Farmers' Market Voucher Initiative to Improve Diabetes Control in Older Adults

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Abstract

This pilot study investigated reported fruit and vegetable consumption and diabetic control for older patients with a diagnoses of diabetes and food insecurity at a rural Midwestern Federally Qualified Health Center. Vouchers ($40 per month for 3 months) were provided for fruits and vegetables at a local farmers' market during a 12-week program (June 2020-August 2020). Data revealed a statistically significant increase in re-ported green vegetable consumption and farmers' market visits postintervention. There was not a significant change in hemoglobin A_{1c}, body mass index, or other reported produce consumption.

Introduction

Diabetes mellitus (DM) is a common, complex, and costly health issue.[1] Nurse practitioners (NPs) can support the goals of Healthy People 2030 by promoting healthy behaviors and eliminating health disparities.[2] In part, these goals address social determinants of health (SDOH), which are the conditions in the social, physical, and economic environment in which people are born, live, work, worship, and age.

People of lower socioeconomic status have poorer control of their diabetes compared with those with higher economic status.[3] Food insecurity has been identified as a SDOH related to DM[3,4] and is associated with poorer glycemic control.[3,5,6] The American Diabetes Association recommends that SDOH, specifically food insecurity, should be assessed in the management of diabetes.[7]

Food insecurity research has focused on children, but few studies have focused on the elderly.[8] Studies claim an association between food insecurity, poor diet, and lower fruit and vegetable consumption.[9-11] In addition, people with severe food insecurity are likely to have a higher level of hemoglobin A1c (HbA1c) and a higher body mass index (BMI).[12,13]

Although there are many components to food insecurity, com-munity agencies can help by providing fresh fruit and vegetables. Various agencies have implemented interventions to improve access to produce for individuals with a diagnosis of diabetes and food insecurity.[14-18] A farmers' market (FM) is one location where a food-related intervention can address SDOH.[13,16]

One of the diabetes control measures identified by Health Re-sources and Services Administration for Federally Qualified Health Centers (FQHC) is a 10% improvement in the number of patients with diabetes with an HbA_{1c} value of more than 9%.[18] The aims of this pilot study were (1) to evaluate the feasibility of providing FM vouchers for produce to older participants with diabetes and food insecurity and (2) to determine whether fruit and vegetable consumption, HbA1c, and BMI would improve over the study period.

Methods

Setting and Sample

The project setting was a FQHC that provides primary care in a rural community in Kansas. Included in the program were English-speaking patients who received care at the FQHC with a diagnosis of diabetes, aged 55 years and older, with food insecurity. A report was created through the electronic medical record

(EMR) to identify all patients aged 55 years and older with a diagnosis of diabetes. Mailings were sent to the home of everyone who met these criteria. Signs about the program were placed in the clinic.

Patients who were interested in the program were assessed by trained staff to determine whether they met the criteria for food insecurity. Patients who patient met all of the criteria and desired to learn more about the program or participate in the intervention were contacted by telephone or in person by the researcher. Informed consent and release of medical records forms were obtained for those interested in participating. The Wichita State University Institutional Review Board approved the study before data collection.

Providers (2 NPs and 1 physician) at the FQHC participated in the intervention by collecting anthropometric measurements and laboratory data. Vendors at the FM were provided information on acceptable food for the voucher (fruits and vegetables only, no honey, eggs, beverages, or baked items).

Design and Measures

The pilot study was a quasi-experimental design. Participants completed questionnaires in person or through the mail before and after the program. The Behavioral Risk Factor Surveillance System 6-item fruit/vegetable questionnaire (BRFSS F/V) was used to measure produce consumption. This updated module was adapted from a validated module in the National Cancer Institute's 26 item Dietary Screener Questionnaire (DSQ).[19] The BRFSS F/V text was analyzed with the Simple Measure of Gobbledygook (SMOG) readability index with a readability of seventh grade level.[20]

Visit frequency to the FM, use of food benefits (eg, Supplemental Nutrition Assistance Program food benefits), and transportation needs were included in the preintervention questionnaire. The postintervention survey included additional questions about perceived benefits and barriers to the produce voucher program.

The study took place during the summer months of June, July, and August 2020 during the COVID-19 pandemic. Each participant received produce vouchers for the local FM worth \$120 to be redeemed over a 3-month period (forty \$1 vouchers each month). Vouchers were mailed before the start of each month. Vouchers were collected from the FM vendors at the last market day of the month, and the vendors were paid by the researcher from grant funds. All participants who redeemed vouchers for at least 1 of the 3 months, completed the postintervention questionnaire, and obtained HbA_{1c}, blood pressure (BP), and BMI measurements at the clinic within 4 weeks of voucher collection were included in data analysis. These individuals received an incentive basket of healthy food and food-related items.

Deidentified demographic data and HbA_{1c}, BMI, and BP before and after the intervention were obtained from each patient's EMR. HbA_{1c}, BMI, and BP were completed up to 6 months before baseline enrollment. HbA_{1c}, BMI, and BP were completed at least 2 months after the start of the intervention and up to 30 days after completion of the intervention.

Results

Descriptive statistics (frequency, percentages, means) were used to examine participants' sociodemographic characteristics. Paired sample t tests examined changes in preintervention and post-intervention variables. There were 23 participants in the program; 1 participant did not have a complete medical release to disclose personal EMR data and was excluded from the statistical analysis. Age ranged from 55 to 69, with a mean age of 61.5 (SD, 4.77) years. Most of the participants were women (63.6% [n = 14]), White (86.4% [n = 19]), with some college education (40.9% [n = 9]), and married (40.9% [n = 9]) (Table 1).

From preintervention to postintervention, there was a statistically significant increase in reported green vegetable consumption ($P = .01$) and FM visits ($P < .001$). Fruit consumption approached significance ($P = .07$). There was no significant change in HbA_{1c}, BMI, or other reported produce consumption (Table 2).

Clinical differences in FM visits and in HbA_{1c} and BMI values were found for many of the participants. Visits to the FM increased for 82% of the participants, with 18% not attending the FM before the initiative. HbA_{1c} values were unchanged or improved for 55% of the participants. The HbA_{1c} in 18% of participants decreased from more than 9% to less than 9%. One participant had a preintervention HbA_{1c} of 10.6% that decreased to 6.7% after the voucher intervention. Another participant had a preintervention BMI of 31.59 kg/m^2 that decreased to 28.41 kg/m^2 postintervention. BMIs decreased for 63% of the participants.

All participants provided feedback about the benefits and barriers of the program. Most of the responses were positive, and several participants stated they would not have consumed fresh produce without the initiative. Several suggested extending the program through the Fall months. Barriers included transportation, hours of the market, and concerns about safety due to COVID-19.

Table 1

Characteristics of Study Participants

Variable	Data Value (N = 22)
Age, y	
Mean ± SD	61.5 ± 4.77
Range	56-69
Sex, No. (%)	
Male	8 (36.3)
Female	14 (63.6)
Race, No. (%)	
African American	2 (9)
Hispanic	1 (4.5)
White	19 (86.4)
Marital status, No. (%)	
Married	9 (40.9)
Widowed	3 (13.6)
Single	6 (27.3)
Divorced	4 (18.2)
Education level, No. (%)	
Less than high school	3 (13.6)
High school graduate or GED	6 (27.3)
Some college or technical school	9 (40.9)
College graduate or graduate school	4 (18.2)
Tobacco status, No. (%)	
Never smoked	17 (77.3)
Former smoker	3 (13.6)
Current smoker	2 (9)

Primary insurance coverage, No. (%)	
Medicare	7 (31.8)
Medicaid	6 (27.3)
Private insurance	2 (9)
No insurance	7 (31.8)
Housing, No. (%)	
Permanent housing	18 (81.8)
Apartment, No. (%)	4 (18.2)
Transportation, No. (%)	
Own car/gets rides from friends	20 (90.9)
Uses public transportation	2 (9)
Food assistance, No. (%)	
Supplemental Nutrition Assistance Program	8 (36.4)
Pantry/emergency food	11 (50)
Employment, No. (%)	
Full-time	2 (9)
Part-time	2 (9)
Retired	7 (31).8
Unemployed	11 (50)
Sexual orientation, No. (%)	
Lesbian or gay	1 (4.5)
Straight	19(86.4)
Choose not to disclose	2 (9)

Table 2
Mean Values of Participants Before and After the Intervention (N = 22)

Variable	Preintervention mean	Postintervention mean	t	P
Hemoglobin A1c, %	7.98	8.19	_0.63	.27
Body mass index, kg/m2	34.71	34.98	_0.48	.32
Market visits/12 wk, No.	4.36	11.95	_5.04	.000027
Fruit juice/mo, No.	4.59	3.77	_1.03	.16
Fruit consumption/mo, No.	16.77	23.09	_1.50	.07
Bean consumption/mo, No.	7.41	8.55	_0.75	.23
Green consumption/mo, No.	9.27	12.86	_2.55	.01
Orange consumption/mo, No.	8.64	11.77	_0.93	.18
Other vegetables/mo, No.	21	25.82	_0.83	.21

Discussion

At the end of the 12-week period, the average consumption of all fruits and vegetables increased, with a statistically significant increase in green vegetable consumption. The fruit and green produce consumption may have increased due to its availability in the FM. Previous studies also found an increase in produce consumption.[14,17]

After the 3-month intervention, the average HbA1c increased slightly from 7.98% to 8.19%. This was consistent with the results from other studies that also did not find a change in HbA$_{1c}$.[14,17] The average BMI displayed a slight increase from 34.71 to 34.98 kg/m^2 in the postintervention measurements, although these findings were not statistically significant. A similar study using FM vouchers at an FQHC did not find BMI changes.[13]

Visits to the FM increased after the program was initiated, with participants reporting an average number of 11.95 visits this past summer compared with an average of 4.36 visits the previous FM session of 2019. Although the results of the research are certainly mixed, there does appear to be some evidence of changes in participant behaviors.

A similar program could be implemented by NPs in other community-focused practice settings. A fresh produce voucher program could be enhanced by providing guidance on individual-ized meal plans,[7] organizing cooking classes, or providing recipes that encourage the use of fresh foods. This would support other aspects of SDOH, specifically education and social support. Addressing barriers such as transportation and more convenient hours may be helpful.

Limitations include the intervention was short-term with a non-randomized small sample size. Data were self-reported and prone to recall error and social desirability bias. Many other factors also influence HbA1c and BMI, including physical activity, medications, and adherence to treatment plan, that were not addressed in this pilot study. This intervention also occurred during the COVID-19 pandemic, which caused some changes in the FM and may have affected other factors related to diabetic control, weight, and access to other food resources.

Conclusions

NPs work to improve health indicators and decrease common, complex, and costly diseases, including DM. Likewise, it is critical that NPs strive to improve health status and glycemic control in vulnerable individuals and populations by addressing gaps in care and developing interventions to address SDOH.

Interventions to increase appropriate fruit and vegetable consumption could enhance nursing care of patients with DM, especially when targeted to communities with limited access to fresh foods and individuals with food insecurity. Additional studies addressing the role of food insecurity on diabetes control would be beneficial.

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