

Farming for Life: Pilot assessment of the impact of medical prescriptions for vegetables on health and food security among Latino adults with type 2 diabetes

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Abstract

Background: In the United States, Latino families have a disproportionate burden of diabetes and associated complications. **Aim:** This pilot study assessed the feasibility of using medical prescriptions of organic vegetables to improve health outcomes among Latinos with type 2 diabetes (T2D). **Methods:** Latino participants ($n = 21$, 91% female, age 56 ± 11.1 years) with T2D received 12 weeks of medically prescribed organic vegetables. Weight, waist circumference, blood pressure, and HbA_{1c} were measured pre and post-intervention. Food security was also assessed. **Results:** Over 12 weeks, there was a significant fall in systolic ($p = 0.03$) and diastolic ($p = 0.01$) blood pressure. A total of 14 participants lost weight (median weight loss among responders was 1.9 pounds), and waist circumference decreased in 9 of 19 responders by a median of 1.5 inches. HbA_{1c} was unchanged ($6.7 \pm 1.1\%$ at baseline versus $7.0 \pm 1.1\%$ post-intervention). **Conclusions:** Medical prescriptions of organic vegetables may have measurable health benefits for adult Latinos with T2D.

Keywords

Type 2 diabetes, food insecurity, weight, blood pressure, vegetables, Hispanic, Latino

Introduction

In the United States, racial/ethnic minority populations face an unfair and disproportionate burden of type 2 diabetes (T2D) and associated complications (CDC, 2014). Guidance from the American Diabetes Association (ADA) recognizes that the most challenging aspect of diabetes treatment is determining what to eat (American Diabetes Association, 2018). In particular, the ADA recommends encouraging carbohydrate intake from vegetables, fruits, whole grains, and legumes (Evert et al., 2014). Recent evidence suggests that plant-based diets can significantly improve psychological health, quality of life, HbA_{1c} levels, and weight for people with diabetes (Tourmpanakis et al., 2018). For underserved populations with type T2D, food insecurity and low socio-economic status are documented barriers to nutrition-based self-management (Seligman and Schillinger, 2010). However, interventions to treat T2D through improved access to vegetables when combined with diabetes education have shown some success in terms of reductions in HbA_{1c} levels. For instance, through the Geisinger Health System (GHS) “Fresh Food Pharmacy,”

diabetes patients who received food with comprehensive care management reported a reduction in HbA_{1c} and healthcare spending (Feinberg et al., 2018). Similarly, a “Fresh Prescription” program in patients with uncontrolled T2D attending a federally qualified health center (FQHC) in Detroit, MI, allotted up to \$10 per week for 4 weeks for purchase of fruits and vegetables from local farmers’ market. Weekly cooking demonstrations, an educational component, were also provided at produce pick up. This program was associated with a decrease in HbA_{1c} (Bryce et al., 2017). While such results are encouraging, no existing studies evidence the impact of medical vegetable prescriptions alone without education and/or management components in Latino adults with T2D.

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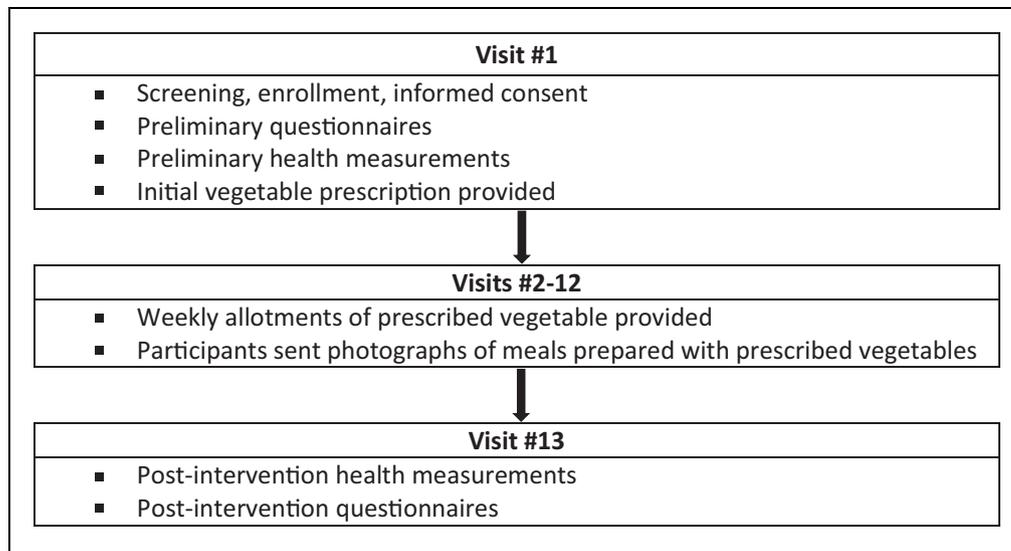


Figure 1. Farming for Life participant visit activities.

The aim of this Farming for Life pilot project was to examine the feasibility and impact of providing medically prescribed organic vegetables to Latino adults with non-insulin treated T2D without adding structured diabetes education. Moreover, Farming for Life used prescriptions of organic vegetables, as studies have shown that organic crops have higher concentrations of antioxidants, and a lower incidence of pesticide residues than non-organic crops (Barański et al., 2014; Mie et al., 2017). There is growing evidence of an association between pesticide exposure and T2D risk (Evangelou et al., 2016).

Methods

The Farming for Life pilot study measured changes in health and food security among Latino adults with a self-reported diagnosis of non-insulin treated T2D after receiving free, medically prescribed organic vegetables for 12 weeks. The study was approved by a central Institutional Review Body. Prior to recruitment, vegetable selections were based on a consumer survey of 270 local Latino adults regarding ones most preferred and most often eaten. These data were subsequently matched with the seasonal availability of vegetables from two local organic farms (within a 9-mile radius), with carrots, beets, zucchini, cilantro, and cabbage being the most commonly prescribed vegetables. Vegetables were delivered to a central distribution center (<http://www.unityshoppe.org/>) each week. The quantity of each order was based on vegetable serving guidelines recommended by the U.S. Department of Health and Human Services and U.S. Department of Agriculture (USDA, 2015).

Participants were recruited from the Unity Shoppe, local social services, Latino-focused community organizations, and existing diabetes programs. After providing informed consent, participants completed 13 study visits (Figure 1). At Visit 1, baseline health measurements were taken, and

participants received the first of 12 weekly vegetable prescriptions. Prescriptions were signed by a medically qualified provider and indicated the types of vegetables prescribed. Following Visit 1, participants received their weekly allotment of prescribed vegetables once a week for a further 12 weeks from the Unity Shoppe distribution center. Fulfillment details, including quantity and type of vegetables provided, were tracked using a checkout counter and barcode inventory system developed for Farming for Life. Participants were also invited (but not required) to submit photographs of the meals they prepared with the prescribed vegetables. Post-intervention measurements were taken, and participants completed a conclusion questionnaire to assess subjective experiences during Visit 13. The vegetables were provided at no cost to participants. Participants were not provided with nutrition or diabetes education, care management, or information on how to prepare the vegetables. There was no control group in this pilot program as the intent was “proof-of-concept” to assess the effects of medical prescriptions of organic vegetables alone.

Comparisons were made pre- and post-intervention of HbA_{1c}, blood pressure (measured seated after 5 min rest and taking the average of three consecutive readings), weight, body mass index (BMI), and waist circumference. Household food security was assessed pre- and post-intervention using a USDA validated questionnaire (USDA, 2012). Information was also collected on the wholesale and retail cost of each vegetable prescription. Comparisons were made with paired Student’s *t*-tests or Wilcoxon signed rank test where appropriate.

Results

After obtaining IRB approval, 21 of 23 enrolled adult Latinos with a self-reported diagnosis of non-insulin treated T2D completed the program (Table 1).

Table 1. Characteristics of enrolled Farming for Life participants.

Characteristics	Total Participants (n = 23)
Age (mean ± SD)	56 ± 11.06
Sex	
Male	2
Female	21
Country of birth	
US	20
Outside of the US	3
Primary cook in household	
Self	21
Spouse or other	2

Continuous variables are presented as means; categorical variables as frequencies.

At recruitment, only 7 of the 23 participants had a baseline HbA_{1c} above 7%, indicating good control of their T2D. There was no statistically significant change in HbA_{1c} after 12 weeks ($6.7 \pm 1.1\%$ at baseline versus $7.0 \pm 1.1\%$ post-intervention). In contrast, there was a reduction in systolic ($p = 0.03$) and diastolic ($p = 0.01$) blood pressure (Figure 2). At study initiation, 4 participants had normal blood pressure (<120/80 mmHg), while 10 participants had normal blood pressure post-intervention. While not statistically significant, 14 (67%) participants lost weight (median weight loss among responders was 1.9 pounds). Waist circumference decreased in 9 of 19 responders by a median of 1.5 inches.

Food insecurity improved in 12 of the 21 participants. Additionally, one-third of participants reported an increase in the importance that “good value for money” had on their food consumption behavior over the course of the study. The average retail cost of the vegetables provided through the pilot was \$31.33 per week per participant. By providing vegetables directly from the producer, estimated costs fell to \$9.62 per participant.

Discussion

In this pilot study, offering medical prescriptions for organic vegetables to Latino adults with T2D was associated with a clinically significant reduction in blood pressure over 12 weeks. Participant changes in weight, waist circumference, and food insecurity appeared to stratify into responders (majority) and non-responders over the same time period. It is noteworthy that, in this pilot program, organic vegetables were medically prescribed and provided with neither nutrition/diabetes education, nor care management. Similarly, no guidance was given on how to prepare the vegetables. This distinguishes the Farming for Life pilot from previous programs (Feinberg et al., 2018; Bryce et al., 2017). Further, at recruitment, the majority of individuals already had well controlled diabetes based on their HbA_{1c} levels, whereas the Detroit Fresh Prescription participants had uncontrolled T2D. The majority

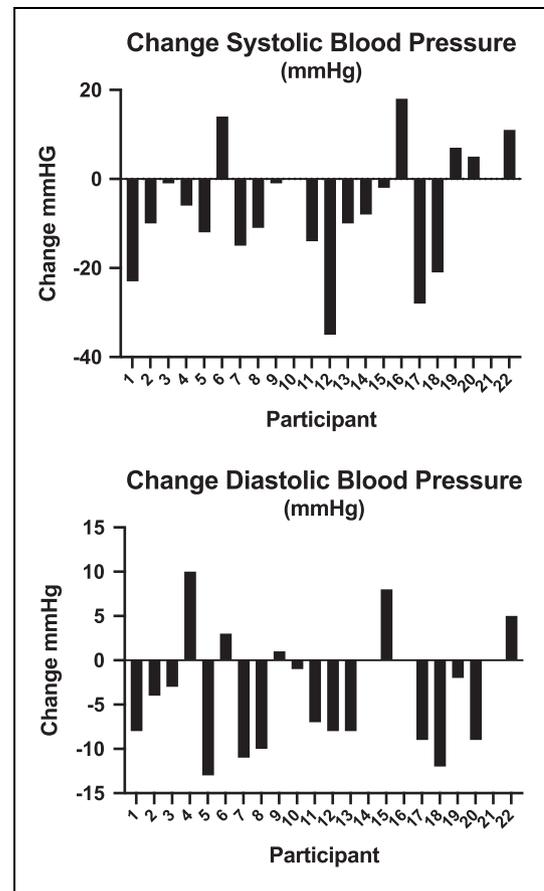


Figure 2. Change in blood pressure over 3 months in 21 Latino adults with non-insulin treated type 2 diabetes after receiving medical prescriptions for organic vegetables.

of Farming for Life participants were also female. The impact of the Farming for Life model on individuals with less well controlled diabetes, a male majority cohort, or with additional nutrition and/or diabetes education remains to be determined. In summary, we have shown that it is feasible to offer medically prescribed organic vegetables to a population at high risk of cardio-metabolic disease. This pilot study suggests that this may be associated with measurable health benefits and a larger study is underway in adults at risk as well as with T2D (US National Library of Medicine, 2019).

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Authors' contributions and consent for publication

BY drafted the manuscript. MK, NG, and DK provided critical revision of the manuscript. CC and BY were involved in the acquisition of the data. All authors have given final approval of the version to be published.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

The study protocol was approved by an Independent Review Board (IRB) (QR#32952/1).

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