HHS Public Access

Author manuscript

Ethn Dis. Author manuscript; available in PMC 2020 July 31.

Published in final edited form as:

Ethn Dis. 2014 ; 24(3): 349–355.

Effect of diabetes self-efficacy on glycemic control, medication adherence, self-care behaviors, and quality of life in a predominantly low-income, minority population

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Abstract

Background: Evidence suggests self-efficacy is an important component predicting positive self-care behaviors in chronic disease. This study examined the effect of self-efficacy on glycemic control, self-care behaviors, and quality of life in low-income, minority populations with type 2 diabetes.

Methods: Data on 378 subjects recruited from two primary care clinics in the Southeastern United States were examined. Multiple linear regression assessed associations between self-efficacy, hemoglobin A1c, medication adherence, diabetes knowledge, self-care behaviors and quality of life.

Results: 83% were Non-Hispanic Blacks, 69% were women, 26% had less than high school education, 60% were unemployed, 39% were uninsured and 80% had yearly income <$25,000. Self-efficacy had modest correlations with glycemic control ($r = -0.250$, $p<0.001$), medication adherence ($r = -0.352$, $p<0.001$), diabetes knowledge ($r = 0.118$, $p=0.039$), diet ($r = 0.420$, $p<0.001$), exercise ($r = 0.220$, $p<0.001$), blood sugar testing ($r = 0.213$, $p<0.001$), foot care ($r = 0.121$, $p=0.032$), and mental health related quality of life ($r = 0.137$, $p=0.017$). In the regression model, self-efficacy was significantly associated with glycemic control ($\beta= -0.104$, 95% CI: −0.157; −0.051), medication adherence ($\beta= -0.067$, 95% CI: −0.090; −0.044), diet ($\beta=0.150$, 95% CI: 0.108; 0.191), exercise ($\beta=0.113$, 95% CI: 0.065; 0.161), blood sugar testing ($\beta=0.107$, 95% CI: 0.049; 0.164) and mental health related quality of life ($\beta=0.112$, 95% CI: 0.051; 0.173).

Conclusion: Higher self-efficacy was associated with improved glycemic control, medication adherence, self-care behavior and mental health related quality of life. Emphasis on self-efficacy is relevant for educational interventions developed for low-income, minority populations.

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Disclosure Statement: No competing financial interests exist.

Keywords

diabetes self-efficacy; glycemic control; medication adherence; self-care behaviors; quality of life; low-income population; type 2 diabetes

1. Introduction

Self-efficacy is a well-studied psychological construct that is consistently associated with health behavior [1, 2]. As defined by Bandura, self-efficacy is confidence in one's ability to perform goal-directed behaviors when confronted with impediments [2, 3]. In patients with type 2 diabetes (T2DM), health behaviors in the form of self-management behavior plays a central role in adequate glycemic control. Many factors influence successful management of T2DM, including self-efficacy [4]. Numerous studies have investigated its role in predicting behavior in patients with diabetes since patient attitudes are strong factors in disease management and self-care [2,5-7]. Results have shown self-efficacy to be more predictive of self-care behaviors than locus of control, coping strategies, perception of relationship with provider, risk awareness, diabetes distress, and autonomous motivation [8-10]. Clark indicated that self-efficacy is a very relevant construct when trying to explain adoption of healthy behaviors such as exercise. [11] More recently Schoenthaler and colleagues noted that individuals with chronic diseases and high levels of self-efficacy were more likely to perform healthy behaviors than those with lower self-efficacy. [12] Additionally, lowered efficacy has been particularly problematic in T2DM patients with depression, which increases negative appraisals of one's capabilities and consequently self-efficacy. [12]

Throughout the self-efficacy literature various measures are used, making comparisons between studies difficult. For this study, we chose a diabetes specific measure, the Perceived Diabetes Self-Management Scale (PDSMS), which is a valid and reliable way to measure diabetes self-efficacy [2]. The 8-item scale asks questions regarding difficulty finding effective solutions to problems with managing diabetes, difficulty in efforts to change, ability to manage one's disease as well as other people, regularity in planning for managing diabetes, and ability in accomplishing goals with respect to managing diabetes [2].

In general, the self-efficacy of individuals from disadvantaged or minority populations is typically lower, and this reduced self-efficacy extends to management of chronic illnesses such as diabetes. [13] In development of the PDSMS, Wallston and colleagues found that patients in the highest five income categories had higher self-efficacy scores than those in lower income categories [2]. Specific factors associated with both minority status and low self-efficacy include relatively lower educational level [13], poor socio-economical status [14,15] and being from a historically disadvantaged minority group, who subsequently present with higher rates of complications and mortality, compared with other groups [16]. A number of studies investigating primarily Hispanic populations have indicated an association between increased self-efficacy and improved self-management. [17-21] However, studies examining groups of mixed racial/ethnic minorities show increases in self-management, but found no statistically significant improvement in self-efficacy. [22,23] This may suggest that while self-efficacy is a major determinant of self-care behaviors and

glycemic control in Hispanic populations, other racial/ethnic groups may be influenced more heavily by factors other than self-efficacy, such as cultural beliefs, lack of funds for treatment and barriers to access. [16,24,25] As a result, the literature suggests that the relationships between self-efficacy, self-care behaviors and glycemic control may differ among low-income minority populations; however the research addressing the nature of this relationship is insufficient.

This study aimed to address the lack of understanding regarding the association of self-efficacy with glycemic control, self-care behaviors, and quality of life in low-income, predominantly minority populations with T2DM. We hypothesized that among low-income, minority subjects with T2DM, individuals with more self-efficacy would have better glycemic control, higher medication adherence, better self-care behaviors, and higher quality of life.

2. Methods

2.1 Sample

We recruited consecutive patients diagnosed with T2DM who had scheduled appointments at two adult primary care clinics in the Southeastern United States. The institutional review board at our institution approved all procedures prior to study enrollment. The study was exempt from HIPAA and written consent because it is of minimal risk. Eligible patients were clinic patients, age 18 years or older with a diagnosis of T2DM in their medical record, and a clinic appointment between June 2010 and August 2010. Patients were ineligible if they did not speak English, or if the research assistants determined (by interaction or chart documentation) they were cognitively impaired or too ill to participate. We approached consecutive patients with a clinical diagnosis of T2DM over a 10-week period. The response rate was approximately 75%. We did not capture data on non-participants, so we are unable to describe differences between participants and non-participants.

2.2 Data and Procedure

Research assistants reviewed the electronic clinic roster to identify eligible patients. Eligible patients were approached in the clinic waiting room and provided a description of the study. Those interested and eligible were consented and taken to a private area in the clinic to complete the study instruments, no incentives were offered. Participants completed the assessment before or after their scheduled clinic appointments, depending on clinic flow. Three hundred and seventy-eight subjects were consented and completed the study. We collected data on self-reported age, sex, race/ethnicity, marital status, education, household income, and health insurance. Additional measures included validated surveys of diabetes self-efficacy, diabetes knowledge, medication adherence, diabetes self-care behavior, and health related quality of life. Glycemic control was assessed by abstracting the most recent hemoglobin A1c from electronic medical records.

2.3 Demographic variables

We categorized the demographic variables as follows: Age: 18-49 years, 50-64 years and 65 years and older. Race/ethnicity: non-Hispanic White and non-Hispanic Black. Marital status:

married or not married. Education: less than high school, high school graduate, or greater than high school. Employment: employed or unemployed. Categories of annual household income were <$10,000, <$25,000, or $25,000 or greater, and health insurance was either insured or uninsured.

2.4 Self-efficacy

Self-efficacy was assessed with the Perceived Diabetes Self-Management Scale (PDSMS); an 8-item measure scored on a 5-point Likert scale from strongly disagree to strongly agree. Scores range from 8 to 40, with high scores indicating high self-efficacy. It is a valid and reliable measure of diabetes self-efficacy (Cronbach alpha = 0.83) [2].

2.5 Diabetes knowledge

Diabetes knowledge was assessed with the Diabetes Knowledge Questionnaire (DKQ) [26]. It is a 24-item questionnaire to determine the level of knowledge about causes of diabetes, types of diabetes, self-management skills, and complications of diabetes. It attained a reliability coefficient of 0.78 and showed sensitivity to a diabetes knowledge intervention. Response options are “yes”, “no”, or “don’t know”, and the final score was based on the percentage of correct scores [26]. False statements are those known to be common and/or serious misconceptions, and it targets possible knowledge deficits that can be related to measurable outcomes. The DKQ was validated in an ethnically diverse sample comprised of 63% non-Hispanic white, 34% non-Hispanic black, and 3% Hispanic and other minorities. [26]

2.6 Medication adherence

The Morisky adherence scale [27] is a 4-item, “yes” or “no” type of response scale which is used to assess medication adherence [27,28]. High scores in this scale indicate poorer adherence. It is a commonly used self-report tool to assess medication adherence and is a reliable and valid measure (Cronbach alpha =0.61) [27,28].

2.7 Diabetes self-care behavior

Self-care behavior was assessed with the 11-item Summary of Diabetes Self-Care Activities (SDSCA) scale [29]. It is a brief, validated self-report questionnaire of diabetes self-management that includes items assessing diet, exercise, medication adherence, and self blood glucose testing. The average inter-item correlations within scales are high (mean=0.47); test-retest correlations are moderate (mean=0.40); and correlations with other measures of diet and exercise generally support the validity of the SDSCA subscales (mean=0.23) [29]. For this analysis, general diet, foot care, blood-glucose testing and exercise were used.

2.8 Quality of Life

Quality of life was assessed with the SF-12 Version 1, which is a valid and reliable instrument to measure quality of life (Cronbach alpha=0.89) [30,31]. It is a widely used brief and comprehensive survey that yields summary physical (PCS-12) and mental health (MCS-12) outcome scores that are interchangeable with those from the SF-36 in both

general and specific populations. The SF-12 items reproduce at least 90% of the variance in PCS-36 and MCS-36 scores. [30,31]

2.9 Glycemic Control

Hemoglobin A1C was abstracted from the electronic medical records using the most recent value for each participant within the previous 6 months.

2.9 Statistical Analyses

We performed four sets of analyses. First, we assessed the psychometric properties of the scale in our sample. Second, we calculated sample percentages for each demographic variable. Third, we used Spearman's correlation to test the association among self-efficacy, hemoglobin A1c, medication adherence, diabetes knowledge, and self-care behaviors (diet, physical activity, blood sugar testing and foot care) as well as PCS-12 and MCS-12 scores. Fourth, we ran multiple linear regression models to assess the independent associations between self-efficacy and hemoglobin A1c, medication adherence, diabetes knowledge and diabetes self-care behaviors (diet, physical activity, blood sugar testing and foot care) as well as PCS-12 and MCS-12 scores controlling for covariates. For each regression model, mean hemoglobin A1c, medication adherence, diabetes knowledge and self-care behaviors (diet, physical activity, blood sugar testing and foot care) as well as PCS-12 and MCS-12 scores were the dependent variables, self-efficacy was the primary independent variable and age, sex, race/ethnicity, education, income, and employment were included in the model as covariates. All analyses were performed with STATA V10 and a two-tailed alpha of 0.05 was used to assess for significance. Variables were selected for inclusion in the models based on clinical relevance.

3. Results

A total of 378 patients with T2DM were enrolled in this study. We assessed the psychometric properties of the PDSMS in our sample. The Cronbach's alpha was 0.78. The eight items loaded on a single factor with eigenvalue of 3.29 and the single factor explained 41% of the variance in the sample. Demographic characteristics of the sample population are presented in Table 1. More than half the sample (53.6%) was between 50-64 years old. The majority were women (69.1%), non-Hispanic black (83.2%) and were not married (68.4%); 43.8% had a high school education, and 60.5% were unemployed; 80.3% had household income of less than $25,000 and nearly 61% were insured.

In assessing the associations among self-efficacy as measured by the PDSMS, medication adherence, self-care behaviors, and quality of life (Table 2), we found modest correlations between self-efficacy and glycemic control ($r = -0.250$, $p<0.001$), medication adherence ($r = -0.352$, $p<0.001$), diabetes knowledge ($r = 0.118$, $p=0.039$), diet ($r = 0.420$, $p<0.001$), exercise ($r = 0.220$, $p<0.001$), blood sugar testing ($r = 0.213$, $p<0.001$), foot care ($r = 0.121$, $p=0.032$), and mental health related quality of life ($r = 0.137$, $p=0.017$). Self-efficacy was not significantly correlated with physical health related quality of life ($r = -0.019$, $p=0.741$).

Finally, multiple linear regression analyses shown in Table 3 were used to determine the independent association between self-efficacy and glycemic control, medication adherence,

self-care behaviors, and quality of life. We found that diabetes self-efficacy was significantly associated with glycemic control (β= −0.104, 95% CI: −0.157; −0.051), medication adherence (β= −0.067, 95% CI: −0.090; −0.044), diet (β=0.150, 95% CI: 0.108; 0.191), exercise (β=0.113, 95% CI: 0.065; 0.161), blood sugar testing (β=0.107, 95% CI: 0.049; 0.164) and mental health related quality of life (β=0.112, 95% CI: 0.051; 0.173). There was no significant association between diabetes self-efficacy and diabetes knowledge (β= 0.069, 95% CI: −0.006, 0.144) foot care (β= 0.041, 95% CI: −0.012, 0.093), or physical health related quality of life (β= −0.019, 95% CI: −0.045, 0.007).

4. Discussion

4.1 Summary of Results

Consistent with our hypothesis, there was a significant association between diabetes self-efficacy, as measured by perceived diabetes self-management, and glycemic control, mental health component of quality of life, medication adherence, and most self-care behaviors (diet, exercise, and blood sugar testing). Contrary to our hypothesis, there was no significant association between self-efficacy and physical health component of quality of life or diabetes knowledge in this low-income, predominantly minority population.

4.2 Implications of Research

The major contribution of these findings is the focus on a low-income minority population and the investigation of an association between self-efficacy and health related quality of life. While a number of interventions have investigated both self-efficacy and glycemic control [8,32-38], few have been focused on low-income populations. Higher self-efficacy has been shown to be protective against barriers to health care access and utilization. [39] However, even within a population of low-income subjects, one study showed that those with higher socioeconomic status had more positive outcome expectancies and self-efficacy. [40] Seligman and colleagues found that self-efficacy scores were lower among food insecure adults, but that it did not mediate the association between food insecurity and glycemic control. [41,42] Additionally, the decreased self-efficacy associated with populations with housing instability was mediated by food insecurity. [43] As a result, it is essential to understand the importance of self-efficacy in low-income populations to determine where to focus intervention efforts. This study helps facilitate the development of these interventions by suggesting that a focus on medication adherence and self-care behaviors will influence self-efficacy more than a focus on knowledge. Increasing self-efficacy, rather than giving information to increase patient concern for their condition, may be more beneficial to their health outcome.

Lastly, few studies have investigated the influence of diabetes self-efficacy, on health related quality of life. Based on patient interviews, comprehensive diabetes treatment can have negative quality of life effects. [44] Low-income patients found chronic diseases to be of greatest concern when considering their health related quality of life. [45] Therefore, in chronic diseases like diabetes, it may be important to measure both objective and subjective outcome measures to integrate individual expectations into overall health status measurement [46,47]. This study indicates that self-efficacy is associated with mental health

related quality of life. Intervention studies should consider this multi-focus approach, considering associations between diabetes self-efficacy and glycemic control, self-care behaviors, and health related quality of life.

4.3 Comparison of Results with Literature

While some studies have found that diabetes self-efficacy does not significantly improve glycemic control [32,38], a number of studies have shown successful interventions improving self-efficacy and glycemic control. [33-38] Additionally, many studies tend to examine self-efficacy and glycemic control as separate outcomes, rather than the association between the two [8,33-38]. Therefore, based on the literature and the current findings of an association between diabetes self-efficacy and glycemic control in low-income minority populations, this relationship is worth further investigation.

The association between diabetes self-efficacy and the mental health component of quality of life was shown, while the physical health component was not statistically significant. The finding that these two aspects of quality of life associate differently is consistent with literature for other diseases [48-50]. This study is one of the first to investigate this relationship in diabetes. Graco and colleagues and Peyrot and colleagues both found no significant association between self-efficacy and quality of life, but did not differentiate between mental and physical health components [32,51]. Replication of our study in low-income minority populations (including Hispanics and other minority groups) is needed to determine if these findings are consistent.

The association between higher diabetes self-efficacy and better diet, blood sugar testing and exercise habits is consistent with the literature [4,8,33]. The association between higher self-efficacy and better medication adherence is different from the findings of Sarkar and colleagues in a racially/ethnically diverse population, but consistent with the findings of Wallston and colleagues in developing the Perceived Diabetes Self-Management Scale and Gherman and colleagues review of various health beliefs [2,4,8]. The findings of this study, in consideration of the literature, suggest that while it is clear that an association between diabetes self-efficacy and self-care exists, the impact on different behaviors varies. The population studied by Sarkar and colleagues included fewer non-Hispanic blacks than the population in this study or by Wallston and colleagues. [2,4] The difference in findings suggests a possible variation of influence on diabetes self-efficacy by racial/ethnic group. Additional research into the direction and mechanism for the association is warranted.

While health behavior and diabetes self-efficacy have been studied relatively often, less attention has been given to the association between self-efficacy and diabetes specific knowledge. Studies have found increased knowledge and increased self-efficacy in post-intervention groups [35,52]; however, the populations were largely non-Hispanic white and Hispanic, and the two variables were not compared to each other in the analyses. Consistent with our findings, McCleary and colleagues found that in a non-Hispanic black population, diabetes knowledge and diabetes self-efficacy were not associated with each other, but were independent predictors of self-care activities [53]. Therefore, more research is needed to determine if diabetes-specific knowledge is associated with self-efficacy, and if differences exist when populations are stratified by income or race/ethnicity.

There are limitations to this study that are worth mentioning. First, the study design was cross-sectional; therefore, the findings cannot address causality or direction of the associations. Second, there are additional confounding factors that were not available in our study including but not limited to disease duration, disease severity, trust, and diabetes distress that need to be accounted for in future studies. Lastly, the study was conducted in Southeastern United States and may not be representative of other areas and other populations across the country.

4.4 Conclusion

In conclusion, higher self-efficacy was associated with improved glycemic control, medication adherence, self-care behavior (diet, exercise, and blood sugar testing) and mental health related quality of life. These findings may be important in development of educational interventions for low-income minority patient populations with T2DM. Additionally, this study suggests the importance of considering mental health related quality of life while investigating self-efficacy in a low-income population.

Acknowledgments

Funding: Supported by Grant #T35DK007431 from the National Institute for Diabetes, Digestive and Kidney Disease

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Table 1.

Sample Demographic Characteristics (n=378)

	%
Age	
18-49 years	24.0
50-64 years	53.6
65+ years	22.4
Gender	
Women	69.1
Men	30.9
Race/Ethnicity	
Non-Hispanic Black	83.2
Non-Hispanic Whites	16.8
Marital Status	
Married	31.6
Not Married	68.4
Educational level	
Less than HS* graduate	25.8
HS graduate	43.8
Greater than HS graduate	30.3
Employment status	
Employed	39.5
Unemployed	60.5
Annual income level	
<$10,000	46.5
<$25,000	33.8
$25,000+	19.6
Health insurance	
Insured	60.9
Uninsured	39.1

*HS = High School

Table 2.

Correlations among Diabetes Self-Efficacy, Glycemic Control, Medication Adherence, Self-Care Behaviors, and Quality of Life

	r	P-value
Diabetes Self-Efficacy Scale		
HbA1c	−0.250 *	<0.001
Medication Adherence	−0.352 *	<0.001
Diabetes Knowledge	0.118 *	0.039
Diet	0.420 *	<0.001
Exercise	0.220 *	<0.001
Blood Sugar Testing	0.213 *	<0.001
Foot Care	0.121 *	0.032
PCS	−0.019	0.741
MCS	0.137 *	0.017

* Statistically significant, $P<0.05$

Table 3.

Adjusted Model[†] for the Relationship among Diabetes Self-Efficacy, Glycemic Control, Medication Adherence, Self-Care Behaviors, and Quality of Life

	β	CI	P-value
Diabetes Self-Efficacy Scale			
HbA1c	−0.104*	−0.157; −0.051	<0.001
Medication Adherence	−0.067*	−0.090; −0.044	<0.001
Diabetes Knowledge	0.069	−0.006; 0.144	0.073
Diet	0.150*	0.108; 0.191	<0.001
Exercise	0.113*	0.065; 0.161	<0.001
Blood Sugar Testing	0.107*	0.049; 0.164	<0.001
Foot Care	0.041	−0.012; 0.093	0.126
PCS	−0.019	−0.045; 0.007	0.150
MCS	0.112*	0.051; 0.173	<0.001

[†]Model adjusted for age, sex, race/ethnicity, education, income, and employment.

*Statistically significant, $P<0.05$