient did not provide information about education; and three patients did not have complete cardiac medication data available. These missing data were replaced with the sample median or most prevalent category for the respective variable.

We calculated unadjusted ethnic group difference in antidepressant use and tested these differences using the Pearson Chi-Square test. We further described antidepressant use based upon their BDI score using established criteria:[30] “Not Depressed” (BDI < 10); “Mildly Depressed” (BDI 10–18); and “Moderate-Severely Depressed” (BDI > 18). We then estimated a set of logistic regression models in order to examine potential confounders or explanatory mechanisms. Each model specified antidepressant use (Yes vs. No) as the response variable and ethnicity (African American vs. Caucasian) as the predictor of primary interest. Adjustment variables were selected *a priori* based on previous research and maintained in the model irrespective of statistical significance. The predictors in each model were as follows: *Model 1*: Ethnic group indicator (African American vs. Caucasian American); *Model 2*: Ethnic group and continuous BDI score (modeled as a restricted cubic spline with three knots in all models); *Model 3*: Ethnic group, BDI, age, gender, LVEF, blood pressure, heart failure, Prior MI, Prior CABG, current mode of therapy (medical, PTCA, CABG), smoking status (never, quit, current), and beta blocker use; *Model 4:* identical to Model 3, but also including a set of interactions, specified *a priori* including Ethnicity by Gender, Ethnicity by BDI, and Gender by BDI. The interactions were tested using the pooled approach recommended by Harrell.[31] Because Model 3 tended to exceed the recommendation for events/predictor ratio[32], we also conducted a propensity score analysis.[33] The propensity score is a single index capturing ethnic differences on a large number of dimensions. The single index was used as an adjustment variable in the primary logistic regression model. The propensity score was generated using a logistic regression model predicting ethnicity using a large number of background variables. The predictors of ethnicity with the largest magnitude effects, and therefore carrying the greatest weight in the propensity score, were gender, age, education, diastolic blood pressure, and 3-vessel CAD. The individual case probabilities from the logistic propensity model were then linearized (logit-transformed) to create the final propensity score. The propensity score (modeled as a 4-knot restricted cubic spline) was then included in a logistic regression model with ethnicity and BDI predicting antidepressant use, and excluding the 13 cases that had propensity scores that did not overlap across ethnic categories. P-values for the effects in the logistic models were generated by the Wald test.

RESULTS

Background Characteristics

Data were available from 864 CAD patients (727 Caucasians and 137 African Americans) undergoing diagnostic angiography. Table 1 presents the demographic and clinical characteristics for African American and Caucasian patients. The most prominent differences between African American and Caucasians in the sample were that African Americans were younger, had fewer years of formal education and less income, lower LVEF, higher rates of heart failure, higher incidence of hypertension, and higher diastolic blood pressure (DBP).

One-hundred sixty nine patients were on antidepressant therapy. The classes of antidepressant were: selective serotonin reuptake inhibitor, 67% (n = 111), norepinephrine reuptake inhibitor, 4% (n = 7), serotonin/norepinephrine reuptake inhibitor, 18% (n = 30), and mixed action, trazodone, 2% (n = 4), bupropion, 10% (n = 17). Because low dose norepinephrine reuptake inhibitors may be used for pain management and bupropion for smoking cessation, we reviewed the charts of patients taking these medications to confirm that they were being treated for depression. Nine patients (all Caucasian) were taking bupropion primarily for smoking cessation. Based on chart review, all other patients were on antidepressant therapy for depressive symptoms.

Presence of depressive symptoms

Overall, 27% of the sample had significant depressive symptoms (BDI scores ≥ 10) and an additional 10% were on anti-depressant medications with BDI scores < 10, suggesting that 38% of the sample had significant depression. BDI scores ranged from 0 to 46 (mean: 7.4; median: 6.0, standard deviation: 6.6). Although the median BDI score (median = 6) was identical in both ethnic groups, African Americans tended to be more likely to be classified as mildly (26% v 21%) or moderately-to-severely depressed (9% v 6%) compared to Caucasians (p =.20).

Unadjusted rates of antidepressant use

The overall rates of antidepressant use were 21% (153/727) for Caucasians and 11.7% (16/137) for African Americans (χ^2 [1df] = 6, p =.016). Table 2 shows that Caucasians were more likely than African Americans to be on antidepressants in each of the three BDI severity categories. We further considered ethnic and gender differences in antidepressant use by BDI severity category. Among patients with BDI < 10, 14% (n = 56) of the Caucasian men compared to 2% (n = 1) of African American men were on antidepressants, while 21% (n= 28) of the Caucasian women and 19% (n = 7) of African American women were on antidepressants. Among patients with BDI between 10 and 18, 28% (n = 27) of the Caucasian men and 11% (n = 2) of African American men were on antidepressants; 39% (n = 20) of the Caucasian women and 12% (n = 2) of African American women were on antidepressants. Considering patients with BDI> 18, 43% (n = 13) of the Caucasian men but only 22% (n = 2) of African American men were on antidepressants; 64% (n = 9) of the Caucasian women and 67% (n = 2) of African American women were on antidepressants.

Logistic regression models: Ethnicity predicting antidepressant use

In order to quantify the likelihood of antidepressant use, odds ratios (ORs), expressed as the odds of antidepressant use/odds of no antidepressant use, were calculated by ethnicity and gender. The unadjusted odds ratio for ethnicity (coded African American/Caucasian) was 0.50 (95% CI = 0.29–0.86, p =.013). Adjusting for the continuous BDI score, the OR for ethnicity was 0.43 (95% CI = 0.24–0.76, p =.004). The OR for a 7-point increase in BDI score was 2.11 (95% CI = 1.51–2.96, p =.001). Table 3 shows the p-values for the Wald tests for the fully

adjusted logistic model. After adjustment for background characteristics, African Americans were significantly less likely to be on antidepressants: OR = 0.47 (95% CI = 0.25–0.88, p =. 020). Figure 1 depicts the point estimate odds ratios and 95% confidence limits from this fully adjusted model. Higher BDI scores, female gender, prior MI, medical treatment versus PTCA or CABG, and lower DBP were also significantly associated with greater odds of antidepressant use. When we removed the nine patients who apparently were prescribed bupropion for smoking cessation the results remained essentially unchanged (OR for ethnicity = 0.50, 95% CI 0.27 – 0.93, p =.030). The pooled test for the three pre-specified interactions, ethnicity by BDI, ethnicity by gender, and BDI by gender was not significant (p =.490), suggesting that the effect of ethnicity may be consistent across gender and BDI severity categories. Finally, adjusting for the propensity score (and removing 13 non-overlapping cases) resulted in a similar estimate for ethnicity: OR= 0.42 (95% CI = 0.22–0.81, p <.009).

DISCUSSION

Considerable health disparities exist in the prevalence, morbidity and mortality associated with CHD.[5,34] Cardiovascular diseases by themselves account for more than one third of the differences in life expectancy between blacks and whites[35] and African Americans have significantly greater risk of dying from CHD compared to their Caucasian counterparts.[36] The reasons for this inequality are multifactorial, including biological, behavioral, and social factors. For example, African Americans have greater prevalence of cardiovascular risk factors including hypertension and diabetes,[6,8] which are less likely to be well controlled.[8] Because of the accumulating evidence that depression also contributes to increased risk in patients with CHD, the present study examined ethnic differences in depressive symptoms and antidepressant treatment in patients undergoing diagnostic coronary angiography. In this large sample of over 850 patients, evidence of clinically significant depression defined as BDI scores ≥10 or BDI scores <10 but on anti-depressant medication, was found in 38.5 % patients, 40.1% of African Americans and 38.2% of Caucasians. These results are consistent with previous studies, primarily consisting of Caucasians, which showed the prevalence of clinically significant depressive symptoms to occur in one out of every five cardiac patients.[15,37]

Although we found no ethnic differences in the severity of depressive symptoms, depression appeared to be under-treated especially in African Americans: 35.5% of Caucasians with BDI scores ≥ 10 were treated with antidepressants, compared to only 17% of African Americans. This difference was especially evident in men compared to women, with only 22% of moderately-to-severely depressed African American men on antidepressants compared to 43% of their white counterparts.

There are several possible explanations for the current findings. It has been noted that patients' race/ethnicity influence physicians' recognition and treatment of depressive symptoms.[25,38] Different causes for this difference in mental health treatment have been suggested, including patients feeling stigmatized by a mental health disorder,[39] low patient education and recognition of depressive symptoms, [40,41] patient preferences and/or ability to access and pay for treatment,[42] and low provider recognition of depressive symptoms in minority groups.[43] Moreover, studies have found that when the diagnosis of a depressive disorder was made, prescription of antidepressants was consistently higher among Caucasians than among minority patients, especially African Americans. [26,28,38,44] For example, Skaer, Sclar, and Robinson[44] found that the rates of office visits in which depression was diagnosed and antidepressants prescribed were higher among Caucasians compared to minorities, with rates for African Americans half those for Caucasians. In an analysis of Medicaid claims, Strothers et al.[45] reported that 37.1% of depressed African Americans did not receive antidepressant medication compared to 22.4% of Caucasians (p <0.001). In a sample of cardiac patients, Amin et al.[14] reported that only 1 out of every 4 patients with moderate to severe depressive

symptoms admitted for acute coronary syndrome was recognized as being depressed before their hospital discharge. Minority status, low ejection fraction, and low education were associated with unrecognized depressive symptoms. The odds ratio for unrecognized depressive symptoms for minority status was 6.73 for minorities compared to whites.

Our study had several limitations. Classification of depression was based on self-reported symptoms rather than a standard psychiatric interview. Although the BDI is considered a reliable and valid instrument for measuring the severity of depressive symptoms[30], it is not a diagnostic tool. In addition, antidepressant use was obtained from medical records at the time of patients' diagnostic coronary angiography. No information was available concerning dose of antidepressants or other types of depression treatment that patients may have received. We also are unable to determine if the differential rates of antidepressant treatment in African Americans is a result of under-diagnosis of depression or under-treatment by physicians, or if it is an expression of reluctance of African American patients to discuss their symptoms and request or accept pharmacological treatment. Although African Americans had less education and income compared to Caucasians in this sample, we found little evidence that these indicators of socio-economic status were responsible for the higher rates of anti-depressant use among Caucasians compared to African Americans. That is, although Caucasians had higher educational levels compared to African Americans ($p = 0.001$), the education by ethnicity interaction for anti-depressant use was not significant ($p = .933$). Similarly, Caucasians also had higher income levels compared to African Americans ($p = 0.001$), but there was no evidence of an ethnicity by income interaction ($p = 0.685$). Among the 770 patients with available income data, antidepressant use among Whites was higher than that of African Americans in each of the four quartiles of income: 1st quartile (<$15,000): 26.9% vs. 14.5%; 2nd quartile: 24.6% vs. 10.8%; 3rd quartile: 20.1% vs 13.3%; 4th quartile (>$50,000): 16.7% vs 0%. Therefore, it is unlikely that differential education or income level was responsible for the ethnic differences in anti-depressant use. Unfortunately, we had limited information about patients' health insurance, so we still cannot rule out the possibility that African Americans may have been less likely to afford antidepressant medications compared to Caucasians. Finally, we should note that ethnicity was based upon patients' self-identification. We recognize that categorization of patients into ethnic or racial groups can be imprecise[14]; we attempted to minimize uncertainty by eliminating the small number of Hispanics and Native Americans from our analyses.

Summary

The need to improve detection and treatment of depression among patients with CHD is widely recognized. And the need to provide efficient and equal healthcare to all patients is a necessity. The federal government's health plan, *Healthy People 2010*, has stated as a goal to eliminate any kind of health disparities by race, ethnicity, gender or socio-demographic characteristics healthy people,[46] by the year 2010. Results of this study demonstrate that elevated depressive symptoms are common in patients undergoing diagnostic coronary angiography and that a significant proportion of patients with significant depressive symptoms are not treated. Moreover, we noted that African Americans are less likely to be treated with anti-depressant medications compared to their white counterparts, despite having similar levels of depressive symptoms. African American men with high levels of depression are especially likely to be under-treated. The ethnic differences in the psychopharmacological management of depression suggests that more careful assessment of depression, especially in African Americans, is necessary to optimize care of patients with CHD.

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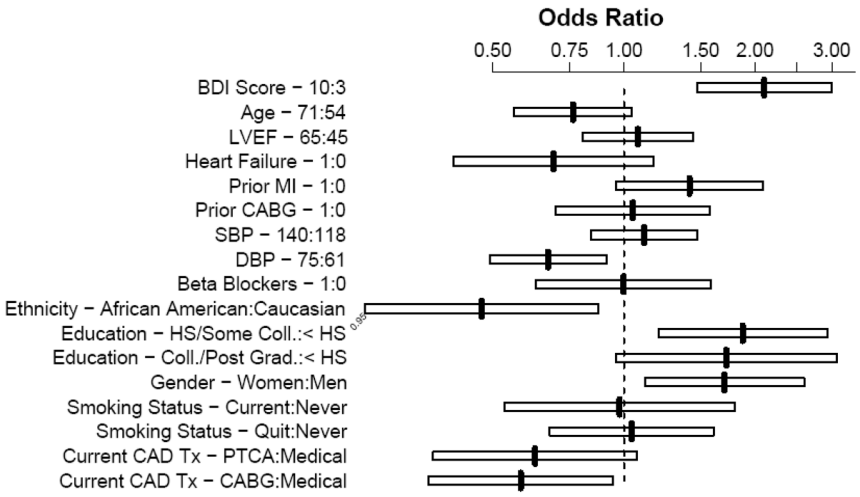

Figure 1.

Odds ratios and 95% confidence limits from logistic regression model predicting antidepressant use. For continuous predictors, the values to the immediate right of the predictor name in column 1 represent the scaling distance on the predictor. For example, *BDI 10:3* in row 1 reflects a comparison of the odds of antidepressant use for a typical patient with a BDI score of 10 to the odds of antidepressant use for a patient with a score of 3, i.e. the OR associated with a 7-point increase on the BDI. Scaling distances for continuous predictors are the interquartile ranges for that predictor. For categorical predictors, the level names to the right of the predictor name represent the levels being compared to generate the OR. For example, *Ethnicity – African American: Caucasian* indicates that the OR is comparing the odds of antidepressant use among African Americans to the odds of antidepressant use for Caucasians.

Table 1

Descriptive Statistics by Ethnicity

	N	Caucasian N = 727	African American N = 137	Combined N = 864	Test Statistic
Current Antidepressant	864	21% 153/727	12% 16/137	20% 169/864	$\chi^2_1 = 6.43$, $P = 0.011$[1]
BDI Score	864	3 **6** 10	3 **6** 11	3 **6** 10	$F_{1,862} = 0.43$, $P = 0.511$[2]
BDI Category : None	864	73% 533/727	66% 90/137	72% 623/864	$\chi^2_2 = 3.53$, $P = 0.171$[1]
Mild-Mod		21% 150/727	26% 35/137	21% 185/864	
Mod- Severe		6% 44/727	9% 12/137	6% 56/864	
Gender : Women	864	27% 197/727	41% 56/137	29% 253/864	$\chi^2_1 = 10.6$, $P = 0.001$[1]
Age yrs	864	55 **63** 71	50 **58** 66	54 **62** 71	$F_{1,862} = 20.7$, $P < 0.001$[2]
Education : < HS	864	27% 195/727	49% 67/137	30% 262/864	$\chi^2_2 = 31.2$, $P < 0.001$[1]
HS/Some Coll.		51% 374/727	43% 59/137	50% 433/864	
Coll./Post Grad.		22% 158/727	8% 11/137	20% 169/864	
Annual Income : <$15K	770	22% 145/653	47% 55/117	26% 200/770	$\chi^2_3 = 53.1$, $P < 0.001$[1]
$15–30K		22% 142/653	32% 37/117	23% 179/770	
$30–50K		22% 144/653	13% 15/117	21% 159/770	
>$50K		34% 222/653	9% 10/117	30% 232/770	
Smoking Status : Current	864	14% 104/727	14% 19/137	14% 123/864	$\chi^2_2 = 3.7$, $P = 0.157$[1]
Never		28% 202/727	36% 49/137	29% 251/864	
Quit		58% 421/727	50% 69/137	57% 490/864	
3-Vessel Disease	864	43% 313/727	47% 65/137	44% 378/864	$\chi^2_1 = 0.9$, $P = 0.342$[1]
LVEF %	864	47 **59** 65	38 **51** 62	45 **58** 65	$F_{1,862} = 12.7$, $P < 0.001$[2]
Heart Failure	864	18% 133/727	35% 48/137	21% 181/864	$\chi^2_1 = 19.5$, $P < 0.001$[1]
Prior MI	864	43% 314/727	38% 52/137	42% 366/864	$\chi^2_1 = 1.29$, $P = 0.255$[1]

	N	Caucasian N = 727	African American N = 137	Combined N = 864	Test Statistic
Prior CABG	864	37% $\frac{268}{727}$	34% $\frac{47}{137}$	36% $\frac{315}{864}$	$\chi^2_1 = 0.33$, $P = 0.568$[1]
Current CAD Tx : Medical	864	55% $\frac{400}{727}$	61% $\frac{84}{137}$	56% $\frac{484}{864}$	$\chi^2_2 = 2.5$, $P = 0.286$[1]
PTCA		15% $\frac{110}{727}$	15% $\frac{21}{137}$	15% $\frac{131}{864}$	
CABG		30% $\frac{217}{727}$	23% $\frac{32}{137}$	29% $\frac{249}{864}$	
Hypertension	864	78% $\frac{564}{727}$	91% $\frac{125}{137}$	80% $\frac{689}{864}$	$\chi^2_1 = 1.33$, $P < 0.001$[1]
SBP	863	118 **129** 140	118 **130** 143	118 **129** 140	$F_{1,861} = 0.89$, $P = 0.345$[2]
DBF	863	61 **68** 74	62 **70** 80	61 **68** 75	$F_{1,861} = 10.1$, $P = 0.002$[2]
COPD	864	16% $\frac{118}{727}$	18% $\frac{24}{137}$	16% $\frac{142}{864}$	$\chi^2_1 = 0.14$, $P = 0.709$[1]
Beta Blockers	864	81% $\frac{589}{727}$	81% $\frac{111}{137}$	81% $\frac{700}{864}$	$\chi^2_1 = 0$, $P = 0.999$[1]

a b c represent the lower quartile *a*, the median *b*, and the upper quartile *c* for continuous variables.

N is the number of non-missing values.

[1] Tests used: Pearson test;

[2] Wilcoxon test

Table 2

Rate of antidepressant use by BDI Seventy and Ethnicity

BDI Category	Ethnicity	No Antidepressant n = 695	Antidepressant n= 169	Total n = 864
		% of row (n)	% of row (n)	% of entire sample (n)
None BDI < 10	Caucasian	84.2 (449)	15.8 (84)	61.7(533)
	African American	91.1 (82)	8.9 (8)	10.4 (90)
Mild-Mod. BDI = 10–18	Caucasian	68.7 (103)	31.3 (47)	17.4(150)
	African American	88.6 (31)	11.4 (4)	4.1 (35)
Mod.-Sev. BDI > 18	Caucasian	50.0 (22)	50.0(22)	5.1 (44)
	African American	66.7 (8)	33.3 (4)	1.4 (12)

None = No significant depressive symptoms

Mild-Mod. = Mild to moderate depressive symptoms

Mod.-Sev. = Moderate to severe depressive symptoms

Table 3

Wald Statistics for Logistic Regression Model Predicting Antidepressant Use

	χ^2	*d.f.*	*P*
Ethnicity	5.68	1	0.0172
BDI	41.21	2	< 0.0001
Nonlinear	0.60	1	0.4387
Age	2.87	1	0.0901
Education	7.76	2	0.0207
Gender	6.16	1	0.0130
LVEF	0.25	1	0.6174
CHF	1.90	1	0.1686
Smoking Status	0.07	2	0.9651
Mode of CAD Therapy	6.58	2	0.0373
Prior MI	3.08	1	0.0794
Prior CABG	0.05	1	0.8194
SBP	0.55	1	0.4584
DBP	6.49	1	0.0109
Beta Blockers	0.00	1	0.9956
TOTAL	86.91	18	< 0.0001