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Research Article

# Food for Health: Evaluation of a Fruit and Vegetable Prescription Program at a Community Health Clinic

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**Keywords**

• Food insecurity; Poorly controlled diabetes; FVRx

## Abstract

**Objective:** To evaluate the impact of a fruit and vegetable prescription program in poorly controlled, food-insecure diabetic adults.

**Study design:** A one group pretest-posttest intervention design prior to and after completion of the six-week intervention. Outcome measures included Hemoglobin A1c (HgbA1c), self-reported fruit and vegetable consumption per day and the 17-item Diabetes Distress Scale score measured pre and post intervention.

**Setting:** Community health primary care clinic located in a food desert zone.

**Participants:** 44 patients with HgbA1c of 8% or higher and answered "Yes" to one of the 2 item Food Insecurity Screen.

**Intervention:** A Fruit & Vegetable Rx program was used with nutrition education and cooking instruction classes.

Main outcome measure: Decreased Hemoglobin A1c.

**Analysis:** A pre- and post-intervention design comparing the mean difference in Hemoglobin A1c using a paired t-test.

**Results:** Showed a decrease in HgbA1c from a mean of 9.88 to 8.46 ($p<.001$), a decrease in the number of patients who reported a high level of Diabetes Distress from 61% to 7% and an increase in the daily consumption of fruits and vegetables.

**Conclusion and implications:** Implementation of nutritional education, including cooking classes, improved HgbA1c levels, increased consumption of fruits and vegetables, and decreased diabetes distress.

## ABBREVIATIONS

**FVRx:** Fruit and Vegetable Prescription

## INTRODUCTION

Lack of consistent, dependable access to food, continues to affect millions across the U.S.A. It is estimated there are fifty million people with food insecurity in the United States [1]. Households struggling with poverty experience food insecurity at greater rates than other households but income alone is not the sole factor that contributes to food security. Those who experience food insecurity at rates greater than the national average include: 1) households with children, 2) households with children headed by a single female; 3) households headed by a Black non-Hispanic or Hispanic individual, 4) those living in rural areas, 5) those living in the south and southwest areas of the U.S., 5) families of enlisted service members and veterans, 6) college students, and 7) seniors [2].

Given the association between lack of access to food and negative health outcome across the population, food insecurity is a major primary healthcare risk. Americans with lower socioeconomic status consistently have worse health, and often higher health care expenditures [3-5]. Obesity and diabetes mellitus are a major public health epidemic. It is estimated about 39.6 % of US adults are obese [7] and around 9% has diabetes mellitus [7]. While a recent US survey revealed prevalence of diabetes is much higher among black, Hispanic and Asian adults 18.3%, 16.6 % and 16.4 % respectively [8]. A longitudinal survey in the U.S. and Canada also shows that there is 50% higher risk of diabetes among food insecure adults and food- insecure adults are 2-3x more likely to have diabetes than other adults, even after controlling for risk factors such as income, employment status, physical measures, and lifestyle factors [9,10]. Emergency department use among persons with diabetes that are food insecure is also higher than in adults with diabetes that are food secure [9].

Some studies also show that American adults who are food insecure are less likely to eat the recommended amount of five vegetables servings per day [11]. They are also less likely to have

fat avoidance behavior [12]. This implies that they cook with items that are high in fat versus food secure individuals who tend engage in fat-lowering behaviors.

As a way to address the social determinants of health, health care providers are increasingly screening for food insecurity [13,14] and incorporating healthy food interventions into patient care as part of their population health management strategies [15]. There is a growing body of evidence of the impact of fruit and vegetable prescription programs, where a "prescription" from a health care provider and nutrition education in a clinical setting is provided to those who are food insecure or have chronic diseases that are impacted by the patient's diet. Prescription studies among patients at risk for chronic disease demonstrated increases in fruit and vegetable consumption resulting in decreases in hemoglobin A1c levels [16] and body mass index [17].

## MATERIALS AND METHODS

The study intervention was based on the Food as Medicine concept by implementing a fruits and vegetables RX (FVRx) program. FVRx programs provide access to fruits and vegetables and healthy eating in underserved communities through partnerships with healthcare providers, community organizations and fresh produce retailers (https://snaped.fns.usda.gov). For our study, the FVRx program was implemented in a family practice clinic that primarily served low-income, minority patients. The clinic provided on-site food box distribution to uncontrolled diabetic patients that were food insecure. The inclusion criteria were adult diabetic patients with a Hemoglobin A1c (HgbA1c) greater than 8.0 in the last 3 months and who answered "Yes" to one of the 2 item Food Insecurity Screen [18]. Patients were approached by their physician if they met the inclusion criteria and were asked to join the FVRx program which was free to participants. Medication regimen was not changed during the study.

Food boxes were provided by a local food bank and nutrition education, cooking demonstrations and recipes were provided by a registered dietitian. Participants received weekly food boxes with varied packaged foods enhanced with in-season fruits and vegetables for 6 consecutive weeks. Participants also attended nutrition education classes weekly that focused on eating healthy on a budget, carb counting, managing stress, exercise and weekly action plan and recipes to use with their food boxes. The consecutive 6 weeks classes included the following: Session 1 - Healthy Meal Planning; Session 2 - Balancing Carbohydrates; Session 3 - Vegetables, Beans and Grains; Session 4 - Heart Healthy Cooking; Session 5 - Handling Stress; and Session 6 - Let`s Get Moving. The program was offered to patients five times over a one year period (November 2018 - October 2019) with a maximum of 12 people enrolled per cohort.

The impact of the FVRx and education program on participants' health was measured by using a one group pretest-posttest intervention design. Patients completed a survey and had biometric data collected prior to program participation and at the end of the 6-week program. Outcomes that were measured include: 1) self-reported fruit and vegetable consumption per day; 2) 17-item Diabetes Distress Scale Rating [19]; and 3) HgbA1c values. The baseline HgbA1c values were pulled from the electronic medical record as part of the initial screening for inclusion in the study and the follow-up HbgA1c values were pulled from the patients' medical record for visits within 3 months of the conclusion of the FVRx program. We also collected the patients weight and BMI before and after participating in the intervention.

Statistical analysis included descriptive statistics of patient demographics and paired t-tests for the comparison of HgbA1c pre and post intervention and the change in fruit and vegetable consumption.

## RESULTS AND DISCUSSION

A total of 44 patients participated in the FVRx program. The participants were predominately female (86%), African American (82%) and had a median age of 61.5 years old (range 31-83) (Table 1).

A total of 34 patients completed the pre and post survey regarding their fruit and vegetable daily consumption and their diabetes distress even though 44 patients participated in the program. Some of the participants did not attend the final session when the post survey was administered. The median fruit and vegetable intake increased from 2 servings per day to 4 servings per day ($p<0.005$). Participant scores on the Diabetes Distress Scale was classified into three groups (high, moderate, little or no distress) based on cut points from the scale developer [20]. Over half of the participants (61%) reported a high level distress prior to the intervention while only 7% reported high distress post intervention (Table 2).

The results of the difference in HgBA1c values before and after participating in the FVRx program were normally distributed and showed significant improvements with a mean decrease of 1.42 ($p <0.001$, $t=5.16$, degrees of freedom = 43) (Table 3). The effect size for the change in the HBGA1c is 0.78. The mean weight and

**Table 1**: Patient Demographics.

| **N=44** | |
|---|---|
| **Age**<br>Median Years<br>(range) | <br>61.5<br>(31-83) |
| **Gender**<br>Male | <br>6 (14%) |
| Female | 38 (86%) |
| **Race**<br>White | <br>7 (16%) |
| Black | 36 (82%) |
| Other | 1 (2%) |

**Table 2:** Pre and post intervention scores on the Diabetes Distress Scale (DDS-17).

| **Score (N=34)** | **Pre-intervention N (%)** | **Post intervention N (%)** |
|---|---|---|
| Little or no distress (0-1.9) | 6 (18%) | 14 (43%) |
| Moderate distress (2.0-2.9) | 7 (21%) | 17 (50%) |
| High distress (≥ 3) | 21 (61%) | 2 (7%) |

**Abbreviations:** Pre and post intervention scores on the Diabetes Distress Scale (DDS-17)

**Table 3**: Paired t-test – pre and post intervention Hemoglobin A1c.

| Variable | N | Mean | Std. Dev. | 95% Conf. Interval |
|---|---|---|---|---|
| HgbA1c (Pre) | 44 | 9.88 | 1.74 | 9.35 -10.41 |
| HgbA1c (Post) | 44 | 8.46 | 1.36 | 8.05 - 8.88 |
| p-value <0.001 | | | | |

BMI of the participants before the intervention was 238.9 pounds and 38.41, and the post-intervention weight and BMI was 238.7 pounds and 38.40.

HgbA1c is a biomarker for the prognosis of diabetes [20]. Even an increase of 1% concentration is associated with about 30% increase in all-cause mortality and 40% increase in cardiovascular or ischemic heart disease mortality, among individuals with diabetes. Reducing the HgbA1c levels by 0.2 % could lower the mortality by 10% [20,21].

## CONCLUSION

In order to combat the challenge of food insecurity, food banks and other charitable organizations frequently provide food to those individuals who are food insecure. These distributions can be in the form of prepared foods, healthy donations or sometimes food that is less expensive or not as nutritious. Using the FVRx program in combination with cooking demonstration classes and recipes instructed by a registered dietitian showed improvement in health outcomes for uncontrolled diabetic patients that are food insecure. We found a significant decrease in the mean HgbA1c. We also found a meaningful decrease in Diabetes Distress from 16 to 7, and improvement in perceived value of fruits and vegetables for health among the participants. Perhaps surprising was the lack of weight loss among the participants. The study strength included their knowledge and comfort in managing their diabetes with better healthier choices in eating more fruits and vegetables and keeping a budget. Some of the fresh fruits and vegetables were unfamiliar to the participants, so the cooking instruction was an important part of the program that enhanced their knowledge.

Our findings support the growing interest in collaborative partnership between healthcare providers, and community food banks to address food insecurity and poor health outcomes. Since most of the FVRx programs rely on grants for funding and sustainability, a study on a larger scale is limited.

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