The Correlation Between Food Insecurity and Type 2 Diabetes Management at a Federally Qualified Health Center

THE UNIVERSITY OF ARIZONA College of Medicine Phoenix

Deborah Yang BS, University of Arizona College of Medicine, Phoenix
Farshad Fani Marvasti MD, MPH

Wesley Community & Health Centers

Introduction

Type 2 diabetes mellitus is a complex, chronic disease that impacts over 34 million Americans. Many factors contribute to the development of type 2 diabetes, including diet choices, level of exercise, and genetics. While there are pharmaceutical treatments available for the management of diabetes, long-term, effective management depends heavily on patient's self-management through lifestyle modifications in addition to treatments from their medical provider. Glycemic control based on a patient's hemoglobin A1c blood level is a common measure of how well a patient's diabetes is being managed. Food insecurity is one factor correlated with poor diabetes management and is more prevalent in populations of low socioeconomic backgrounds. The Wesley Health Center primarily serves patients of low socioeconomic backgrounds and has a sizeable diabetic patient population but has not conducted any systematic food insecurity screenings of their patient population before this year. In response to the COVID-19 pandemic, Wesley implemented a clinic-wide social determinants of health screening of their patients. To screen for food insecurity, Wesley included the Hunger VitalSign™ screening tool in the survey. This retrospective chart review is the first study to evaluate the results of the screenings and determine if there are any correlations with glycemic control in diabetic patients at Wesley.

Research Question

What is the prevalence of food insecurity among adult patients with type 2 diabetes at the Wesley Health Center? Is there a correlation between a positive food insecurity screen using the Hunger VitalSign™ and a patient's glycemic control based on their most recent A1c measurement?

Materials and Methods

This was a retrospective chart review of adult patients with type 2 diabetes at the Wesley Health Center who were screened for food insecurity from 5/1/2020-11/30/2021. Patients whose charts were eligible for this study must have an ICD-10 diagnosis code for type 2 diabetes, be at least 18 years old, have a documented A1c on file, and have documented responses to the Hunger VitalSign™ screening tool from 5/1/2020-11/30/2021. Patient charts were selected using analytics tools built into Wesley Health Center's HER according to these inclusion criteria. Using data from the literature, 506 patients (253 in each group) would be needed to detect a mean difference that is 25% of the standard deviation at 80% statistical power. If the mean difference increased to 30% of the standard deviation, 352 patients (176 in each group) would be needed to achieve 80% statistical power. A positive food insecurity screen was defined as answering "Yes" to at least one of the two questions in the Hunger VitalSign™ screening tool. The level of glycemic control was determined by the patient's most recent hemoglobin A1c measurement. Patient demographic and baseline clinical characteristics were reported as medians for continuous variables and frequencies, and as percentages for categorical variables. The Mann-Whitney Test and Independent sample t-test were used to compare continuous variables while Chi-squared/Fisher's Exact Test was used to compare categorical variables. All p-values were 2-sided and $p<0.05$ was considered statistically significant.

Results

One-hundred seventy-seven patients responded to the Hunger Vital Sign™ questions during the chart review period. Out of these, 119 patients were excluded for not having a documented type 2 diabetes diagnosis. Out of these, an additional 29 patients were excluded for not having a documented A1c measurement. This left 29 patients' data which met the inclusion criteria for analysis. Of these, one patient's response to question 1 of the Hunger VitalSign™ was invalid, so their data was excluded from analysis. A total of 28 patients were included in the final analysis.

Table 1. Demographic Data		
Sex	Count	% of Total
Male	9	32%
Female	19	68%
Ethnicity	Count	% of Total
Hispanic or Latino	24	86%
Not Hispanic or Latino	2	7%
Declined to Specify	2	7%
Race	Count	% of Total
White	3	11%
Black or African American	0	0%
Other Race	2	7%
Unreported/Refused to Report	7	25%
Declined to Specify	16	57%
Total	28	

Table 1: Demographic characteristics of the 28 charts included in analysis.

Figure 1. Age Distribution

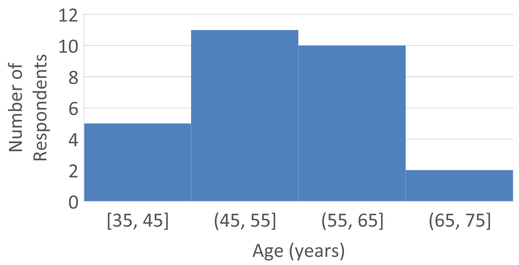


Figure 1: Age distribution of the 28 patients included in analysis.

Table 2. Responses to The Hunger Vital Sign™ Questions		
	Q1	Q2
Yes	5	7
No	23	21
% Yes	17.8%	25%

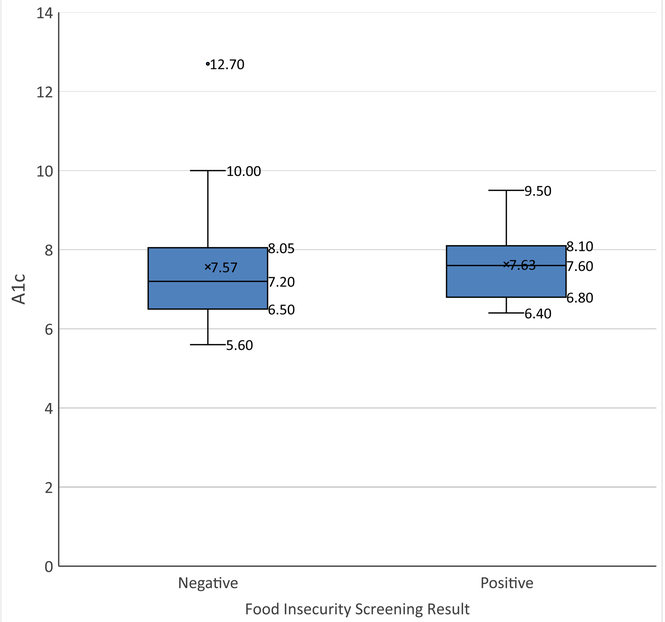
Table 2: Distribution of responses to the Hunger VitalSign™ screening tool

Table 3. Statistical Associations between Food Insecurity Screening and A1c, and Baseline Demographics

	Total	No	Yes	p-value
	N=28	N=21	N=7	
A1c				0.44
median (IQR)	7.25 (6.75-8.05)	7.2 (6.7-8)	7.6 (6.8-8.1)	
mean	7.58 (1.50)	7.57 (1.66)	7.63 (1.00)	
Sex				1
F	19 (68%)	14 (67%)	5 (71%)	
M	9 (32%)	7 (33%)	2 (29%)	
Ethnicity				0.71
Declined to Specify	2 (7%)	2 (10%)	0 (0%)	
Hispanic or Latino	24 (86%)	18 (86%)	6 (86%)	
Not Hispanic or Latino	2 (7%)	1 (5%)	1 (14%)	
Race				0.22
Declined to Specify	16 (57%)	10 (48%)	6 (86%)	
Other Race	2 (7%)	2 (10%)	0 (0%)	
Unreported/Refused to Report	7 (25%)	7 (33%)	0 (0%)	
White	3 (11%)	2 (10%)	1 (14%)	
Age	54.07 (8.84)	54.90 (8.52)	51.57 (10.00)	0.4

Table 3: The results of statistical analysis between responses to the Hunger VitalSign™ questions, A1c, and baseline demographics. Data are presented as mean (SD) or median (IQR) for continuous measures, and n (%) for categorical measures.

Figure 2. Distribution of A1c based on Positive or Negative Food Insecurity Screening Result



Figures 2: Distribution of A1c's categorized by food insecurity screening results by the Hunger VitalSign™.

Out of the 28 eligible patients included in the final analysis, 68% were female, 86% were Hispanic or Latino, and 75% were aged 45-64. Financial status was not collected. Five participants answered Yes to question 1 on the screening tool, and 7 answered Yes to question 2. The average A1c of patients answering Yes to question 1 was 7.5 (6.7-8.1). The average A1c of patients answering No to question 1 was 7.6 (6.6-8.6). The average A1c of patients answering Yes to question 2 was 7.5 (6.5-8.05). The average A1c of patients answering No to question 2 was 7.6 (6.8-8.1). The prevalence of food insecurity by positive screenings was 25%. We found no association between food insecurity and glycemic control measured using A1c values among this population ($p = 0.44$). There was no statistical difference in the mean and median A1c levels between patients who answered No (mean 7.57, median 7.2) verses those who answered Yes (mean 7.63, median 7.6) to either screening question on the Hunger Vital Sign™ tool. There were also no associations found between sex ($p = 1$), race ($p = 0.22$), and ethnicity ($p = 0.71$) regarding the food security response.

Conclusion

The results of the retrospective chart review demonstrated that this study population had a similar prevalence of food insecurity to the population of Arizona. The linear regression analysis did not demonstrate any correlations between positive screening for food insecurity and the level of glycemic control in the study population, primarily because the sample size was too small to reach sufficient statistical power. This occurred due to the logistical challenges posed by the COVID-19 pandemic with administering the survey consistently to all eligible patients, and with obtaining the data from Wesley's EMR. However, the results cannot rule out the possibility of any correlations in reality, therefore further research is recommended to better characterize the true levels of and impacts of food insecurity at the Wesley Health Centers. The results of the study can still be used to inform clinical practices at the Wesley Health Centers regarding general food insecurity screening and providing tailored diabetes management strategies and resources for patients who are negatively impacted by food insecurity.

Summary

- The prevalence of food insecurity among patients with type 2 diabetes at the Wesley Health Center is similar to the prevalence of food insecurity in the state of Arizona.
- No statistical correlation was found between screening positive for food insecurity and A1c level because of a low sample size leading to insufficient power.

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