

## REVIEW ARTICLE

## VEGETARIAN EDUCATION IN TYPE 2 DIABETES PREVENTION

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## KEYWORDS

Vegetarian Diet  
Diabetes Prevention  
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Hemoglobin A1c  
Weight Loss

## ABSTRACT

Past iterations of the Diabetes Prevention Program (DPP) have demonstrated success in reducing the risk of developing type 2 diabetes in high-risk individuals, including studies that focused on low-carbohydrate or ketogenic approaches. The program emphasizes dietary modifications, physical activity, and behavioral strategies to promote weight loss and improve metabolic health. While the traditional DPP focuses on a low-fat, calorie-restricted diet, there is growing interest in exploring alternative dietary approaches, such as vegetarian diets, which have shown promise in improving glycemic control and reducing cardiovascular risk factors. This study aims to evaluate the effectiveness of a 6-month vegetarian DPP in individuals with prediabetes. The study included 7 participants initially, but 2 dropped out, resulting in a final sample size of n=5. The program consisted of 16 sessions led by 2 certified DPP coaches, with a curriculum focused on education about healthy vegetarian diets, exercise, and lifestyle modifications. The primary results showed that while there was a slight decrease in weight and hemoglobin (Hb)A1c levels, these changes were not statistically significant, suggesting the need for further research with larger sample sizes and longer durations to validate these findings.

## INTRODUCTION

The Diabetes Prevention Program (DPP), a Centers for Disease Control and Prevention (CDC)-accredited initiative established in 2002, has been instrumental in reducing the risk of type 2 diabetes through lifestyle interventions. This program underscores the importance of dietary modifications, physical activity, and behavioral strategies in enhancing metabolic health. Previous research has extensively explored indigenous, paleo, or ancestral diets, emphasizing whole foods, plants, and natural ingredients. In line with these principles, the initial objective of our study was to adopt a fully plant-based (vegan) approach. However, recognizing the challenges of low adherence and high dropout rates associated with such dietary regimens, particularly in the context of the DPP, we aimed to prioritize sustainability for our participants. Consequently, we opted for a vegetarian diet, focusing on the elimination of meats while maintaining nutritional adequacy

and long-term feasibility. Touro University California has a history of conducting successful DPPs, including notable studies like the ketogenic study. Building on this foundation, our study focuses on evaluating the effectiveness of a 6-month vegetarian DPP in individuals with prediabetes. By adapting the DPP curriculum to align with vegetarian dietary principles, we aim to determine if a vegetarian DPP can achieve comparable or enhanced outcomes compared to traditional DPP programs. This research seeks to provide valuable insights into the development of personalized and effective diabetes prevention strategies, particularly in the context of the current diabetes pandemic.

## METHODS

This study, approved by the Touro University California Institutional Review Board (IRB), utilized a prospective, single-arm, intervention design to assess the efficacy of a 6-month vegetarian DPP in individuals with prediabetes. Participants were recruited from the Vallejo/Bay Area community through diverse channels, including local businesses, schools, hospitals, clinics, the Touro University California campus, and previous DPP participant databases. Given the historical challenges with enrollment in DPP studies, we pursued diverse advertising channels to broaden participation opportunities. Advertising efforts were conducted, in part, through collaboration with high-risk ethnic populations, engaging centers of worship such as gurdwaras, mandirs, and temples. Touro University's DREAM (Diabetes Research Education and Management) team, with a history of collaboration with such

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organizations, facilitated the dissemination of study information. These centers permitted us to post flyers and actively promote our research within their communities. The DREAM team was instrumental in facilitating outreach to ongoing campus-run initiatives such as MOBEC (Mobile Diabetes Education Center) and SRFC (Student-Run Free Clinic), thereby extending the reach of our study within the community. Eligible participants were required to be 18 years of age or older and possess a clinical diagnosis of prediabetes or a history of gestational diabetes. Verification of eligibility was conducted based on initial hemoglobin (Hb)A1c readings and American Diabetes Association (ADA) guidelines. The work on which this manuscript is based received financial support from Touro University's DREAM team for classroom rental and participant prizes.

Seven participants initially enrolled, but 2 dropped out due to scheduling conflicts, resulting in a final sample size of n=5. The sample comprised 3 Asian, 1 Hispanic, and 1 Caucasian participant, with a gender distribution of 4 females and 1 male. The 6-month vegetarian DPP, led by 2 certified DPP coaches, comprised 16 sessions. Hourlong sessions were conducted weekly for the first 4 months and biweekly for the remaining 2 months at a local community center in Vallejo. The curriculum was tailored for a vegetarian study, emphasizing education on healthy vegetarian diets, exercise, and lifestyle modifications. The guidelines were derived from historical DPP curricula and refined in accordance with current ADA recommendations. Specifically, adjustments were made to align with contemporary guidelines for daily recommended macronutrient and micronutrient intake, as well as daily exercise quotas, screen time, and sleep duration. Participants were taught practical skills for implementing vegetarian diets and maintained food logs, which were reviewed and discussed in class.

Outcome measures included changes in HbA1c levels and weight, along with assessments of attrition rates, satisfaction, and attendance. Participants were given a survey to provide feedback on what should be improved or continued in future

DPPs, the difficulty they experienced in adhering to the diet, and their overall enjoyment of the program. HbA1c levels and weight were measured at the beginning and end of the program, with weigh-ins at each session. Participants received a \$25 gift card at the first session and a second \$25 gift card at the final session as compensation for their participation. Data were analyzed using Microsoft Excel, with paired t-tests used to assess statistical significance. The study aimed to evaluate if a vegetarian DPP could achieve outcomes comparable to or better than traditional DPP programs, offering insights into personalized diabetes prevention strategies.

## RESULTS

The mean starting weight of participants was 171.02 lb, which decreased to a mean final session weight of 168.04 lb (Figures 1 and 2), however this change was not found to be statistically significant (P=0.2817). The mean baseline HbA1c level was 5.88, which decreased to 5.82 by the final session (Figure 3). Like weight change, the change in HbA1c levels was not statistically significant (P=0.5012).

Participants' satisfaction with the study was high, and attendance was generally consistent throughout the program. Two participants dropped out due to scheduling conflicts, resulting in a final sample size of n=5. Despite these dropouts, the study maintained a high level of engagement among participants, indicating strong adherence to the program. Participants offered limited suggestions for improvements; however, a common theme emerged from their feedback: many highlighted their enjoyment of the team bonding experience, noting the formation of a strong sense of community. Most participants did not find the diet difficult to follow, and some even expressed interest in maintaining a vegetarian diet in the future. The study appeared to make vegetarianism seem less daunting, as the coaches provided instruction on various healthy lifestyle modification techniques to help participants incorporate less meat into their daily diet.

FIGURE 1:

Weight Trends in Participants

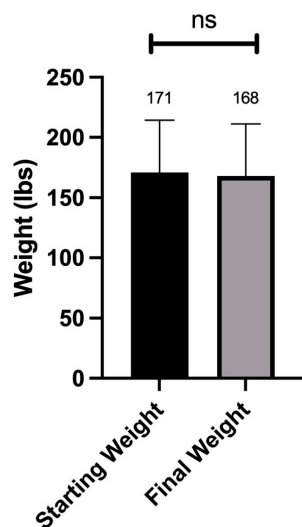


FIGURE 2:

Weight Trends in Participants

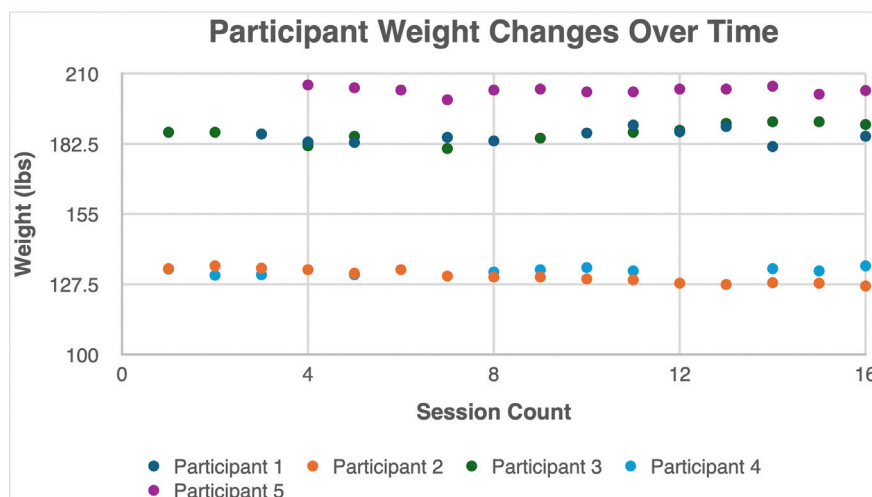
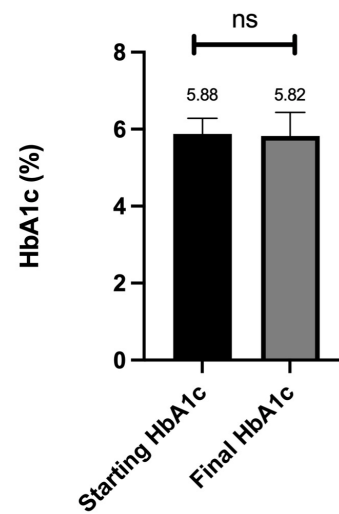


FIGURE 3:

Mean HbA1c Change in Participants



## DISCUSSION

The findings of this study indicate that despite the increasing interest in vegetarian diets for improving metabolic health, the 6-month vegetarian DPP did not result in statistically significant reductions in either HbA1c levels or weight compared to baseline measurements. This contrasts with some studies that have shown positive outcomes with other dietary approaches, such as low-carbohydrate or ketogenic diets. In retrospect, our decision to transition participants to a vegetarian diet proved to be a pragmatic choice, given the historical challenges observed in adherence and retention within lifestyle intervention programs like the DPP. While the initial aspiration was toward a wholly plant-based (vegan) regimen, participant self-reports indicated successful adherence to the vegetarian diet without experiencing feelings of undue restriction, underscoring its acceptability and feasibility within the study context. The lack of significant changes in HbA1c levels and weight could be attributed to several factors, including the small sample size and the relatively short duration of the intervention. Additionally, the reliance on self-reported dietary adherence may have introduced bias into the results. Future research should consider employing larger sample sizes and longer intervention periods to better assess the impact of a vegetarian DPP on metabolic health. Additionally, incorporating more objective measures of dietary adherence, such as biomarkers or dietary records, could provide more accurate insights into the effectiveness of the intervention. Further investigation is warranted to determine the optimal dietary strategies for preventing type 2 diabetes in high-risk individuals.

## CONCLUSION

In conclusion, this study did not demonstrate significant improvements in HbA1c levels or weight loss among individuals with prediabetes or a history of gestational diabetes following a

6-month vegetarian DPP. While the findings do not support the effectiveness of this specific intervention, they highlight the need for tailored approaches in diabetes prevention. Understanding the impact of vegetarian diets on metabolic health remains an important area of research, especially given the global rise in diabetes prevalence. Clinically, these findings underscore the importance of comprehensive lifestyle interventions that consider individual dietary preferences and needs. Further research into alternative dietary approaches and their long-term effects is crucial for informing more effective strategies to combat the diabetes pandemic.

## LITERATURE SEARCH AND DATA SOURCES

For this study, the search strategy focused on identifying the highest-quality evidence on the effects of a vegetarian DPP on HbA1c levels and weight loss in individuals with prediabetes or a history of gestational diabetes. Keywords used included “vegetarian diet,” “diabetes prevention,” “prediabetes,” “gestational diabetes,” “hemoglobin A1c,” and “weight loss.” The search was conducted from January to March 2024, and data sources accessed included PubMed, Cochrane Library, and relevant clinical trials databases for randomized controlled trials and systematic reviews. Additionally, reference lists of relevant articles and guidelines were reviewed to identify additional studies meeting inclusion criteria.

## ACKNOWLEDGEMENT

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