Best Practices to Prevent or Delay Diabetes in Adults with Prediabetes

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Best Practices to Prevent or Delay Diabetes in Adults with Prediabetes

Winona State University

Aminata Cham

04/14/21
Abstract

Diabetes mellitus is a common disease prevalent in 10.5% of the US population about 34.2 million people and a disproportionate percentage of people of color. An EBP project for people with prediabetes was conducted in a faith-based setting after institutional review board approval. The purpose of the project was to increase fruits and vegetable intake and increase physical activity in adults with prediabetes. The Chronic Care Model was used to guide the design and implementation of the project. The project was a modified version of the National Diabetes Prevention Program (NDPP) in a series of four 2-hour sessions at the Mosque focused on healthy eating and increase in physical activities. The project included (a) extensive review of the literature, (b) assessing the risk of prediabetes, (c) collecting baseline data including weight, average daily servings of fruits and vegetable and average daily number of physical activities, (d) conducting diabetes education sessions at the Mosque and collecting data six weeks post implementation. All educational sessions were conducted in the native language of the participants Mandinka.

The results of the study showed the mean daily servings of vegetable consumption increased from baseline to six weeks on average by 2.42 servings \((p = 0.0001)\), The mean daily servings of fruit consumption increased by 1.1 serving \((p = 0.0055)\) and physical activity increased on average by 18.33 minutes \((p = 0.0377)\).

This study demonstrated that implementing a diabetes prevention program in a faith-based setting is feasible with improved behavioral health outcomes.
**Background**

Diabetes mellitus is a common disease prevalent in 10.5% of the US population about 34.2 million people. Eighty-eight million adults age 18 and older with prediabetes with an estimated cost of more than $327 billion in 2017 (Centers for Disease Control and Prevention (CDC), 2020; Dall et al., 2019). The prevalence of diagnosed diabetes in the state of Minnesota is 339,000 (7.9%), undiagnosed diabetes 118,000 (2.8%), prediabetes 1,441,000 (33.7%), and gestational diabetes 5,100 (7.3%) with an estimated cost to the state of $4.7 billion, $3.5 billion for direct medical costs and $1.2 billion for indirect costs (CDC, 2020; Dall et al, 2019). Diabetes disproportionately affects minorities and people of color and they are more likely to experience complications (Katula et al., 2011; CDC, 2020). On average, deaths categorized as having diabetes as a primary cause represent between 7,000 and 8,000 years of potential life lost every year in Minnesota and patients who are of African American, American Indian, and Hispanic race/ethnicity experience higher mortality rates and greater numbers of years of potential life lost due to diabetes (as a primary cause) than non-Hispanic whites (MDH, 2012). The prevalence of diabetes is 12.5% in Hispanics, 11.7% in blacks, 14.7% in American Indian/Alaska Native, and 9.2% in non-Hispanic Asians (CDC, 2020). Over 24.2 million people aged 65 and older have prediabetes. Majority of patients do not reach their diabetes care goals despite strong evidence-based guidelines (CDC, 2020). Prediabetes is defined as HbA1c of 5.7%-6.4%, Fasting blood sugar of 100-125mg/dl, and Oral Glucose Tolerance Test 2-hour blood sugar of 140mg/dl-199 mg/dl (CDC, 2016) (see Figure 1). Approximately 5-10% of people with prediabetes develop diabetes annually but the conversion rate varies depending on the characteristics of the population and definition of prediabetes (Tabak et al., 2012). It is estimated that up to 70% of people with prediabetes will eventually develop diabetes (Zhang et al., 2008). The World Health
Organization estimates there are 422 million people worldwide with diabetes (WHO, 2019).

Figure 1.

*The Road to Type 2 Diabetes.*

Compared to individuals without diabetes, individuals with diabetes have a higher risk of hospital readmissions and other complications and risk factors including increased severity of illness, the presence of coexisting conditions, higher age, lower socioeconomic statuses, previous hospitalizations, and suboptimal care at hospital discharge and thereafter. Murphy et al. (2019) estimated that the 30-day readmission rate for patients with diabetes is between 14.4% to 22.7% which is higher than patients without diabetes (i.e. 8.5% to 13.5%).

Providing education regarding diabetes self-management skills in the inpatient setting is challenging because patients often are under stress, and do not feel well enough to engage in education. Nuyen and DeJesus (2014) determined if enrollment in a home health care program would improve diabetic outcomes among minority patients who have a poorly controlled diabetes. The study was conducted at one of four primary care clinics within an academic
institution in midwestern United States. The study participants included 23 patients all of Somali decent. The median number of home health care visit per week was two. The results showed no difference in hospitalization pre and post home health care (1 vs 1, \( p = 0.49 \)) but there was an improvement in mean HbA1c (6.5\% Vs 8.8\%, \( p < 0.001 \)). An interesting finding was that the number of “no-shows” of clinic appointments has decreased significantly (8.3\% vs 28.6\%, \( p < 0.001 \)). Outpatient diabetes care can affect the need for hospitalization as inpatient education can impact self-care. (See Figure 2).

Figure 2.

*Relationship between inpatient and outpatient diabetes care*

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**Needs Assessment of Hospitalized Individuals – Chart Review**

A detailed retrospective chart review of all patients who had an episode of hyperglycemia at a large medical system in the upper Midwest (defined as a blood glucose reading >180 mg/dL by blood draw or finger stick) was conducted between September 1, 2016 and February 28, 2017. Key findings from the chart review informed the focus of this project in
diabetes prevention. The average length of stay of study patients was 8.3 days. The average number of episodes of hyperglycemia during admission was 16.5 days. The average episodes of hyperglycemia/days admission ranged from 0.1 to 23 with an overall average of 2.5 episodes/day.

Twenty four percent of patients were not prescribed an appropriate correction scale. One hundred ninety-four of the patients received sliding scale and/or bolus insulin; of these 179 (92%) had their insulin held at some point during admission. A sliding scale insulin was usually documented as being held per the prescribing protocol, other reasons for holding insulin included the patient not being available, refused the insulin, or did not eat; transfer orders not reviewed: the nurse unable to check BG, the patient was off the unit at dialysis; or the reason was undocumented. Basal insulin was not held in most cases. One hundred and nine of the two hundred (54.5%) of patients reviewed were on a glucocorticoid (i.e. inhaled, IV, oral, nasal or ophthalmic) during admission, 119 (59.5%) did not have an infection, 22 (11%) had a probable infection, and 59 (29.5%) had a confirmed infection.

Of the 200 patients, 136 (68%) underwent a surgery or major procedure during the hospitalization. Procedures performed included paracentesis, small bowel resection, hysterectomy, ovarian abscess removal, pacemaker placement, pericardiocentesis, stent placement, valve replacement, bronchoscopy, IVC filter placement, ventriculostomy, brain tumor biopsy, craniectomy, coronary artery bypass grafts (CABG), laminectomy, laminoplasty, cervical fusion, thrombectomy, ICD placement, heart catheterization, aortic root replacement, ureteral stent, permacath placement, tracheostomy, caesarean section, right coronary artery re-implantation, and aortic dissection repair. Cardiology and neurosurgery were the most common disciplines performing the procedures.
Approximately ninety percent (179/200) of the patient charts reviewed were administered at least one dextrose containing fluid during admission. The majority of these patients (140/179, 78%) received multiple dextrose containing fluids during admission, which could increase the risk of hyperglycemic episodes. Diabetic ketoacidosis was the admitting diagnosis in 15 cases (7.5%), these patients had some of the highest number of hyperglycemic episodes per day. There are a number of opportunities for potential improvement that can be identified through this analysis. First, the analysis shows a large percentage of patients administered multiple dextrose containing fluids; these have the potential to increase incidence of hyperglycemia. Many of the medications (e.g. antibiotics, electrolytes) administered in dextrose fluids may be administered in alternate delivery vehicles which do not directly affect blood sugar levels, such as normal saline. There is an opportunity to decrease this risk by limiting the number of drugs administered in dextrose fluids and replace with alternate delivery vehicles, unless there are compelling reasons for dextrose use.

Second, patients with a diagnosis of diabetes on admission are at higher risk of hyperglycemic episodes. Ensuring ordering of appropriate sliding scale insulin and more responsive adjusting of basal bolus insulin could improve hyperglycemic episodes in this population. There may be an opportunity to improve care using this guideline more consistently. Third, a high number of charts reviewed (66/200, 33%) had undergone coronary artery bypass grafting. Further investigation into this association could provide additional areas for decreasing the incidence of hyperglycemia. The findings of this chart review highlight the complexities of diabetes care in the hospitals which necessitate the importance of diabetes prevention and diabetes care in the outpatient setting and more proactively in the communities.

**Needs Assessment of Community Members**
Obesity is a risk factor of diabetes and ethnic minorities are more likely to die from diabetes and yet getting community members to attend diabetes education in the clinics is difficult. (see Figure 3). Research has shown that intense lifestyle medication can delay or prevent diabetes as proven by the Diabetes Prevention Program (DPP) a randomized control trial of high-risk adults in 27 clinical centers which included 16 lifestyle education sessions in clinical and community settings. There was a 58% reduction in the incidence of diabetes with the intense lifestyle intervention and 31% with metformin compared to placebo (Diabetes Prevention Program Research Group, 2002).

Figure 3. Prevalence of Obesity Among Adults Aged ≥ 20 Years, by Race/Ethnicity and Sex — National Health and Nutrition Examination Survey, United States, 2009–2010


Social and cultural factors have been identified as determinants of positive behavior change related to diabetes self-care. Faith-based organizations may provide a trusted and culturally
sensitive setting for the delivery of diabetes prevention programs (Newlin et al., 2012).

Fruits and vegetables as part of a healthy diet decreases the risk of many chronic diseases including type 2 diabetes. The 2015-2020 Dietary Guidelines for Americans recommend that adults consume 1.5-2.0 cup equivalents of fruits and 2.0-3.0 cups of vegetables per day (Lee-Kwan et al, 2017). Only 12.2% of adults meet fruit recommendations and 9.3% meet vegetable recommendations (Lee-Kwan et al., 2017). In Minnesota only 11.6% of adults met the fruit intake requirements and 8.1% of adults met the vegetable intake recommendations (Lee-Kwane et al., 2017) (see Figure 4). The literature reviewed identified several barriers to adults consuming recommended fruit and vegetable intake including lack of knowledge, high cost, limited availability and access, transportation, lack of quality, lack of variety, changing food environment, spoilage, knowing how to cook fruits and vegetables, not thinking on fruits and vegetables when hungry (Lee-Kwan et al., 2017).

Physical activity in addition to a healthy diet is also important to an improved health. Adults need at least 150 minutes per week of moderate-intensity physical activity (US Department of Health and Human Services, 2016).

Figure 4.

Average Daily Food Group Intakes by Age-Sex Groups, Compared to Ranges of Recommended Intake
The purpose of this project was to increase fruit and vegetable intake and increase physical activity of adults with prediabetes in a faith-based setting.

**Review of Literature**

A literature search was conducted using the following databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochrane, PubMed, Ovid, Up-to-date, Google Scholar and Science Direct. A librarian assisted with the search strategy to augment the literature findings. The search restrictions were applied in a variety of combinations with inclusion and exclusion criteria. The article abstracts were reviewed, and duplications were eliminated. The inclusion criteria for article review were based on the specific key words and phrases searched, which were directly related to the defined components of the PICO question. The following inclusion criteria were applied, and studies were included if: (a) the study tested diabetes intervention on patients with diabetes, and (b) the intervention group was compared to a control group such as patients who received usual care. The literature searches encompassed articles from
database inception and articles restricted to ten years prior to the search dates. The search restrictions were applied in a variety of combinations with the following exclusion criteria: non peer-reviewed only, English language, journals, full text, full-length article, and no citations. The inclusion criteria for article review were based on the specific key words and phrases searched, which were directly related to the defined components of the PICO question.

Full articles related to increase fruit and vegetable intake, healthy eating, increase physical activity and potential evidence-based interventions and outcomes were reviewed. From the search results, the inclusion criteria for the population of interest were expanded to incorporate interventional studies for increase in fruit and vegetable intake and increase physical activity, which included education, self-management education, self-care, faith-based, and community-based. This approach was utilized to increase the number of interventions that could be reviewed for increase physical activity and increase in fruit and vegetable intake. Based on the abstract review, the articles that encompassed the inclusion criteria were reviewed in full. A manual search of listed references within included articles was conducted to identify additional pertinent studies that met inclusion criteria. Articles were selected as evidence to inform the PICO question. Twenty-one articles were included in the final review that pertained to community-based diabetes prevention programs, culturally tailored self-management, diabetes education, and diabetes discharge instructions post-acute care follow-up planning. (see Figure 5).

Figure 5.

*Flowchart of literature reviewed.*
Community-Based Diabetes Prevention Program

Social support is an important factor to diabetes self-management outcomes. Katula, Vitolins, Rosenberger, Blackwell, Morgan, Lawlor and Goff (2011) reported the first-year results from the Healthy-Living Partnerships to Prevent Diabetes (HELP-PD) study of a community-based translation of the Diabetes Prevention Program lifestyle weight loss intervention on fasting glucose, insulin resistance, and adiposity. Fasting blood glucose, insulin, and anthropometry were assessed at baseline and randomization and 6 and 12 months. HELP PD is a modified group-based lifestyle weight loss intervention version of CDC’s Diabetes Prevention Program into the community. Participants included a sample of people at risk for diabetes representative of the local community. The objective of the project was a weight loss of 5 – 7% during the first 6 months. The participants met weekly for Community Health Worker-led group sessions during the first 6 months along with a personalized consultation with a registered dietician. Participants also received two scheduled contacts with the community health worker each month for months 7-12. Three hundred and one people participated in the project. The study results showed that participants lost a net of 6% of their body weight and 5.0 cm in waist circumference ($p < 0.001$).
Fasting glucose decreased by 4.3 mg/dL. The results of this study indicated that the HELP PD was able to translate the Diabetes Prevention Program Lifestyle Weight Loss intervention into a community-based approach with significant improvements in weight and blood glucose.

Hahn and Gordon (1998) conducted a diabetes prevention program in the community using focus groups and information from those focus groups were used to draw the community to help develop, promote, and teach a diabetes education program. The program was focused on nutrition and diabetes and was called “Learn, Taste, and Share” Much of the outreach was conducted via community agencies and churches. The program entailed four 2-hour sessions conducted at local churches and community centers. Each of the four 2-hour sessions included games with prizes, giveaways and either a cooking demo or cooking participation. The first session also included a presentation on overview of diabetes and effects of different foods on blood sugar and health. There were 120 participants in the program 85 had diabetes, 10 caregivers and 25 community health aides. The primary objective of the project was to increase participation in the project since previous programs had netted only three or fewer people per session. The HbA1c of the group ranged from 7.3%-18.8%. Mean HbA1c decreased from 12.1% to 10.8% ($p = 0.002$). The participants in the programs showed a high level of enthusiasm and interest in learning and participating in the series. Participants contributed recipes for a community cookbook called *The Learn, Taste, and Share cookbook*.

Barnhart, Mossavar-Rahmani, Nelson, Raiford, Wylie-Rosett (1998) conducted a study to assess the feasibility of a church-based nutrition intervention to increase fruit and vegetable intake among African American women using the Nurse’s unit. The intervention consisted of three 90-minute bi-weekly sessions that were interactive and focused on problem solving. The sessions were tailored to the needs of the group. Fruits and vegetables were also served at every
session to help model behavior. Thirty African American women participated in the sessions with a mean age of 60.5 years. The study used a Food Frequency Questionnaire to assess intake of fruits and vegetables. The results of the study showed that the mean number of weekly servings baseline for fruits and vegetables was 6.2 and 5.7 and 8.6 and 7.7 respectively post intervention. The mean number of servings increased by 2.4 and 2.0 for fruits and vegetables respectively post intervention ($p = 0.03$). The investigators looked at barriers to consumption of fruits and vegetables and most of the participants perceived that the physician would most likely influence their fruit and vegetable intake and others strongly agreed that cost and intestinal gas were potential barriers to their intake of fruits and vegetables (Barnhart et al.; 1998).

**Culturally Tailored Self-Management**

Samuel-Hodge, Keyserling, Park, Johnston, Banngdiwala (2009) conducted a randomized trial of a church-based diabetes self-management program for African Americans with type 2 diabetes. The study was conducted at twenty-four African American churches. Churches were randomized to receive special intervention (SI) (13 churches, 117 participants) or minimal intervention (MI) (11 churches, 84 participants). The intervention consisted of individual counselling visit and group education sessions. The intervention was given in part by a church diabetes advisor. The group education sessions were twelve biweekly sessions held at each church lasting approximately 90 to 120 minutes. Each session included short physical activity session, taste testing one to two recipes, small group activities. The sessions included interactive, visual, and hands-on activities and game format for teaching nutrition concepts. Physiologic measures included HbA1c, weight and blood pressure. At the eight-month follow-up post intervention the mean HbA1c for the intervention group was 7.4% and 7.8% for the control group with a difference of 0.4% ($p = 0.009$). Physical activity outcomes for the intervention
group at both eight- and twelve-month follow-up showed little change in either light and moderate physical activity. This study demonstrates the feasibility of implementing a culturally targeted faith-based diabetes self-management education.

In a similar study, Lorig, Ritter, Villa, Armas (2009) determined the effectiveness of a community-based diabetes self-management program comparing treatment participants to a randomized usual care control group at six months. Three hundred and forty-five adults participated in the project which was a six-week program offered two and half hours weekly by two peer leaders. The sessions were held in community settings such as churches and senior centers with class sizes of ten to fifteen participants at a time. The program content included: an overview of self-management and diabetes, making an action plan, nutrition and healthy eating, feedback/problem solving, preventing complications, fitness/exercise, stress management, relaxation techniques, difficult emotions, monitoring blood glucose, depression, positive thinking, communication, medications, working with your health care professional, working with the health care system, sick days, skin and foot care, and future plans. A pilot project preceded the implementation of this program which was conducted in Spanish language and all program materials rewritten in English after the pilot for implementation of this program. Six months follow-up post intervention results showed significant improvements in depression, hypoglycemia symptoms, communication with physicians, healthy eating, and reading food labels ($p < 0.01$). Self-efficacy and patient activation measures also improved for the intervention group compared to the usual care controls ($p = 0.001$).

Comparatively, Williams, Utz, Hinton, Yan, Jones, Reid (2014) in a quasi-experimental design in a rural community evaluated a culturally tailored community-based group diabetes self-management education (DSME) program among African Americans. The program was
culturally tailored by its implementation in the community setting, multimodal method of learning, positive approach to problems and by emphasizing group over individual needs. Participants in a group of six to eight members attended a series of eight weekly sessions of two hours each. The sessions included the following topics: healthy eating, being active, monitoring blood sugar, taking medications, problem solving, reducing risks, and health coping. During each session participants viewed a videotaped story depicting an African American adult confronting diabetes self-management problem. The session facilitators facilitated a discussion about the problem depicted in the video and encourage participants to problem solve for characters in the video and then apply the situation to their own lives and identify solutions. Twenty-five enrolled participants completed the two-year study follow-up. The outcomes measured assessed at three, six and twelve-months post bassline included average blood sugar levels, cardiovascular risk factors and general physical and mental health. The results revealed that HbA1c levels decreased but not significantly at three months follow-up 8.0% to 7.6% ($p = 0.22$). BMI significantly decreased at three months follow-up 38.5 to 38.0 ($p = 0.03$); level of exercise increased 2.12 to 3.10 ($p = 0.007$). Self-efficacy was not significantly impacted post intervention 3.99 to 4.25 ($p = 0.11$). This study has shown that providing culturally sensitive DSME is an effective approach to improve education and support for people with type 2 diabetes.

Similarly, Collins-McNeil, Edwards, Batch, Benbow, McDougald, Sharpe (2012) in a twelve week two-hour session DSME intervention project with twelve African Americans examined conducting a church-based diabetes self-management education program and the effects on diabetes self-management, level of self-care management, emotional distress, HbA1c, blood pressure, lipids, waist circumference and weight. The program focused on seven areas of type 2 diabetes self-management; (a) healthy eating, (b) being active, (c) monitoring blood
glucose, (c) taking medications, (e) problem solving, (f) reducing risk, and (g) healthy coping.

The results of the study showed significant improvement in adherence to medication and insulin administration \((p = 0.006)\). There was a mean change in SBP of 9mmHg, a 10mg/dL reduction in LDL, an increase in HDL of 4mg/dL and a reduction of 26mg/dL in triglycerides. These results indicated that DSME can be successfully implemented in the community and achieve health outcomes.

In a randomized control trial, Spencer, Rosland, Kieffer, Sinco, Valerio, Palmisano, Anderson, Guzman and Heisler (2011) tested the effectiveness of a culturally tailored, behavioral theory-based community health worker (CHW) intervention for improving glycemic control. The study involved 136 adults randomized into a CHW intervention group or a control group. Known in this study as family health advocates, CHW underwent 80 hours of training and their interventions were centered around three activities conducting eleven 2-hour culturally tailored group diabetes education classes in English and Spanish, 2 home visits per month of about 60 minutes to address participant specific self-management goals and a clinic visit with the participant. The study results showed a 0.99 reduction in mean HbA1c from baseline \((p < 0.01)\), and a statistically significant improvement in participant knowledge of diabetes and behavioral variables from baseline to 6 months \((p < 0.05)\). A statistically significant improvement in both the intervention group and participant group in meeting physical activity guidelines from 37% to 53% for the intervention group \((p < 0.05)\) and 32%-53% for the control group \((p < 0.01)\). The study results did not show an improvement in the consumption of fried or fatty foods. This study highlights the importance of Community Health Workers and their role in diabetes prevention and care.

In a culturally tailored patient education and communication skills training to empower
African-Americans with diabetes, Peek, Harmont, scott, Eder, Roberson,Hui Tang, Chin (2012) conducted an observational cohort pilot study in a Federally Qualified Health Center (FQHC). Twenty-one participants were included in the study. Eleven in cohort 1 and ten in cohort 2. The goal of the project was to develop a patient intervention combining culturally tailored diabetes education with share decision-making. The program included ten education weekly classes 80 to 90 minutes in length. The initial six sessions focused on diabetes basics and the last four sessions were based on shared decision-making and patient and provider communication. The study results showed an improvement in HbA1c at three months follow-up from baseline 8.24 at baseline to 7.33, \( p = 0.02 \). The results did not show an improvement in shared decision-making behaviors. This study showed an innovative patient empowerment intervention.

**The Johns Hopkins Nursing Evidence-Based Practice Model**

The Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP) helps to translate evidence to clinical, administrative, and educational nursing practice. (Dearholt & Dang, 2012). The JHNEBP model is implemented using the PET process which consist of three phases: practice question, evidence, and translation. Within these phases, there are eighteen prescriptive steps. The JHNEBP model was used to assemble the implementation of the evidence-based intervention with permission (see Appendix A - Permission for JHNEBP Model and Tools). The JHNEBP process occurs in three phases described as PET. The JHNEBP Project Management Guide was utilized to define the timeframe, persons assigned, specific milestones, and resources required for each of the individual steps listed in the model.

**Statement of Problem**

Does a faith-based diabetes prevention lifestyle intervention increase fruits and
vegetables intake and increase physical activity in adults with or at risk for prediabetes compared to standard care pre-intervention fruits and vegetable intake in six weeks? Research has shown that intense lifestyle modifications can delay or prevent diabetes. Diets rich in fruits and vegetables can prevent many chronic diseases. Without taking action, many adults with prediabetes could develop type 2 diabetes within 5 years (CDC, 2017). Fruits and vegetables as part of a healthy diet decreases the risk of many chronic diseases including type 2 diabetes. The 2015-2020 Dietary Guidelines for Americans recommend that adults consume 1.5-2.0 cup equivalents of fruits and 2.0-3.0 cups of vegetables per day (Lee-Kwan et al., 2017). Only 12.2% of adults met fruit recommendations and 9.3% met vegetable recommendations (Lee-Kwan et al., 2017). In Minnesota, only 11.6% of adults met the fruit intake requirements and 8.1% of adults met the vegetable intake recommendations (Lee-Kwane et al., 2017).

Methods

Description of Evidence -Based Practice Project

An EBP project was conducted in a faith-based based setting after Institutional Review Board approval. The project was a modified version of the National Diabetes Prevention Program (NDPP) in a series of four 2-hour sessions at a Mosque focused on healthy eating and increase in physical activities. The project included assessing the risk of prediabetes, collecting baseline data including weight, average daily servings of fruits and vegetable intake and average daily number of physical activities, conducting diabetes education sessions at the Mosque and collecting data six weeks post implementation. (See Figure 6). The objective of this project was to increase fruit and vegetable intake and increase physical activities in adults with or at risk for prediabetes. The project followed CDC’s designed Diabetes Prevention program in the community called The Road to Health: How to Prevent of Delayed Type 2 Diabetes in your
community for African Americans and people of African descent. The program targets two categories healthy eating and increase in physical activity with seventeen different activities to complete during the program (CDC, 2016).

Figure 6.

*Elements of Implementing a Diabetes Program in a Mosque.*

**Recruitment of Participants**

Institutional Review Board approval was obtained before recruiting participants and implementation of the project. A focus group was formed which comprised the Imam, the head of the women, and some Mosque members to help determine the approach to participant recruitment and to discuss implementation of the project at a Mosque in a metropolitan area of the Midwest U.S. The recommendation of the focus group determined the approach to recruitment. The members of the Mosque were introduced to the program through posters and announcement from the pulpit. Members expressed interest in participating by calling or emailing the project leader or mentioning their interest to the Imam or the leader of the women. The recruitment goal for this project was 5-15 members with or at risk for prediabetes and diabetes at the Mosque. COVID-19 social distancing guidelines required by State regulations were adhered to. Interested participants were contacted by phone by the project leader to assess
eligibility using the Prediabetes Risk Assessment and to answer questions about the program. Those eligible were enrolled in the project.

**Participants**

Eligibility criteria for inclusion in the project include (a) adults age 18 years and older with preference given to older adults, (b) self-reported diagnosis of diabetes or prediabetes with a score of 5 or higher based on the risk assessment, (c) willingness to participate and attend all four sessions at the mosque, and (d) having a home phone or easy access to one. Exclusion criteria include a contraindication to consumption of fruits and vegetables, and/or an inability to walk or communicate.

**Setting**

The project was conducted at an Islamic Mosque located in a metropolitan area of the Midwest U.S. with a majority of the congregates from Gambia, West Africa. To promote translation of diabetes science to community settings, non-traditional venues for delivery of DSME are important. This setting was chosen to help increase participation and attendance of a diverse community in the project.

The community setting implementation feasibility of the project inventions were reviewed and approved by the Mosque leadership for implementation at the Mosque. A review of the literature and examination of the population of interest demonstrated the utility of the interventions in the community. The utilization of the community setting was based on the Chronic Care Model which represents a method for reorganizing health care through interactions between health systems and communities. The utility and feasibility of the interventions were analyzed to determine the findings, setting, sample, feasibility of implementation, benefits, risks, and resources needed.
Diabetes disproportionately burdens ethnic and racial minority population. The project followed CDC’s designed Diabetes Prevention program in the community setting called *Road to Health* for African Americans and people of African descent. The sessions took place in a classroom with access to computers, chairs, writing materials and audio-visual apparatus and using physical distancing in accordance with CDC COVID-19 guidelines.

**Diabetes Lifestyle Intervention Education Sessions**

The project is a modified version of the National Diabetes Prevention Program (NDPP) in a series of four weekly 2-hour sessions at the Mosque focused on healthy eating and increasing physical activities. All the sessions were conducted in Mandinka the native language of the participants of which the facilitator is fluent. The sessions were rich in information and information exchange and tailored to the needs of the participants, interactive and problem solving. The project included extensive review of the literature, assessing the risk of prediabetes, collecting baseline data on weight, average daily servings of fruits and vegetable intake and average daily number of physical activities, conducting diabetes education sessions at the mosque and collecting data six weeks post implementation. To model desired behavior, fruits and vegetables were served at the sessions.

Sixty percent of the project participants in the group did not have transportation and could not drive. The facilitator provided transportation to and from the Mosque for each of those participants for each session which took about an hour and 30 minutes. Based on the feedback of the focused group, it was determined that the best time to conduct the sessions was Saturday mornings 11am to 1pm at the Mosque. Each session was led by a project leader who has been a nurse for 16 years and of the same nationality and religion of the study participants.

The first session began with completing the informed consent and an overview of the
program. Each of the sessions included a prayer during the session. The initial session also
included an overview of diabetes and complications of diabetes, the effect of different foods on
blood sugar, importance of health eating, physical activities and the Road to Type 2 Diabetes.
(See Figure 7). Included in this session was an overview of the project handouts which includes
the weekly food log, fitness log, and the action plan journal.

The other three sessions were similar in format to the initial session. Each of the
subsequent sessions began with a welcome, review of each of the participant action plan journal,
fitness log and food log, celebrating wins and providing support and suggestions for overcoming
barriers to goal. Session handouts were distributed to the participants at the start of each session.
Each participant was asked to set goals for fruit and vegetable intake and physical activities for
the subsequent week. A breathing exercise and a prayer concluded each session. (see Table 1)
There was additional weekly support after each session and at the completion of the fourth
session for the participants in a form of a phone call from the project facilitator to provide
support and guidance. Managing stress and coping skills were heavily discussed at the sessions
as a means to prevent diabetes. At the completion of session four, a traditional Gambian dish
called “Benachin” incorporating vegetables was prepared and served to the project participants
by the project leader. (See Figure 8). A certificate of completion was also given to each
participant. At the conclusion of the fourth session, the group provided support to each other, and
discussed the role of the Mosque in preventing diabetes in our community.
### Table 1

**Topics discussed in Each of the Education Sessions**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
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<td>Making an action plan</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Ways to get active</td>
<td></td>
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<tr>
<td>Stress management and relaxation techniques</td>
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<tr>
<td>Reading food labels</td>
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<tr>
<td>Using the nutrition label to make healthier choices</td>
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<tr>
<td>Portion control</td>
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<tr>
<td>Importance of food tracking and how to track food</td>
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<td>Eating well to prevent diabetes</td>
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<tr>
<td>Recommended fruits and vegetables serving sizes</td>
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<td>✓</td>
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</tr>
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<td>Ways to burn more calories</td>
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<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What foods are in the fruit and vegetable group</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types of fats and ways to avoid unhealthy fats</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Overview of carbohydrates, types of carbohydrates and the connection between carbohydrates and diabetes</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>How to incorporate fruits and vegetables into our regular Gambian dishes</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ways to make our cultural dishes more healthy</td>
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<td>✓</td>
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<td>Friends and family support for a healthy lifestyle</td>
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<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>How to cope with difficulties and challenges</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Ways to shop for healthy food choices on a budget</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>How to keep a healthy lifestyle at the conclusion of this program</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
Figure 7.

*Diabetes Education Session at the Mosque*

![Image](image1.png)

Figure 8.

*A Traditional Gambian Dish “Benachin” with Vegetables incorporated.*

![Image](image2.png)

Project Expense and Implementation Timeline
The project cost approximately $519 which included printing cost for handouts, weight scales, food, and gas for transporting participants to the education sessions. This cost does not include time of the facilitator and the space given by the Mosque to conduct the sessions.

The goal for the number of participants for this project was 5 – 15 participants with or at risk for prediabetes to meet for four 2-hour sessions. In meeting with the Imam and the leader of the women they recommended conducting the sessions on Saturdays starting 12/13/20 and continuing each Saturday for four weeks, from 11am-1pm. The class sessions adhered to COVID-19 social distancing and group size limits as required by Minnesota State ordinance.

**Gantt Chart.** The Gantt chart in Figure 9 illustrates a project’s schedule. The y-axis lists each of the identified tasks for the project. The x-axis represents project duration in days.

**Figure 9.**

*Timeline and Duration of Project Components in Days*

![Gantt Chart Image](image)

**Measurement Tools and Data Collection**

Data were collected preintervention to evaluate participant average daily intake of fruits and vegetable and average daily minutes of physical activities at baseline and to compare post intervention data to determine the effectiveness of the implemented diabetes prevention interventions.
The outcomes associated with the PICO question are to increase fruit and vegetable intake and increase physical activities. The outcomes were assessed at baseline, at the fourth session, and six weeks post implementation. Participants were asked the following questions at baseline and at the six weeks follow up:

Over the past week, on average how many servings of fruits per day have you had?
Over the past week, on average how many servings of vegetables per day have you had?
Over the past week, on average how many minutes of exercise per day have you had?

The outcome of physical activity (in minutes) and fruit and vegetable intake (in servings/day) were also assessed at the fourth class session using the fitness log and food log included in the diabetes prevention tool kit with days of the week and number of physical activities and food intake for each day. The logs are used because it is easy to use for any participant level of literacy. Participants were encouraged to use the food intake and fitness log during the four-week intervention. The focus of the exercise was a gradual increase in brisk walking or other activities of similar intensity. At the end of each of the project session, participants were given an action plan journal for goal setting and achievement.

The Prediabetes Risk Assessment was completed with each participant prior to participation in the four 2-hour class sessions. Individuals with a concerning level or combination of risk for diabetes were referred to local community health clinics/resources and given written materials. The project facilitator met with each individual participant to review the Food Log and Fitness log at during the four weeks of the class sessions. Having the facilitator directly administer the tools helped to ensure accuracy and standardization.

Results
All data were entered into SPSS for analysis. The project was conducted with five Gambian immigrants living in Minnesota, including three women and two men between the ages of 43 and 67.

**Prediabetes Risk Assessment**

All project participants \((N = 5)\) completed the prediabetes risk score. Eighty percent of the participants were identified as high risk for diabetes with a risk score of \(\geq 5\).

The results of the project showed the mean daily servings of fruit consumption increased from baseline to six weeks by 1.1 servings \((p = 0.0055)\), vegetable consumption increased from on average by 2.42 servings \((p = 0.0001)\), and physical activity increased on average by 18.33 minutes \((p = 0.0377)\). (see Table 2 & Figure 10).

Table 2

*Means and standard deviations for each time period for Fruit Consumption, Vegetable Consumption, and Physical Activity.*
Repeated Measures Analysis

A repeated measures analysis was completed to analyze each individual at three time points, baseline, 4 weeks and 6 weeks post implementation. The process was modeled in the following ways; (a) Primary Independent Variable: Time, (b) other potential
independent/external variables; (a) age, (b) weight, (c) Prediabetes Risk Score, (d) Recommended Daily Caloric Intake.

The only external variable that appeared to be statistically important was weight. To improve model construction and interpretation the following categorical indicator variable was created for weight as follows:

- If Weight > 200; then Weight Group = High
- If Weight ≤ 200; then Weight Group = Low

Fruit consumption

The average daily servings of fruits increase was statistically significant ($p = 0.0055$). The analysis showed that the effect of time on fruit consumption depends on weight and participants in the high weight group consumed statistically significantly more fruits than those in the low weight group ($p = 0.0162$). This also showed that neither the effect of time alone nor the effect of weight group alone impacted fruit consumption as the interaction between the two is significant. (see Figure 11).

Figure 11.

*Interaction Plot Between Time and Weight Group. Mean fruit consumption Vs. Time*
Vegetable Consumption

Vegetable consumption increased, on average, by 2.42 servings ($p = 0.00001$). Time had a statistically significant impact on vegetable consumption ($p = 0.00001$). (see Figure 12). All participants regardless of their weight worked to increase their intake of vegetables.

Figure 12.

*Means for Vegetable Consumption Vs Time Physical Activity*
The analysis showed a statistically significant \((p = 0.0377)\) increase in physical activity, on average, by 18.33 minutes. Time had a statistically significant impact on physical activity \((p = 0.035)\). (see Table 2 & Figure 13). All participants regardless of their weight worked to increase their daily physical activity.

Table 2

*Fixed Effects Test of Time and Weight on Physical Activity*

<table>
<thead>
<tr>
<th>Source</th>
<th>Nparm</th>
<th>DFNum</th>
<th>DFDen</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
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</thead>
<tbody>
<tr>
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<td>2</td>
<td>2</td>
<td>6.4049756</td>
<td>0.0325*</td>
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<tr>
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<td>1</td>
<td>1</td>
<td>2.0210675</td>
<td>0.2508</td>
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<tr>
<td>Time*Weight Group</td>
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<td>2</td>
<td>2</td>
<td>0.1949993</td>
<td>0.8278</td>
</tr>
</tbody>
</table>

*LS Means for Vegetable Consumption vs. Time*
Social Determinants of Health

Social determinants of health are the condition in the environment where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality of life outcomes and risks (Hill-Briggs et al.; 2021). Addressing social determinants of health can improve diabetes prevalence, decrease economic costs and disproportionate population burden of diabetes. The following social determinants of health were impacted in this project:

Transportation/Travel

The biggest challenge in the project was transportation. Sixty percent of the participants in this project cannot drive. Transportation was provided to the participants to and from the diabetes education sessions by the project facilitator. This highlights disparities in healthcare and the need for action and ways we can improve health through transportation.

Cost
The project cost approximately $519 which included printing cost for handouts, scales, food, and gas for transporting participants to the education sessions. This cost does not include time of the facilitator and the space given by the Mosque to conduct the sessions. This cost is minimal when compared to cost avoidance of medication interventions. In the National Diabetes Prevention Program that spans 2.8 years, the cost of lifestyle intervention per participant was $4,572, and $2,281 for participants in the metformin arm of the study compare to $752 for placebo (Diabetes Prevention Program Research Group, 2012).

**Trust and relationships**

Transparency is key to success when working with communities. It is important to have strong relationships with the community members and nurture those relationships early and continuously to ensure engagement. This project used trusted leaders within the community and provided the program in the participants’ first language to promote relationship building. Prayer a key component of the participants faith was also incorporated into the diabetes education sessions.

**Health Literacy**

Diabetes risk assessment and prevention seemed unfamiliar to some of the project participants. Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (Almader-Douglas, 2013). Only 12 percent of U.S. adults have the health literacy proficiency to perform complex health tasks. Ninety million people, nearly half the US adult population, lack health literacy skills needed to understand and act on health information and health system demands. (U.S. Department of Education, 2006). Diabetes requires patient engagement and self-management and self-management requires attainment of knowledge and
the skills to properly engage in self-care behaviors (Reyes et al., 2017). Self-management is the method of actively engaging in self-care activities intended to control the negative effects of an illness on one’s own health. Patient’s lifestyle modifications can significantly reduce the development of type 2 diabetes among people with prediabetes (Sattin et al., 2017).

**Limitations**

This project was implemented in a Mosque with small number of participants and may not be representative of all Mosque members. Further projects are needed to further evaluate the effectiveness of diabetes prevention programs in a Mosque setting. This project did not evaluate outcomes beyond six weeks. Evaluating long term outcomes such as Weight loss, HbA1c, and diabetes incidence rate would provide additional information about the sustainability of behavior change.

**Conclusions**

This project has shown that implementing diabetes prevention program in the community is feasible, cost effective, and will provide improvements in preventing diabetes through improvements in physical activity and consumption of fruits and vegetables. Participants were enthusiastic, engaged, and interested in learning about diabetes and diabetes prevention.

Social and cultural factors have been identified as determinants of positive behavior change related to diabetes self-care. This project demonstrated the feasibility of providing health promotion programs in a faith-based community.
References


https://nnlm.gov/initiatives/topics/health-literacy


Center for Disease Control and Prevention (2019). Age Disparities Among Patients with Type 2 Diabetes and Associated Rates of Hospital Use and Diabetic Complications. Retrieved from https://www.cdc.gov/pcd/issues/2019/18_0681.htm


Community commons (n.d.) Reversing the risk of diabetes. Retrieved from https://www.communitycommons.org/entities/8bce3558-2590-4344-86e7-1aaf7b353a9


10.1016/j.jcte.2017.03.003


S., & Goff, D. C., Jr (2011). One-year results of a community-based translation of the
Diabetes Prevention Program: Healthy-Living Partnerships to Prevent Diabetes (HELP
Kilpatrick, C. R., Elliott, M.B., Pratt, E., Schafer, S.J., Blackburn, M.C., Heard, K., McGill,
Med, 10, 621-626.
Oxman AD, Cook DJ, Guyatt GH. Users’ guides to the medical literature. VI. How to use an
State-Specific Adult Fruit and Vegetable Consumption — United States, 2015. MMWR
DOI: http://dx.doi.org/10.15585/mmwr.mm6645a1external icon
in health care, 45(3), 1–17. https://doi.org/10.1300/J010v45n03_01
Lee, P. H., Franks, A. S., Barlow, P. B., & Farland, M. Z. (2014). Hospital readmission and
emergency department use based on prescribing patterns in patients with severely
uncontrolled type 2 diabetes mellitus. Diabetes technology & therapeutics, 16(3), 150–
155. https://doi.org/10.1089/dia.2013.0168


http://www.stratishealth.org/pubs/qualityupdate/f18/numbers.html#text=Overall

Minnesota performs almost a 18.4 percent for the nation.


