Racial Differences in Glucose Control among Patients with Type 2 Diabetes: A Survey on Dietary Temptations, Coping, and Trust in Physicians

Renée M. Betancourt, MD; Kathleen O. Degnan, MD; Judith A. Long, MD

Objective: A quantitative evaluation of self-care behaviors, psychosocial stressors, and patient relationships to health care to better understand racial disparities in these domains.

Research Design and Methods: A cross-sectional study of adult patients with type 2 diabetes in University of Pennsylvania Healthcare System who had a HbA1c test within one month of survey administration. The survey instrument included among other items, the Dieter's Inventory of Eating Temptations Self-Efficacy instrument (DIET-SE), the Jalowiec Coping Scale (JCS), and the Trust in Physician (TIP) scale.

Results: 332 individuals completed the survey. Poor glucose control was significantly associated with Black race, lower income level, other demographic variables, non-perfect medication adherence, and poorer diet quality. It was also associated with lower self-efficacy to resist social dietary temptations, and among White patients it was associated was decreased use of a confrontive coping style. However, these factors did not explain the racial differences in glucose control between Blacks and Whites.

Conclusions: Interventions aimed at dietary temptations, coping styles, or trust in physicians may not reduce racial disparities in glucose control. However, interventions that focus on dietary temptations may positively affect all diabetic patients. (*Ethn Dis*. 2013; 23[4]:409–414)

Key Words: Disparities, Diabetes Mellitus, Glucose Control, Psychosocial Factors

From University of California San Francisco Department of Family and Community Medicine (RMB); and Perelman School of Medicine at the University of Pennsylvania (KOD); and Philadelphia VA Center for Health Equity Research and Promotion, Division of General Internal Medicine, University of Pennsylvania Perelman School of Medicine (JAL).

Address correspondence to Renée M. Betancourt, MD; 995 Potrero Avenue, Building #83; San Francisco, CA 94110; 415.206.3026; fax: 415.206.8387; betancourtr@fcm.ucsf.edu

Introduction

Racial disparities in diabetes incidence and outcomes have been well-documented. In particular, compared to the general population, Black Americans tend to have poorer glucose control[1–3] and decreased quality of diabetes care.[4–6] Black Americans with diabetes also experience increased mortality,[5,7] poorer blood pressure control,[7,8] and increased rates of diabetic complications.[5,9,10]

Psychosocial factors likely play important roles in individual patient's glucose control. In qualitative studies, patients describe the importance of stress, external social support, mood, and coping on diabetes self-management and control.[11,12] Numerous quantitative studies show that increased stress and depression are associated with worse glucose control,[13–15] as are weak physician-patient relationship and worse mental health status.[13] Conversely, patients with increased family support, self-efficacy, and satisfaction with diabetes treatment have better glucose control.[13,14]

Few studies have evaluated the role these psychosocial factors may play in mediating racial disparities in diabetic outcomes. Our study builds upon findings of a qualitative study by Shacter, et al[16] to develop a quantitative evaluation of self-care behaviors, psychosocial stressors, and patient relationships to health care in order to better understand racial disparities in these domains. Shacter, et al[16] analyzed differences in the themes discussed by four different groups of patients with diabetes: well-controlled White patients, well-controlled Black patients, poorly-controlled White patients, and poorly-controlled Black patients.

Our study builds upon findings of a qualitative study by Shacter, et al[16] to develop a quantitative evaluation of self-care behaviors, psychosocial stressors, and patient relationships to health care in order to better understand racial disparities in these domains.

Analyses of transcripts showed that poorly-controlled Black patients were significantly less likely to say that health care positively promoted glucose control and more likely to cite barriers to self-care and psychosocial issues, such as difficulty coping with stress and dietary temptation, as hindering control. Based on these findings, this study assesses dietary temptation, coping style, and trust in physician in order to determine if these psychosocial factors mediate racial disparities in glucose control.

We hypothesized: 1) patients with poor glucose control would endorse decreased ability to manage dietary temptations, difficulty coping, and poorer relationships with their health care providers compared to patients with adequate glucose control; and 2) racial differences in diabetes control would be partially mediated by dietary temptation, coping styles, and relationship to physician.

METHODS

Study Population

Potential participants were identified from the University of Pennsylvania Health System electronic medical record. This health system serves a diverse population in terms of race, ethnicity, and socioeconomic status. Individuals aged ≥18 years, with more than one ICD-9 code for diabetes mellitus, and a HbA1c test result within one month were sent a letter informing of their eligibility for the survey. Individuals were called by trained interviewers for administration of the survey. Exclusion criteria included: 1) not having a telephone number, 2) not self-identifying as having diabetes mellitus, 3) not speaking English, or 4) current hospitalization or long-term institutionalization. Participants provided verbal consent and received a $5 gift card after completing the survey. Survey responses were collected between January 2011 and December 2011. We obtained University of Pennsylvania Institutional Review Board approval for survey administration as well as permission to abstract from the medical record the age, sex, race, and last HbA1c result of responders and non-responders.

Survey Instrument

The survey instrument contained 89 items. We collected demographic variables including self-reported race, age, sex, education, marital status, health insurance status, annual income, and employment status. Participants were asked about their duration of diabetes, diabetes treatment, diabetic comorbidities such as hypertension and hyperlipidemia, and smoking status. In addition, we asked about diabetes self-care activities such as performing finger stick glucose measurements, medication adherence, and following a healthy diet. In order to assess medication adherence, we used the Morisky Medication Adherence Scale,[17] a 4-item scale that addresses barriers to medication taking. We dichotomized adherence into perfect vs non-perfect. We used the Diet subscale of the Summary of Diabetes Self-care Activities instrument[18] to capture adherence to a healthy diet. This subscale contains 4 items that assessed the number of days per week (0 to 7) that the individual followed a healthy diet.

Potential explanatory scales of interest evaluate dietary temptations, coping style, and trust in physicians. We used the Dieter's Inventory of Eating Temptations Self-Efficacy instrument (DIET-SE) to determine each participant's confidence in their ability to overcome different diet temptations.[19] Participants were asked to rate their confidence as not at all, a little, moderately, quite, or very confident. The eleven diet items were sub-classified as high caloric temptations, social and internal factor temptations, or negative emotional temptations. We used the Jalowiec Coping Scale (JCS) to determine each participant's predominant coping style. The JCS consisted of 40 items asking participants how often they used a particular coping strategy in a stressful situation: ''In a stressful situation, how often do you blame someone else for your problem?''[20,21] Participants were asked to respond never, seldom, sometimes, often, or always. Lastly, the Trust in Physician (TIP) scale[22] is an 11-item scale that assesses interpersonal trust in the primary care physician within the context of the management of the patient's diabetes. We asked participants to describe their level of agreement (strongly disagree, disagree, neutral, agree, strongly agree) with statements about their doctor: ''I doubt that my doctor really cares about me as a person.''

Glucose Control

We used the most recent HbA1c result gathered from the electronic medical record to determine glucose control. All surveys were administered within one month of the HbA1c result to ensure that survey responses corresponded to each patient's current glucose control status. Good control was defined as having an HbA1c< 8%.

Analysis

For demographic variables, diabetes disease characteristics, medication adherence, and diet, we calculated summary statistics by glucose control (*t*-tests for continuous variables and chi-square tests for ordinal and categorical variables). For the DIET-SE and JCS subscales, as well as the TIP scale we calculated the mean scores by control and race. We used factor analysis to group 21 of the 40 items on the JCS into 3 coping sub-scales consistent with Jalowiec's terms: confrontive coping (cronbach alpha=.83), emotive coping (alpha=.75) or evasive coping (alpha=.68). We performed a multivariate logistic regression with glucose control (good, bad) as our dependent variable and race (Black, White) as our primary independent variable of interest. We adjusted for variables found to be significantly associated with control and significant interaction terms.

RESULTS

We obtained complete survey data from 332 out of 633 participants, yielding a response rate of 51%. Individuals who did complete the survey were similar to those who did not complete the survey with respect to sex, race, and glucose control; however, individuals who did complete the survey were significantly younger than non-responders by 6.3 years ($P<.001$).

Among the individuals who did complete the survey (Table 1), 69.3% identified as Black and 66.9% were female; the mean age of respondents was 59.8 years; and 28.6% had poor glucose control. Poor glucose control was significantly associated with Black race, with Black participants representing 80.0% of patients with poor glucose control in comparison to 65.0% of those with good control ($P=.023$).

Table 1. Sample demographics

	Total (*N*=332)	Good Control (*n*=237)	Poor Control (*n*=95)	*P*
Race, %				.023
White	21.4	24.9	12.6	
Black	69.3	65.0	80.0	
Other	9.3	10.1	7.4	
Age, years ± SD	59.8 ± 12.3	61.0 ± 12.8	56.9 ± 10.4	.007
Sex, %				.902
Male	33.1	33.3	32.6	
Female	66.9	66.7	67.4	
Education, %				.028
≤High school	39.7	35.7	49.5	
Some college/trade school	35.2	34.9	35.8	
College	13.0	14.9	8.4	
>College	12.1	14.5	6.3	
Marital status, %				.454
Married	38.9	40.9	33.7	
Widowed	14.4	15.2	12.6	
Divorced/separated	20.2	19.0	23.2	
Other	26.5	24.9	30.5	
Health insurance, %				.001
Private	53.3	59.5	37.9	
Medicare	16.6	15.6	31.6	
Dual	10.0	16.0	17.9	
Medicaid/other	20.1	8.9	12.6	
Annual income, %				.005
$0-9,999	24.7	19.4	37.9	
$10,000–19,999	20.5	20.7	20.0	
$20,000–69,999	28.3	30.8	22.1	
≥$70,000	16.3	19.0	9.5	
Unknown	10.2	10.1	10.5	
Employment status, %				<.001
Working	30.1	31.2	27.4	
Retired	28.3	9.3	14.7	
Unemployed/other	10.9	34.2	13.7	
Disabled	30.7	25.3	44.2	
Years with diabetes, %				.006
0–5 years	26.0	30.0	16.0	
6–10 years	25.1	27.0	20.2	
11–15 years	20.2	18.1	25.5	
>15 years	28.7	24.9	38.3	
Medications, %				<.001
Diet/oral hypoglycemics	56.9	67.1	31.6	
Insulin	20.4	17.3	28.4	
Both	22.6	15.6	40.0	
Diabetic comorbidities, %				.011
0–1	20.2	22.4	14.7	
2–3	48.5	51.0	42.1	
≥4	31.3	26.6	43.2	
Tobacco use, %				.368
Never smoked	37.8	39.3	34.0	
Past smoker	44.4	44.7	43.6	
Current smoker	17.8	16.0	22.4	

Other demographic characteristics associated with poor glucose control included younger age, having a high school education or less, having Medicare or Medicaid insurance coverage, annual income less than $10,000, and being retired or disabled. Diabetes specific characteristics associated with poor control included having diabetes for more than 10 years, using insulin, and having more than three diabetic comorbidities. In addition, decreased adherence to diabetes medications correlated strongly with poor glucose control; 65.3% of participants with poor glucose control reported non-perfect medication adherence compared with 51.5% of those with good control (P=.022). Lastly, a lower score on the Diet subscale of the Summary of Diabetes Self-care Activities (62.3 among poorly-controlled participants vs 71.2 among well-controlled, P=.004) was associated with poor glucose control. Race was not associated with self-reported medication adherence or self-reported diet quality.

Among all patients, higher self-efficacy to resist social and internal diet temptations was associated with good glucose control (P=.026) (Table 2). High caloric temptations and negative emotional temptations were not associated with glucose control. White participants who endorsed a confrontive coping style were significantly more likely to have good glucose control (P<.001); however, this relationship was not seen among Black patients and was not significant in the study population as a whole (Table 2). There was no significant relationship between TIP scores and glucose control or race.

In regression analyses, the unadjusted odds of poor control in Blacks compared to Whites were 2.43 (95% CI: 1.23–4.78) (see Table 3). This finding remained relatively unchanged after adjusting for significant differences in demographic variables, diabetes disease specific characteristics, dietary social temptations, as well as confrontive coping style and an interaction term

Table 1. Continued

	Total (*N*=332)	Good Control (*n*=237)	Poor Control (*n*=95)	*P*
Do fasting finger sticks, %				.117
No	11.8	13.5	7.4	
Yes	88.2	86.5	92.6	
Self-reported medication adherence, %				.022
Perfect	49.2	48.5	34.7	
Non-perfect	50.8	51.5	65.3	
Self-reported diet quality (score ± SD)	68.6± 21.0	71.2 ± 19.6	62.3 ± 23.1	.004

between Black race and confrontive copying style (OR 2.53; 95% CI: 1.01–6.32, setting the confrontive coping style score at the median value for Blacks). This was also true after adding medication adherence and adherence to diabetic diet as possible mediators of poor glucose control (OR 2.43; 95% CI: 0.96–6.15, setting the confrontive coping style score at the median value for Blacks).

DISCUSSION

The results of our study, in which Black race is significantly associated with poor glucose control, confirms previously well-documented racial disparities in glucose control.[1–3] However, while two of the three potential mediators of racial disparities explored here—dietary temptation and coping style—were significantly associated with glucose control, they did little to explain racial disparities in control. Interventions aimed at improving patients' ability to handle dietary temptations may be beneficial for all patients with poor control but at this time there is no evidence that they would reduce disparities in control.

To our knowledge ours is the first study to use the DIET-SE scale in a diabetic population; however, among non-diabetic patients, higher total scores on the DIET-SE significantly predicted lower amount of food intake, smaller portions, and lower self-report intake of food.[19] Results from our study support findings from focus groups of diabetic patients in which themes such as self-care and psychosocial factors are important aspects of glucose control,[16] and where negative emotions, resisting temptations, and being tempted to relapse emerged as important barriers to observing a healthy diet and glucose control.[23] In addition, a recent survey of low-income diabetic patients revealed that stress causing over-eating or unhealthy food choices and difficulty resisting the temptation to eat unhealthy food were among the top barriers to healthy eating.[24] While qualitative and quantitative studies have highlighted the importance of dietary temptation for diabetic individuals, few studies have demonstrated an association between ability to resist temptation with better glucose control.

Analyses of the respondents' coping styles demonstrated that among White individuals with diabetes, a more confrontive coping style was associated with good glucose control; however, this was not the case for Black participants. This association of confrontive coping style with good glucose control contradicts Nomura, et al's[25] study of Japanese diabetic patients, in which men with poor glucose control showed significantly higher problem-oriented (ie, confrontive) coping than men with good control. Data from our study yielded a significant interaction term between race and confrontive coping style; thus confrontive coping style moderated glucose control differently in Whites than in Blacks. Our findings are consistent with a study of Black Americans with diabetes in which there was no association between glucose control and JCS coping style.[26] However, they did find that a more active (or confrontive) coping style explained some of the differences in participants' self-care (number of days following a diabetic diet), and decreased use of emotive coping style independently explained increased perceived well-being. The differing findings among these various populations regarding the relationships between coping style, glucose control, and other self-care behaviors, may be due to the fact that styles of coping are culturally-informed, carrying different significances and meanings among different cultural and ethnic groups. Given other studies' findings of increased perception of diabetes-related stress among Black patients,[16,27] we expected significant differences in JCS coping styles along the lines of glucose control and race; however this increase in stress may not be mediated through coping styles, and thus the JCS may not be an appropriate tool to understand the effects of stress and coping among Black diabetic patients.

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Table 2. Glucose control, race, and psychosocial factors

	Diet Temptations			Coping Styles			
	Social and Internal	High Caloric	Negative Emotional	Confrontive	Emotive	Evasive	Trust in Physicians
All patients, mean ± SD							
Good control	3.8 ± 1.1	3.5 ± 1.1	4.0 ± 1.1	3.6 ± .8	2.5 ± .9	2.9 ± .8	84.1 ± 13.6
Poor control	3.5 ± 1.1	3.4 ± 1.1	3.8 ± 1.2	3.7 ± .7	2.5 ± .8	2.9 ± .8	81.5 ± 15.2
P	.026	.375	.273	.206	.994	.602	.121
Black patients, mean ± SD							
Good control	3.9 ± 1.1	3.6 ± 1.1	4.0 ± 1.0	3.7 ± .8	2.3 ± .8	2.9 ± .9	83.3 ± 13.9
Poor control	3.6 ± 1.1	3.5 ± 1.1	3.9 ± 1.1	3.6 ± .8	2.5 ± .8	3.0 ± .8	82.2 ± 15.1
P	.037	.443	.285	.796	.264	.707	.580
White patients, mean ± SD							
Good control	3.6 ± 1.0	3.3 ± 1.1	3.6 ± 1.1	3.7 ± .5	2.9 ± .8	2.7 ± .5	85.4 ± 13.6
Poor control	3.0 ± 1.3	3.1 ± 1.3	3.0 ± 1.4	3.0 ± .8	2.8 ± .9	2.7 ± .6	78.8 ± 15.8
P	.083	.443	.168	<.001	.535	.862	.142

We found no differences in TIP scores between patients with good vs poor glucose control or between Black and White patients. However, other studies have shown that decreased levels of trust in physicians are associated with poorer adherence to medication in the general patient population,[28,29] and in diabetic patients.[30] In other analyses, trust in physicians has been found to be lower among non-White patients compared to White patients.[31–33] This negative finding may be explained by a potential response bias introduced by the fact that the researchers had the same affiliation as participants' doctors; though we explained to all participants that responses were anonymous and their doctors would not know the results of the survey responses, participants may have been reluctant to reveal their true feelings about their trust in their physicians.

Limitations

This study was conducted as a telephone interview; thus instruments that were designed and validated for paper administration were read aloud to participants. However, the scales showed internal reliability with good chronbach's alphas and at least two scales were associated with glucose control reflecting appropriate use of the scales over the telephone. The method of survey administration may have introduced selection bias in that individuals who were available to answer their phone and take the time to complete the survey may have been more likely to be unemployed, disabled, or retired, thus these results may not represent the full range of patient experiences. In addition, we must consider the possibility that the instruments used to measure coping and trust in physicians did not adequately capture these domains. Finally, this was a cross-sectional study; we can only report associations and are unable to claim causality between these associations.

Table 3. Odds of poor glucose control by race

	Model 1	Model 2	Model 3
White	1.0	1.0	1.0
Black, OR (95% CI)	2.43 (1.23–4.78)	2.53 (1.01–6.32)[a]	2.43 (.96–6.15)[a]
Other, OR (95% CI)	1.43 (.50–4.08)	3.41 (.93–12.56)	3.27 (.86–12.89)

Model 1: Unadjusted.

Model 2: Adjusted for age, education, insurance, income, employment, years with diabetes, medication, diabetes co-morbidity, and social diet temptations, confrontive coping style, and an interaction term between black and confrontive coping style.

Model 3: Model 2 plus potential mediators of poor control (self-reported medication adherence and diet).

[a] Odds of poor control in Blacks compared to Whites setting confrontive coping style score at mean value for Blacks.

CONCLUSIONS

Results from Shacter et al's[16] qualitative analysis of Black and White veterans with poor and good glucose control indicated that self-care, psychosocial factors, and health care relationships were important themes in addressing racial disparities in glucose control. Our study evaluated a non-veteran population, however, we have no reason to believe that the issues discussed in that study should vary largely by veteran status. Overall, no evidence from our data suggests that interventions aimed at dietary temptations, coping styles, or trust in physicians would reduce racial

disparities in glucose control. Based on these analyses, it may be concluded that interventions that focus on dietary temptations would positively affect all diabetic patients. Moreover, White diabetic patients may benefit from interventions to boost confrontive coping style.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Betancourt, Long
Acquisition of data: Betancourt, Degnan
Data analysis and interpretation: Betancourt, Degnan, Long
Manuscript draft: Betancourt, Long
Statistical expertise: Degnan, Long
Acquisition of funding: Betancourt
Administrative: Betancourt, Degnan, Long
Supervision: Long