

# Self-care behaviors of food insecure persons with diabetes

Treashure Wade, Olivia Fahey, Maren Vanmieghem and Eva Vivian\*

School of Pharmacy, University of Wisconsin-Madison, USA

## Abstract

**Objective:** Food insecurity has been associated with poor glycemic control in patients with diabetes. This study evaluates the self-care behaviors of patients with diabetes who experience food insecurity.

**Results:** The Diabetes Self-Management Questionnaire (DSMQ) was administered to 132 food insecure persons with diabetes at randomly selected community centers, local churches, and food pantries in the Madison, Wisconsin area between May 2016 and August 2017. Sixty-one percent of the participants were female and 52% identified as African American or Black. The mean sum DSMQ score of participants was  $6.47 \pm 2.37$  out of ten possible points and the mean subscores for glucose management, dietary control, and physical activity were  $6.95 \pm 2.05$ ,  $5.54 \pm 2.18$ , and  $6.35 \pm 2.37$  respectively. While 92% of respondents reported having medical coverage, 42% reported cost related medication under-usage. These results suggest that diabetes management education that identifies challenges and barriers to proper self-care and takes into account the challenges that food insecure individuals face every day is greatly needed.

## Introduction

Poverty is the greatest enemy of those with type 2 diabetes mellitus (T2DM). Adults with T2DM from low socioeconomic status are at greater risk of developing heart disease and other diabetes complications due to worse glycemic control than adults from high socioeconomic status [1-2]. While multiple factors may contribute to poor glycemic control, food insecurity, the inability to afford healthy, nutritious food, is one mechanism by which poverty may predispose persons with diabetes to be unable to maintain glycemic control [3-5]. 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 [6]. Second, the uncertain nature of experiencing food insecurity may lead to cycles of “feast or famine” eating behaviors making it challenging to maintain consistent glycemic control [6]. Third, the high cost of many antidiabetic medications may cause persons to reduce or skip doses increasing the risk for hyperglycemia or hypoglycemia [6]. Food insecure individuals are more likely to be uninsured, lack a usual source of care, or not receive diabetes self-management education resulting in limited diabetes self-care management skills and diabetes complications [6-7].

Although previous studies have examined the effects of food security on glycemic control, few studies have assessed the diabetes self-management behaviors of persons with diabetes who experience food insecurity. Further examination of the diabetes self-care skills of persons with diabetes who face food insecurity may provide insight into the challenges these people face when attempting to maintain adequate glycemic control.

It is important to identify these individuals in order to provide them with the tools they need to manage their diabetes properly.

## Methods

We conducted a cross sectional survey of adults with diabetes at randomly selected community centers, local churches, food pantries,

and health fairs in the Madison, Wisconsin area from May 2016 through August 2017.

Three graduate students administered the Diabetes Self-Management Questionnaire (DSMQ) [8] to persons 18 years of age or older who self-identified as living with type 1 diabetes mellitus (T1DM) or T2DM and could read and speak English or Spanish.

Participants received a five-dollar monetary gift for completing the survey. The study received exempt status from The University of Wisconsin's institutional review board as the surveys were completed anonymously and no patient specific identifiers were collected.

## Measures

The survey contained 42 questions that included sixteen demographic items, sixteen items adopted from the (DSMQ) [8], six food insecurity questions taken from United States Department of Agriculture's household Food Security Survey [9] and four medication underuse questions adopted from the Medication Expenditure Panel Survey [10].

Diabetes self-management skills were measured using the Diabetes Self-Management Questionnaire (DSMQ), developed by the Research Institute of the Diabetes Academy Mergentheim and validated in Germany [8]. The DSMQ measures four areas of self-care management associated with glycemic control: 1) dietary control (e. g. frequent consumption of foods complicating glycemic control and adherence to dietary recommendation, 4 items); 2) glucose management (e.g., medication adherence, regularity of self-monitoring of blood glucose,

**\*Correspondence to:** Eva M Vivian, School of Pharmacy, University of Wisconsin-Madison, 777 Highland Avenue, Madison, WI 53705, USA, E-mail: eva.vivian@wisc.edu

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5 items; 3) regularity of physical activity 3 items); and 4) healthcare use appointment adherence (3 items), and an item that inquires about the participant's overall judgements of the adequacy of his or her self-care (1 item). One additional item which addressed overall self-care ('my diabetes self-care is poor') is included in the 'Sum Scale' only (16 items) [8].

Food insecurity was determined using the US Department of Agriculture's household level 30-day food security 6 item short form [9]. The survey measures experiences of food insecurity which include 1) worrying about running out of food before there is more money to buy more; 2) the inability to eat a balanced diet due to cost; 3) cutting meal sizes or completely skipping meals due to lack of money; 4) eating less because of lack of money for food; and 5) remaining hungry due to an inability to purchase food. Response options included dichotomous scales (e.g., yes or no) as well as 4 point rating scales (e.g., "Almost every month", "Some months but not every month", "Only 1 or 2 months", and "Don't know" or "Often true", "Sometimes true", "Never", or "Refused"). Participants who responded affirmatively to one or more items were classified as food insecure.

Cost-related medication underuse was determined by response to four validated items adopted from the Medication Expenditure Panel

Survey [10]. Similar to a prior study, [9] a respondent was considered to have cost-related medication underuse if he or she responded "Yes" to any of the four items that asked if, in the last 12 months: 1) there was a prescription a participant did not fill due to cost; 2) the participant skipped medication doses to save money; 3) the participant took less medication than prescribed to save money; or 4) the participant delayed filling a prescription to save money.

## Statistical methods

Descriptive statistics were used to analyze survey data (frequencies, percentages, means, standard deviations, and medians, when appropriate). We used proportions and binomial confidence intervals to calculate categorical variables. Stata version 13 was used in conducting the analyses.

## Results

The mean age range of the 132 food insecure participants that completed the survey was between 55 to 64 years old, 61% were female and 52% identified as African American or Black (Table 1). Ninety two percent reported having T2DM, 6% T1DM and 2% reported being unsure.

**Table 1.** Demographics

	<b>Results N=132 N (%)</b>	<b>Demographics</b>	<b>Results N=132 N (%)</b>
<b>Age</b>		<b>Employment</b>	
18-24 years old	1 (0.76)	Employed for wages	45 (34.1)
25-34 years old	11 (8.3)	Self-employed	6 (4.5)
35-44 years old	16 (12.1)	Out of work and looking for work	9 (6.8)
45-54 years old	32 (24.2)	Out of work and not currently looking for work	1 (0.76)
55-64 years old	51 (38.6)	A homemaker	7 (5.3)
65-74 years old	12 (9.1)	A student	3 (2.3)
75 years and older	7 (5.3)	Military	0 (0)
Unknown	2 (1.5)	Retired	24 (18.2)
<b>Sex</b>		Unable to work	35 (26.5)
Male	49 (37.1)	Unknown	2 (1.5)
Female	80 (60.6)	<b>Children living in the house</b>	
Unknown	3 (2.3)	None	74 (56.1)
<b>Race</b>		One	19 (14.4)
African American or Black	69 (52.3)	Two	16 (12.1)
American Indian or Alaskan Native	1 (0.76)	Three	13 (9.8)
Asian/Pacific Islander/ Native Hawaiian	1 (0.76)	Four or more	10 (7.6)
Caucasian/White	38 (28.8)	<b>Education</b>	
Multicultural	8 (6.1)	No Schooling completed	4 (3.0)
Other	11 (8.3)	Nursery School-8 <sup>th</sup> grade	3 (2.3)
Would rather not say	4 (3.0)	Some high school (no diploma)	12 (9.1)
<b>Ethnicity</b>		High school graduate, GED, or the equivalent	39 (29.5)
Hispanic/Latino	16 (12.1)	Some college credit (no degree)	29 (22.0)
Nonhispanic/Latino	102 (77.2)	Trade/Technical/vocational training	14 (11.4)
Preferred not to say	14 (11.4)	Associate degree	9 (6.8)
<b>Marital Status</b>		Bachelor's degree	9 (6.8)
Single/ Never married	53 (40.1)	Master's degree	7 (5.3)
Married or domestic partnership	27 (20.5)	Professional degree	4 (3.0)
Widowed	11 (8.3)	Doctorate degree	1 (0.76)
Divorced	33 (25)	<b>Tobacco Smoking</b>	
Separated	8 (6.1)	Smoker	58 (43.9)
<b>Living Status</b>		Non-Smoker	74 (56.1)
House	32 (24.2)	<b>Insurance</b>	
Apartment	93 (70.5)	Have medical insurance	121 (91.7)
Shelter	3 (2.3)	No medical insurance	11 (8.3)

The mean sum score of the DSMQ sample of food insecure individuals was  $6.47 \pm 2.37$  out of ten possible points. The mean subscores for glucose management, dietary control, and physical activity were  $6.95 \pm 2.05$ ,  $5.54 \pm 2.18$ , and  $6.35 \pm 2.37$  respectively. The mean healthcare use subscore was  $7.22 \pm 1.62$ . Most of the respondents (93.2%) reported receiving diabetes education with 53.8% of respondents reporting receiving at least ten hours of diabetes education since their diagnosis.

Ninety-two percent of respondents reported having health coverage through Medicare, Medicaid, or private insurance. In spite of the high reported health coverage, 42% of respondents reported cost related medication under-usage. Thirty percent of respondents reported skipping their medications to save money, 31.8% indicated they had taken less medication than prescribed by their doctor in order to save money, and 38.6% of patients self-reported they had delayed filling a prescription to save money in the last 12 months.

## Discussion

Poverty is the greatest enemy of persons with diabetes because it impacts access to medical care, housing, healthy foods, transportation and safe spaces for physical activity. This study examined the diabetes self-care behaviors of persons with diabetes who reported experiencing food insecurity within the last 12 months period. The mean DSMQ sum score of  $6.47 \pm 2.37$  for this sample suggests that most participants found it challenging to self-manage their diabetes on a daily basis. While we did not obtain hemoglobin A1Cs for participants in this study, extrapolating results from previous studies suggest that the low mean DSMQ score for our sample may be correlated with marginal or poor glycemic control [8,11]. In one study, patients assigned to a 'good glycemic control group' (defined as a  $HbA_{1c} \leq 7.5\%$ ) had a significantly higher sum score ( $7.7 \pm 1.2$ ) than those in the 'medium glycemic control group' (defined as a  $HbA_{1c}$  of 7.6%-8.9%) who had a mean sum score of  $6.9 \pm 1.4$  or the 'poor control' group (defined as an  $HbA_{1c} \geq 9$ ) who had a sum score of  $5.9 \pm 1.8$  ( $p > 0.001$ ) [7].

While 92% of respondents reported having medical coverage, 42% reported cost-related medication under-usage. It is possible that some of the newer antidiabetic medications available on the market are not covered in full by private insurers or government programs such as Medicaid or Medicare thus requiring the patient to carry the burden of the cost. Despite receiving some form of diabetes education, most of the participants obtained subscale scores below 7.0 in the areas of glucose management, dietary control, and physical activity. While 54% of the respondents reported receiving at least 10 hours of diabetes education after their diagnosis, we were unable to assess if respondents received ongoing diabetes education or diabetes education within the last 12 months. The American Diabetes Association's 2017 National Standards for Diabetes Self-Management Education and Support recommends that persons with diabetes engage in on-going self-management education that focuses on the person's specific priorities, values, and goals [12]. On-going self-management education that is culturally appropriate and addresses limited or uncertain access to healthy food is necessary to maintain healthy self-care behaviors [10].

The cross-sectional nature of this study does not allow for drawing causal inferences. While most of the participants obtained a subscore of less than 70% in glucose management, dietary control, or physical activity, we were unable to correlate A1C values with DSMQ scores.

We were also unable to assess if the respondent received diabetes education within the last 12 months. Finally, the DSMQ was validated in a patient population that was significantly different from this study's sample. The DSMQ sample were inpatients at a tertiary referral diabetes center with a long duration of diabetes [6]. A majority of the patients (71.3%) were treated with insulin or oral medications combined with insulin (21.1%), therefore the pattern of correlations between the DSMQ scales and HbA1c might differ when assessed in patients not treated with insulin or antidiabetic medications [6]. Medication under-usage, a nutritionally balanced diet, and physical activity might have a larger impact on glycemic control in our sample who experienced food insecurity.

## Conclusion

Diabetes management can be stressful, when compounded with food insecurity, it becomes an even greater challenge. As a result, many food insecure persons with diabetes find themselves caught between competing priorities such as procuring food, prescribed medications and supplies for diabetes, and managing other living expenses, potentially worsening their condition and overall health.

The DSMQ allows for assessment of overall self-care behaviors and is a valuable tool for clinicians who wish to identify areas for improvements. Since the tool does not identify the barriers faced by food insecure individuals that contribute to poor self-care behaviors, it is important for health care providers to ask their patients about the daily challenges they face when attempting to lead a healthy lifestyle. The provider can assist the patient in developing a self-management plan that takes into consideration the limited resources available to the patient.

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