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Identifying knowledge deficits of food insecure patients with diabetes

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Abstract

The purpose of this project was to identify the self-care needs of adults with diabetes who experience food insecurity. A cross-sectional study design and methodology were used to attain the study data.

We invited 153 adults with diabetes who utilized the St Vincent de Paul Food Pantry to complete the diabetes knowledge test. The reliability of the sample was calculated using Cronbach's coefficient α . To determine validity, differences in test scores were examined by diabetes type and treatment, educational attainment, and receipt of diabetes education.

Results—The coefficient α for the general test and the insulin-use subscale indicated that both were moderately reliable, $\alpha > 0.60$. General test scores were significantly associated with educational attainment ($p < 0.01$) and prior diabetes education ($p < 0.05$). We found that participants who attained education beyond high school or previously received diabetes education scored significantly higher on the test compared to those with less than high school education or not receiving diabetes education ($p < 0.05$). Adults with type 1 diabetes had higher general and insulin use scores compared to adults with type 2 diabetes, however the difference was not statistically significant.

While general knowledge about diabetes is not a predictor of self-care behavior, it is needed to perform daily self-care activities. Health care providers should assess diabetes knowledge in low income patients who experience food insecurity regularly to identify any gaps in knowledge that can compromise self-care behaviors.

Keywords

diabetes knowledge test; food insecurity; diabetes self-care education; self-care type 1 diabetes; type 2 diabetes

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Conflict of Interest: None

Introduction

Socioeconomically disadvantaged patients with diabetes have an increased risk of diabetes-related complications, prompting a search for interventions that can decrease risk of morbidity [1] and mortality [2] in these patients. A frequently overlooked modifiable risk factor among socially disadvantaged individuals is food [3], which is defined as “limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” [4]. There is an estimated 30 million adults in the United States who are food insecure and approximately 8% of these food insecure adults have diabetes [1].

Food insecure individuals face challenges in managing their diabetes due to detrimental self-care behaviors and limited access to diabetes management support. Continuous exposure to food insecurity can diminish self-care behaviors in several ways. First, food insecure adults with diabetes may reduce or substitute healthier foods for inexpensive calorific foods, such as refined sugars and fats [2]. Second, the uncertain nature of experiencing food insecurity may lead to cycles of binges and fasting making it challenging to maintain consistent glycemic control [2]. Third, the high cost of many antidiabetic medications may cause patients to reduce or skip doses increasing the risk for hyperglycemia or hypoglycemia [2]. Food insecure individuals are also more likely to be uninsured, lack a usual source of care, or receive diabetes self-management education [3]. As a result, most food insecure individuals with diabetes have limited diabetes self-care management skills and experience complications associated with diabetes due to poor glycemic control [2]. This particular vulnerable population may benefit from tailored diabetes knowledge assessments and subsequent diabetes educational interventions [4]. Assessment of diabetes self-care knowledge in patients who face food insecurity is crucial in order to identify knowledge deficits and allow for tailoring of a diabetes intervention plan designed to improve diabetes self-efficacy and self-care behaviors [5-7]. Therefore, the objective of this project is to identify knowledge deficits in food insecure individuals with diabetes.

The Diabetes Knowledge Test (DKT) was used to measure general understanding of diabetes and self-care management. The DKT was created and examined for reliability and validity by the Michigan Diabetes Research and Training Center (MDRTC) [8] in 1998. While general scores on an exam may not reflect self-care behaviors, patients who have a better understanding of self-care are more like to practice healthy behaviors. We believe the results from the DKT can help in designing tailored diabetes interventions that address the patient's specific areas of need and improve diabetes self-care behaviors.

Method

The project was conducted at St. Vincent de Paul (SVdP) food pantry in order to have access to a large number of individuals who are food insecure or at risk of food insecurity. SVdP operates the largest food pantry in Dane County, Wisconsin, the second most populous county in the state of Wisconsin. Individuals and families are eligible to participate in the food pantry program if they have an annual household income below 185% of the federal poverty level. The SVdP food pantry is a client choice model, where clients are allowed to

select their own food, similar to a grocery store. The SVdP food pantry serves nearly 45,000 individuals and distributes over \$1,300,000 of food in 2013. SVdP has a racially and ethnically diverse clientele that consists of 35% Whites, 33% African Americans, 20% Hispanics/Latino Americans, 10% Asians, and 2% American Indians and/or Alaskan Natives.

The survey instrument was conducted among a convenience sample of low-income adults with diabetes utilizing the services of the SVdP food pantry (n = 153). All individuals who utilized the services of the SVdP food pantry indicated during registration that they lacked sustainable physical or economic access to enough safe, nutritious, and socially acceptable food for a healthy and productive life over the last 30 days.

The survey was conducted from October 2013 to December 2013. A booth was set up near the entrance of the food pantry. Paper surveys were administered by trained interviewers to individuals who were waiting in line to register for the food pantry. Surveys were conducted in English. Each participant was given a brief, standardized description of the survey and screened for eligibility. To be eligible, individuals were required to have a total household income below 185% of the federal poverty level, speak English, be 18 years of age or older, and have self-reported diabetes. The Health Sciences Institutional Review Board at the University of Wisconsin determined that the project did not fit the federal definition of research; therefore, informed consent was not required.

In order to measure general diabetes knowledge and insulin use knowledge, a modified version of the Diabetes Knowledge Test (DKT) was administered. The modified DKT consists of 21 items, 14 general items administered to all individuals and 7 insulin-use items administered only to individuals who indicated that they use insulin [9]. The 21-item test took approximately 15 minutes to complete. The test's readability was measured by the Flesch-Kincaid readability test and the reading level for the test items are at the 6th grade level [10]. Two insulin use items were excluded from the original DKT. One insulin use item was excluded from the original DKT because the item inquired about signs associated with ketoacidosis, a term the investigators felt was above 6th grade reading, thus inappropriate for the sample. The second omitted insulin use item assessed knowledge of a potential insulin reaction to NPH and Lente intermediate insulin, which are infrequently prescribed (the latter is no longer available in the United States) [11].

Demographic information collected included age, gender, race/ethnicity (White, African-American, Hispanic, Other), educational attainment (less than high school, high school, some college, college or greater,) and information on diabetes type and treatment. Individuals were categorized based on their responses into three groups: 1) type 1 diabetes 2) type 2 diabetes not using insulin 3) type 2 diabetes using insulin. A diabetes education measure was also included which inquired whether the individual had ever received diabetes education or information about how to care for his or her diabetes.

Cronbachs coefficient α was used to calculate scale reliability for the general test and the insulin use test. To test construct validity of the measures, differences in mean general test scores and mean insulin use scores were examined by educational attainment, diabetes type

and treatment, and prior receipt of diabetes education using analysis of variance. A Bonferroni adjustment was utilized to adjust for multiple statistical tests. All analyses were conducted using STATA/MP 13.1 (StataCorp LP, College Station, TX). The significance level was set at $p < 0.05$.

Results

A total of 153 clients completed the DKT (Table 1). The sample had a higher percentage of women and individuals were mostly middle aged. The sample was also racially and ethnically diverse. The majority of individuals in our sample did not have a college degree. Approximately 90% of our sample had type 2 diabetes. The majority of individuals reported that they had received some form of diabetes education in the past.

The mean general test scores and insulin use test scores were lower in individuals who had lower levels of educational attainment (Table 2). Compared to individuals who had obtained a college degree or higher, individuals who did not graduate from high school or graduated from high school without going to college had significantly lower mean test scores for the general test ($p < 0.05$). Individuals who reported having received diabetes education in the past had significantly higher mean general test scores ($p < 0.05$, Table 2). Individuals who had received diabetes education also had higher insulin use scores, however this difference was not statistically significant. Individuals with type 1 diabetes had higher mean general test scores and insulin use scores compared to individuals with type 2 diabetes (Table 2), but these differences were not statistically significant.

Discussion

The adults in this sample with type 1 diabetes had higher general use scores and insulin use scores compared to adults with type 2 diabetes, consistent with previous findings [8]. This difference was not statistically significant in this sample, potentially due to the small number of patients with type 1 diabetes who participated. Patients with type 1 diabetes may be more likely to receive extensive diabetes self-care management training at the time of their diagnosis than patients with type 2 diabetes because some health providers perceive type 1 diabetes as a more severe (untreated it is immediately life threatening) disease. However, the National Standards for Diabetes Self-Management Education and Support recognize diabetes self-management education as an integral component of care for all people with diabetes as well as those at risk for developing the disease [12, 13].

Individuals who reported receiving diabetes education had higher general test scores and insulin use scores compared to individuals who did not have prior diabetes education (Table 2). This finding supports the validity of the modified DKT in this population because formal diabetes education has been associated with reductions in diabetic complications and improvements in self-management skills [13, 14]. Unfortunately, many patients never receive formal education and training [14-18]. In this sample, approximately 1 in 4 adults reported never receiving any form of diabetes education. These individuals may be particularly vulnerable because of the dual challenges of food insecurity and lack of diabetes education. In addition, health care providers may only provide advice on risk reduction

rather than training in diabetes self-management; resulting in patients ill equipped with the self-management education and skills training needed to effectively manage their diabetes [6, 11, 17].

Because food insecurity can have a dramatic impact on diabetes self-care activities and glycemic control, healthcare providers and diabetes educators should screen all low income patients with diabetes for food insecurity. A simple screening question such as “In the past month, was there any day when you or anyone in your family went hungry because you did not have enough money for food?” has been shown to identify individuals at risk for food insecurity [7]. Food insecure and low food secure patients should be assessed to identify any gaps in diabetes knowledge or inappropriate self-care behaviors that may negatively impact glycemic control. This assessment should include information about the individual's medical history, demographics, cultural influences, health beliefs and attitudes, diabetes knowledge, diabetes self-management skills and behaviors, emotional response to diabetes, readiness to learn, literacy level (including health literacy and numeracy), physical limitations, and family and financial support [15]. This information can be used to design a self-management education plan that is tailored to address social circumstances such as food insecurity and help patients successfully manage their disease.

The findings from the project must be considered preliminary due to the small sample size. Individuals self-identified as having diabetes, however the investigators did not validate this by looking at medical records. This could potentially lead to misclassification, however, self-reported diabetes has been shown to be fairly accurate [3].

While the project has a representative group of White Americans and African Americans, language and literacy barriers limited the recruitment of more Hispanic/Latinos Americans and Asian Americans participants. Future research needs to incorporate these populations. Community settings such as food pantries and food kitchens are potential points of invention to engage food insecure individuals and families in diverse settings for health promotion and prevention efforts.

The extent of the diabetes education received by participants was not assessed. It is likely that the diabetes education received by participants in this sample was heterogeneous, ranging from a brief recommendation from a health care provider to “exercise more, eat more veggies” to participation in formal diabetes education classes which covered multiple aspects of diabetes self-care management. This may account for some participants' lack of knowledge about ‘free foods’ or self-care behaviors that decrease the risk of hypoglycemic events.

A unique feature of this project was surveying clients with diabetes at a food pantry, an understudied setting among low income households. While the DKT does not cover all components of diabetes self-care management, it is an efficient way to assess a patient's knowledge about diabetes self-care management. The DKT can be administered in a variety of settings (e.g., hospitals, clinics, community centers, neighborhood health fairs, and food pantries) where health care providers and researchers can target food insecure patients as well as patients at risk for food insecurity. Providers can discuss the test responses with

patients to identify where additional guidance and support are needed. In addition, the modified DKT could be used to assess the effectiveness of tailored diabetes education programs designed to improve diabetes knowledge and self-care behaviors in individuals with food insecurity.

Conclusion

While general knowledge about diabetes is not a predictor of self-care behavior, it is necessary to perform daily self-care activities. Persons with diabetes who have attained education beyond high school or previously received formal diabetes education are more likely to have general knowledge about the disease and may be better positioned to perform daily self-care activities compared to those with less than high school education or not receiving diabetes education. Health care providers should assess diabetes knowledge and self-care management skills in low income patients who experience food insecurity regularly to identify any gaps in knowledge that can compromise self-care behaviors.

The clinical management of food-insecure individuals with diabetes can be challenging, but referrals to food resources, nutrition counseling that recognizes the challenges of food, smoking-cessation support, and appropriate medication therapy management can help these individuals' lead healthier lifestyles.

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Table 1
Sample demographic characteristics

<i>n</i>	153
Age (%)	
18-40 years	19.1%
41-50 years	27.6%
51-60 years	40.8%
Over 60 years	12.5%
Gender (%)	
Male	42.5%
Female	57.5%
Race/Ethnicity (%)	
White	49.7%
African-American	31.1%
Hispanic	12.6%
Other	2.7%
No Response	3.9%
Educational Attainment (%)	
Less than HS	9.8%
HS	37.9%
Some College	30.7%
College or greater	21.6%
Diabetes Type & Treatment (%)	
Type 1	10.7%
Type 2, no insulin	56.0%
Type 2, insulin	33.3%
Has received diabetes education (%)	
No	25.5%
Yes	74.5%

* Percentages were calculated for individuals with complete information on each variable

Table 2
Differences in test scores by diabetes type & treatment, educational attainment, and diabetes education

	General test % correct	Insulin use % correct
	(items 1-14)	(items 15-21)
	Mean $\pm$ SD (n)	Mean $\pm$ SD (n)
Overall	63.5 $\pm$ 0.2 (153)	70.6 $\pm$ 0.3 (66)
Race/Ethnicity		
White (reference)	69.7 $\pm$ 0.2 (75)	76.7 $\pm$ 0.2 (38)
African-American	54.9 $\pm$ 0.2 (47) ***	55.6 $\pm$ 0.2(18) ***
Hispanic	64.3 $\pm$ 0.1 (19)	85.7 $\pm$ 0.1 (6)
Other	57.9 $\pm$ 0.2 (10)	47.6 $\pm$ 0.3 (3)
Educational Attainment		
Less than HS	44.3 $\pm$ 0.1 (15) ***	57.1 $\pm$ 0.3 (4)
HS	61.0 $\pm$ 0.2 (58) *	70.0 $\pm$ 0.2 (31)
Some College	67.5 $\pm$ 0.2 (47)	76.8 $\pm$ 0.3 (16)
College or greater (reference)	71.0 $\pm$ 0.2 (33)	68.6 $\pm$ 0.3 (15)
Diabetes Type & Treatment		
Type 1 (reference)	67.9 $\pm$ 0.2 (16)	75.2 $\pm$ 0.3(15)
Type 2, no insulin	60.8 $\pm$ 0.2 (84)	-
Type 2, insulin	67.3 $\pm$ 0.2 (50)	69.7 $\pm$ 0.3 (8)
Has received diabetes education		
No	57.1 $\pm$ 0.2 (39) *	66.1 $\pm$ 0.3 (8)
Yes (reference)	65.7 $\pm$ 0.2 (114)	71.2 $\pm$ 0.3 (58)

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$