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Leah Carrillo , *The University of Texas at San Antonio*, leahc1217@gmail.com
Summer R. Wilmoth , *The University of Texas at San Antonio*, Summer.Wilmoth@utsa.edu
Raymundo Mendoza , *The University of Texas at San Antonio*

See next page for additional authors

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Abstract

Objectives: This study aimed to assess the feasibility, facilitators, barriers, and impact of adopting the Self-Management Resource Center Diabetes Self-Management Program (SMRC DSMP) on diabetes-related outcomes.

Methods: The SMRC DSMP was implemented in five churches in San Antonio, Texas. A single group pre-post-test design was used to evaluate program effect on improving T2D outcomes. The primary outcome was glycohemoglobin (HbA1c) and secondary outcomes included Self-Efficacy for Diabetes, health-related quality of life (HRQOL), and patterns of eating and physical activity. Program feasibility, facilitators, and barriers were assessed through documentation and in-person interviews with participants.

Results: A total of 96 participants were in the program with 87 completed endpoint surveys (91%). HbA1c level was significantly reduced by 0.73%. HRQL score increased by 2.6 days per month; stretching/ strengthening activity increased by 36 minutes per week; and Self-Efficacy for Diabetes score significantly increased. The program was viewed as necessary for the community due to familiar environment with church acquaintances and ease of access to the program. Key barriers were a lack of facilitators' competency in the Spanish language, short program length, and no ongoing support group / reunions.

Conclusion: The DSMP program was feasible and effective when implemented in faith community settings for Hispanics.

Keywords

Diabetes Self-Management; Hispanics; Faith-community

Cover Page Footnote

Corresponding author: Dr. Meizi He, One UTSA Circle, the University of Texas at San Antonio, Department of Public Health, San Antonio, TX, United States. Email: meizi.he@utsa.edu

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Authors

Leah Carrillo; Summer R. Wilmoth; Raymundo Mendoza; Ashton Balarin; Meixia Pan; Elena Martinez,; Erica T. Sosa; Zenong Yin; Sarah Ullevig; and Meizi He

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Leah Carrillo, MS, RN, CHES, The University of Texas at San Antonio
Summer R. Wilmoth, PhD, The University of Texas at San Antonio
Raymundo Mendoza, MS, The University of Texas at San Antonio
Ashton Balarin, MS, CHES, The University of Texas at San Antonio
Meixia Pan, MD, PhD, The University of Texas at San Antonio
Elena Martinez, MS, CHES, The University of Texas at San Antonio
Erica T. Sosa, PhD, The University of Texas at San Antonio
Zenong Yin, PhD, The University of Texas at San Antonio
Sarah Ullevig, PhD, RDN, LD, The University of Texas at San Antonio
Meizi He, PhD, The University of Texas at San Antonio
Corresponding Author: Meizi He, meizi.he@utsa.edu

ABSTRACT
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Methods: The SMRC DSMP was implemented in five churches in San Antonio, Texas. A single group pre-post-test design was used to evaluate program effect on improving T2D outcomes. The primary outcome was glycohemoglobin (HbA1c) and secondary outcomes included Diabetes Self-Efficacy Scale, health related quality of life (HRQOL), and patterns of eating and physical activity. Program feasibility, facilitators, and barriers were assessed through documentation and in-person interviews with participants.
Results: A total of 96 participants were in the program with 87 completed endpoint surveys (91%). HbA1c level was significantly reduced by 0.73%. HRQOL score increased by 2.6 days per month; stretching/ strengthening activity increased by 36 minutes per week; and Diabetes Self-Efficacy Scale significantly increased. The program was viewed as necessary for the community due to familiar environment with church acquaintances and ease of access to the program. Key barriers were a lack of facilitators' competency in the Spanish language, short program length, and no ongoing support group / reunions.
Conclusion: The DSMP program was feasible and effective when implemented in faith community settings for Hispanics.

Keywords: Diabetes Self-Management; Hispanics; Faith-community

INTRODUCTION

Type 2 diabetes (T2D) is a public health problem with increasing prevalence at national and global levels. Approximately 34 million adults in the United States (US) were diagnosed with diabetes and another one-third with prediabetes (Prevention, 2020). T2D costs the nation an estimate of $327 billion in direct medical costs and in reduced productivity in 2017 (ADA, 2018). T2D is a lifelong disease requiring ongoing treatment and self-management. If left untreated or without proper self-management, diabetes may cause severe health complications such as heart disease, stroke, kidney failure, lower-limb amputations, and adult-onset blindness (Funnell et al., 2009). Diabetes disproportionally affects minorities including Hispanics, the fastest growing minority group in the US (Colby, 2014). It was estimated that half of all Hispanics will develop diabetes in their lifetime, as compared to 40% of all Americans (Gregg et al., 2014). Hispanics are more likely to develop T2D related complications than Whites (Aguayo-Mazzucato et al., 2019). In addition, Hispanic patients are less likely than Whites to routinely check their Hemoglobin A1c (HbA1c), have routine foot exams, self-monitor blood sugar, adhere to medications, and have their HbA1c level reaching the target of 7% or below (Levine et al., 2009; Stark Casagrande et al., 2013). Effective T2D self-management strategies are urgently needed to prevent T2D's severe health complications and related healthcare burdens, especially among Hispanics with T2D.

Proper diabetes self-management is essential in preventing long-term diabetes-related complications. Diabetes Self-Management Education and Support (DSMES) is one of the essential elements of comprehensive diabetes medical care (Powers et al., 2020). DSMES is an ongoing process of facilitating people with the knowledge, skills, and confidence to accept responsibility for their self-management (Powers et al., 2020). Effective DSMES has been shown to improve diabetes outcomes and quality of life while reducing hospitalizations and health care burden (Chrvala et al., 2016; He et al., 2017). DSMES is mainly delivered through primary care in office-based settings in the US. Despite the beneficial impacts on diabetes outcomes, DSMES utilization remains low in the US (Powers et al., 2020). In addition, office-based DSMES might not supply a sufficient amount of information and ongoing support to patients for long-term proper self-management (Powers et al., 2020; Shrivastava et al., 2013; Stellefson et al., 2013). To address low utilization of office-based DSMES and sustain maximum benefit, individuals require accessible DSMES that can be delivered at the community level beyond primary care (Powers et al., 2020). The recent DSMES Consensus Report calls for healthcare providers to collaborate with innovative and nontraditional DSMES services, such as those in community health centers, pharmacies, faith-based organizations, and homes of people with diabetes (Powers et al., 2020). These types of innovative DSMES services are particularly needed for Hispanic communities that often have cultural and linguistic barriers coupled with limited access to resources (Testerman & Chase, 2018). Indeed, resent research shows that community-based DSMES led by healthcare workers are effective at improving HbA1c at six months in Latino populations (Spencer et al., 2018).

The faith community setting appears to be a culturally appropriate setting to host evidence-based interventions for the Hispanic population. Almost 90% of Hispanics report an affiliation with the Catholic and/or Protestant faith (Westoff & Marshall, 2010). Frequent attendance, social

networks and support systems, mutual trust, familiarity of the environment, accessibility, and broad outreach make the faith community setting a viable platform for implementing evidence-based programs (Baig et al., 2015). Research also suggests that social support provided by a religious setting may have a beneficial effect on health and well-being of parishioners (Ellison & Levin, 1998; Krause, 2006). Adopting the evidence-based DSMES through the faith community platform can be feasible and effective in helping Hispanics with T2D manage their lifelong disease.

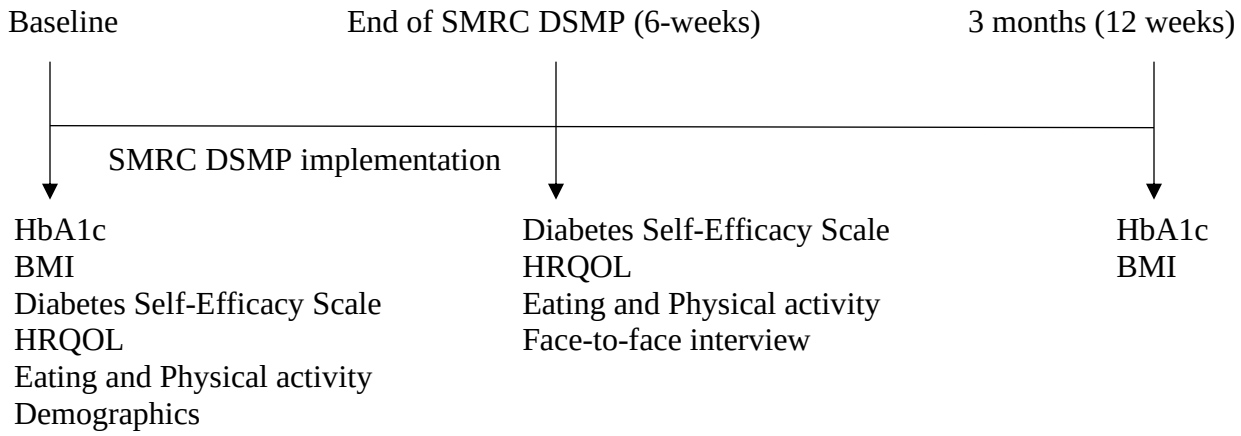
In an effort to search for suitable existing DSMES programs to be delivered in faith community settings for Hispanics, the Self-Management Resource Center's Diabetes Self-Management Program (SMRC DSMP) appears promising. The SMRC DSMP was a 6-week program designed to be implemented in a variety of community settings by trained community lay health leaders (Lorig & Gonzalez, 2000; Lorig et al., 2008; Lorig et al., 2009). The SMRC DSMP was proven effective by two randomized controlled trials (RCT) held in community settings, one in English and one in Spanish, which improved healthy eating, food label reading skills, and diabetes self-management self-efficacy (Lorig et al., 2008; Lorig et al., 2009). However, in regards to the intervention effect on HbA1c level, the Spanish DSMP RCT significantly reduced HbA1c level at the 6-month follow-up (Lorig et al., 2008); whereas, there was no significant change in HbA1c level for the English DSMP RCT at the 6- and 12-month follow-up (Lorig et al., 2009). Nonetheless, the SMRC DSMP's origin in the Spanish language and effectiveness in reducing HbA1c level in the Spanish speaking sample appears to be applicable to the Hispanic population.

To ensure effective program implementation, a pilot study was conducted to assess the feasibility, facilitators, barriers, and effectiveness of adopting the SMRC DSMP in Hispanic faith-based communities in south Texas.

METHODS

A single group pre-post-test design was used to assess program effect on improving T2D outcomes for diabetic congregants and surrounding community members in five churches in San Antonio, Texas between 2015 and 2017. The primary outcome was HbA1c level and secondary outcomes included BMI, Self-Efficacy for Diabetes, health-related quality of life (HRQOL), eating and physical activity patterns. Program feasibility, facilitator and barriers were assessed through documentation and face-to-face interviews with participants. ***Figure 1*** provides a timeline for the implementation and data collection of the pilot study. This pilot study was reviewed and approved by the Institutional Review Board (IRB) at the University of Texas San Antonio. Informed consent was obtained from all participants prior to data collection.

***Figure 1*. Pilot Study Implementation and Data Collection Timeline**



Study Population and Recruitment Procedures

Study population and recruitment were conducted at two levels, i.e., at church level and participant level.

*Church recruitment***.** Churches with at least 60% Hispanic congregants, reported by church officials via a short demographic survey, were offered the opportunity to voluntarily take part in the study. To be eligible for the study, each church was required to recruit at least 15 potential participants to ensure the support group dynamic per instruction from the SMRC DSMP. In order to recruit eligible churches, official study announcements were made via: large church leader gatherings, mass email, mailers, phone call, word of mouth, and door-to-door visits. The pastors were also required to circulate a preliminary program interest sign-up sheet to ensure their church had approximately 15 individuals interested and willing to participate in this program.

Participant recruitment**.** Study participants were adults with T2D and caregivers for family or friends who have T2D above 18 years of age. Participant recruitment strategies included announcements at the pulpit during worship services, flyers in church bulletins, and participant interest sheets. Prospective participants included both congregants and surrounding community members.

The SMRC DSMP Delivery

The SMRC DSMP was offered to participants, free of charge and facilitated by two trained health leaders from the local health department in five predominately Hispanic churches. The SMRC DSMP consisted of six lessons implemented over the course of 6 weeks, one 2 ½ hour session per week. During each session, participants made weekly action plans, shared experiences, and helped each other solve problems related to personal diabetes self-management. All materials were available in English and Spanish. Two trained health leaders, who often also had diabetes and were from a similar culture, facilitated sessions in either language when necessary. These health leaders were from our partner organization, Metropolitan Health District of San Antonio

Diabetes Prevention and Control Program, who received 40 hours of in-depth and hands-on skills training in SMRC's Chronic Disease Self- Management Program curriculum coupled with cross-training in the SMRC DSMP. The research team assisted with program coordination, ensured program implementation fidelity, and collected objective and subjective evaluation data.

Study measures and data collection

To test program impact, changes in outcome measures were assessed, including HbA1c, BMI, diabetes self-efficacy scale, HRQOL, eating and physical activity patterns. Data were collected by trained research staff in church settings. Questionnaire data were collected at baseline and the end of the program (i.e., 6 weeks), while HbA1c and BMI at baseline and at 3-month time point.

HbA1c was tested using a finger-prick blood sample via the A1CNow+System manufactured by PTS Diagnostics. This system reported a rapid test with acceptable reliability and validity in the community setting (Schwartz et al., 2009). Trained research staff performed HbA1c testing following standard finger prick protocol at church. BMI was calculated using participants' self-reported weight in kilograms divided by the square of height in meters. A questionnaire was administered at baseline and upon the completion of the SMRC DSMP. This self-administered questionnaire consisted of multiple components, primarily based on the original SMRC DSMP studies (Lorig et al., 2008; Lorig et al., 2009). The components of the questionnaire included diabetes self-efficacy, health-related quality of life, eating and physical activity patterns, along with participants' demographic characteristics. Below are details of the instruments in the questionnaire.

- The diabetes self-efficacy scale *(DSES)* was an 8-item scale based on diabetes self-care tasks, e.g., eating meals every 4 to 5 hours, choosing appropriate foods to eat when hungry, participating in exercise, preventing blood sugar drop, how to react to blood sugar spike, and controlling diabetes (Ritter et al., 2016). The DSES score ranges from 1 to 10 with higher number indicating higher self-efficacy (Ritter et al., 2016).
- HRQOL was measured using the 4-item Healthy Days core questions (Centers for Disease & Prevention, 2013) that measured participants' perceived general health, number of unhealthy days and functional days over the past 30 day (Centers for Disease & Prevention, 2013).
- Eating Breakfast Scale was a simple 2-item scale in an effort to capture eating habits related to better glycemic control among diabetic patients (Lorig et al., 2005).
- Physical activity level was assessed using the 6-item Exercise Behaviors scale, measuring total minutes per week of aerobic and anaerobic exercise specifically over the past seven days (Lorig et al., 1996).
- Demographic information included gender, age, ethnicity, race, highest level of education completed, employment status, occupation, current household income, marital status, zip code, years lived in the United States, and primary language spoken at home.

In addition, program implementation process was monitored by tracking participants' attendance of the weekly SMRC DSMP sessions. Program feasibility was assessed using qualitative research methods. At the conclusion of the SMRC DSMP program, participants were

invited to take part in a face-to face interview. Using a semi-structured interview facilitation guide, a trained researcher, along with an assistant interviewer, conducted the interviews in either English or Spanish. The interview guide solicited participants' insight on each aspect of the SMRC DSMP, facilitators and barriers of the program, as well as suggestions for future health programming. These interviews took place mainly at the church and lasted approximately 30 minutes. A debriefing session was held after each interview to identify emerging themes. All interviews were audio recorded and transcribed verbatim. For interviews conducted in Spanish, a bilingual research team member transcribed the audio recording verbatim in addition to translating the transcription into English. All translated transcripts were edited and proofread by a certified bilingual specialist.

Data Analysis

Quantitative data were entered into and analyzed using SPSS, version 25.0 (IBM Corporation, 2020). Missing values were excluded list wise. To determine program effect, all continuing outcome variables were tested for normal distribution and appropriate statistical analyses methods were selected based on data distribution. The paired *t*-test was used for continuing variables with normal distribution (i.e., age, HbA1c level, BMI, diabetes self-management self-efficacy, quality of life, physical activity scale); while Wilcoxon signed-rank test was used for continuing variables with a skew distribution (kurtosis < -2 or > 2). McNemar test was used for categorical variables (i.e., frequency of breakfast consumption and protein consumption at breakfast). Since not all program participants were diabetic, pre- and post-HbA1c comparison was only performed for those with a baseline measurement above 5.7%. The level of significance for all statistical tests was set at 0.05.

Qualitative data collection and analysis occurred simultaneously using a combination of editing and template organizing styles (Flick, 2009). Two researchers reviewed the transcripts and independently identified key themes and developed a preliminary coding template. They then met to discuss and develop a merged coding template. The researchers pilot coded the template on one transcript, using NVivo 12 software. Coding issues that arose during the initial analysis were resolved through consensus between the researchers. The remaining transcripts were coded by two researchers independently. A number of strategies were used to enhance the trustworthiness of the data, including member checking, peer debriefing following each focus group, and a team-analysis approach (Patton, 2002).

RESULTS

This pilot study was conducted in five churches with a total of 96 participants. Program attendance rate was 4.1 out of 6 sessions with 91% (87 out of 96) retained at the end of the 6-week SMRC DSMP. However, only 40 participants (42%) returned at the 3-month time point when the HbA1c and BMI measurement was recorded.

Study Participants' Profile

Table 1 displays the demographic profile of study participants at baseline. A majority of participants were married female Mexican Americans residing in the US for more than 16 years and attended college and / or earned a college degree. One-quarter of the participants had a household income of under $10,000; and 40% were retired with a mean age of 55. Table 2 displays

participants' T2D related characteristics. Out of all program participants, 39.1% reported a T2D diagnoses by a medical professional with almost 70% reporting a family history of T2D. These participants also reported that they managed their T2D either through lifestyle (43.1%) or medication (44.8%). About 73% of participants took oral medications daily; however, over half reported that they did not monitor blood glucose daily. Two thirds of participants registered for the SMRC DSMP to help manage their own chronic condition(s) (Table 2).

Table 1. Baseline Demographics of Program Participants*

Characteristics of Participants		***n***	**%**
Age (mean and SD)		78	55 (15)
Gender (***n***=96)	Female	76	79.2
	Male	20	20.8
Race (***n***=96)	White	93	96.9
	African American	3	3.1
Ethnicity (***n***=96)	Mexican American	75	78.1
	Puerto Rican	3	3.1
	Other Hispanic Origin	2	2.1
	Non-Hispanic	16	16.7
Education Level (***n***=40)	Below High School	2	5.0
	High School	11	27.5
	Some College	15	37.5
	College Degree	3	7.5
	Graduate/Professional Degree	9	22.5
Employment Status (***n***=78)	Full-Time	23	29.5
	Part-Time	8	10.3
	Unemployed	15	19.2
	Retired	31	39.7
	Disabled	1	1.3
Annual Household Income (***n***=70)	Under $10,000	18	25.7
	$10,000-$19,999	13	18.6
	$20,000-$29,000	14	20.0
	$30,000-$39,000	7	10.0
	$40,000-$49,000	4	5.7
	$50,000-$74,999	10	14.3
	$75,000 and above	4	5.7
Marital Status (***n***=78)	Married /living with partner	44	56.4
	Single	15	19.2
	Widowed	6	7.7

	Divorced or Separated	13	16.7
Years Lived in U.S. (***n***=78)	5 or fewer	1	1.3
	6-10	1	1.3
	11-15	0	0
	16+	76	97.4
Primary Language (***n***=79)	Spanish	13	16.5
	English	39	49.4
	Both equally	18	22.8
	More Spanish than English	3	3.8
	More English than Spanish	6	7.6

*Sample size varied due to missing values by variables

Table 2. Program Participants' Type 2 Diabetes Related Characteristics*

		n	**%**
Diabetes Diagnoses (***n***=92)	Diabetes	36	39.1
	Pre-Diabetes	18	19.6
	No Diabetes	38	41.3
Family History of Diabetes (***n***=95)	Yes	66	69.5
	No	29	30.5
Type 2 Diabetes Management (***n***=58)	Lifestyle	25	43.1
	Insulin	6	10.3
	Medication	26	44.8
	Others	1	1.7
Adherence to Oral Medication (***n***=59)	Yes	43	72.9
	No	16	27.1
Daily Blood Glucose Monitoring (***n***=67)	Yes	31	46.3
	No	36	53.7
Purpose of Program Registration (***n***=65)	Manage own chronic condition(s)	46	70.8
	Help a family member manage their chronic condition(s)	10	15.4
	Help a friend or neighbor manage their chronic condition(s)	1	1.5

*Sample size varied due to missing value by variables

Intervention Effects on Outcome Measures

Table 3 displays the pre-post differences in outcome measures. The primary outcome measure HbA1c level was significantly improved by a mean reduction of 0.73% at the 3-month time point for pre-diabetic and diabetic participants (n=28). The majority of secondary outcomes

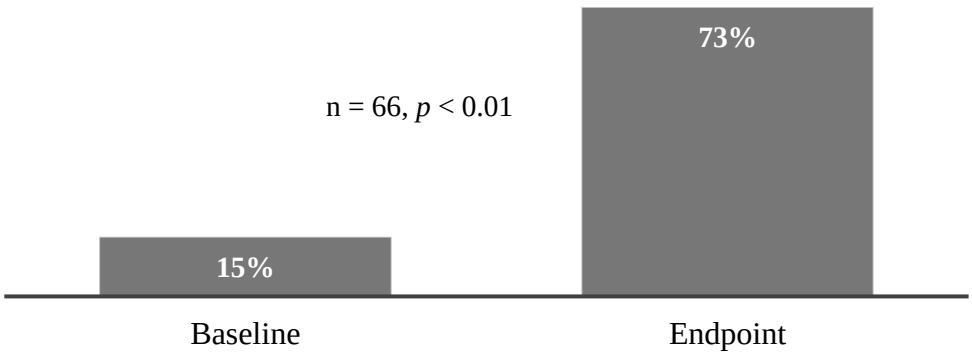
were significantly improved from baseline to endpoint. More specifically, the HRQOL mean increased by 2.6 days per month in addition to the increase of stretching/strengthening activity by 36 minutes per week. Furthermore, the Self-Efficacy for Diabetes was significantly increased. Figure 2 displays the proportion of participants who incorporated protein foods at breakfast significantly increased from 15% at baseline to 73% at the end of the program.

Table 3. Pre-Post Comparison of Outcome Measures*

Outcome Measures	*n*	Mean (SD)		*t*	*p*
		Baseline	Endpoint		
HbA1c**	28	7.6 (1.5)	6.9 (1.0)	3.0	0.005
BMI (kg/m2)	38	31.7 (6.9)	31.3 (6.1)	1.4	0.176
Health-Related Quality of Life (0-30 days)	48	22.8 (11.1)	25.4 (7.3)	2.1	0.039
Aerobic Activity (Minutes/Week)	32	122.3 (99.4)	141.6 (153.8)	0.9	0.380
Stretching/Strengthening Activity (Minutes/Week)	34	48.1 (65.2)	83.8 (68.0)	2.7	0.011
Self-Efficacy for Diabetes (1-10)	51	6.6 (15.5)	7.8 (9.6)	5.4	0.000

*Comparison by Paired Sample t-test
**Reflects only participants with a HbA1c level of 5.7% or greater

***Figure 2*. Pre- and Post-Changes in Eating Habit: Incorporating Protein Foods at Breakfast**



Participants' Insights of DSMP Programing in Church Settings

At the end of the SMRC DSMP, approximately 45 participants were invited to take part in the face-to-face interview and 12 participants agreed to participate. Among the 12 program participants interviewed, the majority were of Mexican American descent with a half of the participants being females. The qualitative findings were organized into three key themes: A) The overall perceived perception of the SMRC DSMP implemented in a church setting; B) Perceived social support and diabetes self-management practice; and C) Facilitators and barriers for program participation and future improvements.

Theme A. Overall perception of the SMRC DSMP implemented in a church setting. Table 4 displays the interviewees positive perceptions about the SMRC DSMP in the church setting. Participants viewed the program as much needed for their families and community as T2D is prevalent among Hispanics with many health complications. Participants discussed feeling comfortable attending this program due to the fact of the familiar environment and acquaintances at church. They also appreciated the ease of access to the program because of the church location in the surrounding community. Participants perceived many benefits from attending the SMRC DSMP. They reported an increase in nutrition knowledge including counting calories, reading food labels, being more open-minded about trying new healthy foods, portion control, more awareness of food consumption regarding blood sugar levels after ingestion as well as the harmful effects of soda, and diabetes self-management.

Table 4. Overall Perception of The SMRC DSMP Implemented in a Church Setting

DSMES being much needed by the Hispanic community
"…rates of obesity here in America…Hispanics being the ones that always have the most diabetes rates…"
"...I have five brothers and three sisters…majority of them are sick with diabetes…"
"...she went into renal failure, she was on…dialysis…then she got a kidney transplant…"
Church being a friendly setting for DSMES program delivery
"…we feel more…comfortable around the brothers…it helps us and others share good ideas to have good health here."
"…very comfortable around [church] family…it was very convenient because it was here at the church."
"…it's very convenient 'because I live nearby…"
Perceived benefits of attending DSMES classes
"…it teaches how to…count calories…."
"…look up…sodium and…carbohydrate…reading… labels…"
"…I'm aware of it…I check myself (blood sugar) every day…"
"…it really did change our lives...[when] we started eating healthier or became more active…"
"…a very good…eye opener for people that are diabetic or have this kind of problems [like] diabetes or heart problems…"

Theme B. Perceived social support and diabetes self-management practice. Participants discussed the value of social support in their diabetic journey. Most reported the main source of social support was given by their immediate family and spouses. In particular, inviting other family members to participate in the program was beneficial to their learning. A few participants stated a growing support relationship among the peers who participated in the same program. The support within the program was perceived as an interactive process, where one becomes the role model for others and was able to share information and knowledge regarding diabetes self-management.

"…my niece attended with me…we would discuss it [class] on the way home…"

"…[he] got my number, he stayed in touch with me…we talk every day now…if he needs something…he'd call me and ask me questions…"

"…they would ask me questions and I knew a lot of the stuff…I knew just about how to control my sugars…I would tell people how to do it…"

Theme C. Facilitators and barriers for program participation and suggestions for future program improvements. Participants stated that announcements during worship services and flyers posted around the church was helpful in making them aware of the upcoming diabetes self-management program. They also reported that churches also utilized other church-associated outlets to promote the program. Participants reported their gratefulness and usefulness for receiving incentives such as the free YMCA pass, HbA1c education and testing, and the SMRC DSMP reference textbook that accompanied the class. Participants articulated very few barriers to program participation. One barrier that stood out was the lack of the health leaders' competency in the Spanish Language. Participants offered their suggestions for future program improvements. They identified the need for more intensive program promotion, which is not only limited to the church, but expanded into the surrounding neighborhood. They also expressed their interest in participating in a program lasting more than 6 weeks long with a follow up class and reunion for all program participants. The reunion can help facilitate ongoing diabetes self-management practices and social support network. Participants also displayed interest in participating in a program that discussed overall health and wellness.

Table 5. Perceived DSMES Program Facilitators, Barriers, and Future Improvements

Program facilitators	**Church promoting DSMES program** *"…the pastor announced it [at service] and then he told us to just go ahead and sign up in the lobby."* *"…through the [church] pantry… they told me about it 'because I attend…all the classes that they offered."* **Incentives and education materials** *"…the [YMCA] gym has…become the escape into…relaxation…"* *"…I will try to put it [reference book] to good use and after I have studied it, I will pass it on to someone that needs it too…especially in my family…"*
Program barriers	**Health leaders' lack of competency in the Spanish Language** *"…the only thing that made me feel a little…uncomfortable was that the presenter's language…[it] was not very accurate…"* *"…[Spanish] was their second language…they were not very fluent…"* *"…they…had a hard time trying to communicate with the rest of the group."*
Suggestions for program improvement	**Program promotion beyond church, longer health education classes, and class reunion** *"…spread…out the word to the people…my neighbors they didn't know about it…more advertisement and more classes…"* *"…heart disease, or anything like that, maybe more common diseases, that we have going on in the community…"* *"…do like a follow-up class…couple of months, six months later, to a year later to… discuss what kind of improvements we've made…."*

DISCUSSION

This pilot study aimed to assess the feasibility, facilitators, barriers, and effectiveness of adopting the SMRC DSMP, as well as its impacts in faith community settings for Hispanics. The SMRC DSMP was well received by program participants with a retention rate of 91%. The results of this pilot study indicate that the SMRC DSMP is feasible and effective in reducing HbA1c levels, increasing diabetes self-management self-efficacy, and improving health-related quality of life as well as improving eating and physical activity behavioral patterns. The challenges that ascended during this pilot implementation of the SMRC DSMP in predominately Hispanic churches provide valuable insights for future program modification, improvement, and adoption.

Participants viewed the SMRC DSMP as a much-needed program for their family and community. They perceived the faith community setting to be accessible and comfortable to attend a support group-based program of this nature. The recruitment process which included pulpit announcements and flyers at the church assisted congregants and surrounding community members in the program registration process. Indeed, our finding is consistent with a recent qualitative research in which Mexican-American Catholic adults with diabetes expressed their

interest in church-based diabetes programs that emphasized information sharing, skills building, and social networking (Baig et al., 2015). The relative higher SMRC DSMP program retention rate in the current study is worthy of noting. Average SMRC DSMP class attendance was 4.1 out of 5, as well as approximately 91% of participants were retained until the end of the 6-week program in the current pilot study, which is higher when compared to the SMRC DSMP being implemented in other community settings (Lorig et al., 2008). The high retention rate in a church setting may be related to its accessibility, convenience, and comfort level of program participation at church. Social support may play an important role for diabetes self-management practice. Participants reported receiving consistent emotional and tangible support from their immediate families; some also indicated receiving support from their peers in the diabetes self-management group. The supportive group dynamic may contribute to both high retention and positive changes in diabetes self-management practice and outcomes.

The SMRC DSMP delivered via predominately Hispanic faith community settings appears to be effective in improving T2D related outcomes (i.e., HbA1c level, BMI, diabetes self-management self-efficacy, quality of life, eating behaviors, and physical activity patterns). Although the sample size was relatively small at the 3-month time point, HbA1c levels were significantly lower than baseline among participants with pre-diabetes and T2D. The program also significantly improved diabetes self-management self-efficacy and health-related quality of life; in addition to favorable changes in breakfast eating patterns that incorporating protein foods and levels of stretching and strengthening exercises on a weekly basis. The results are consistent with that of the original SMRC DSMP randomized trial that reported significant reduction of HbA1c levels, improved diabetes self-management self-efficacy, eating and physical activity behaviors at 6 months in Spanish speaking adults in San Francisco (Lorig et al., 2008), although its translational study for English speakers showed no significant reduction in HbA1c levels (Lorig et al., 2009). Nonetheless, the improvement of HbA1c levels in the current study suggested that the implementation of a diabetes self-management program via the Hispanic faith community setting appeared to be promising.

Consistently, with positive program impacts, participants in the current study viewed the SMRC DSMP program to be beneficial in improving their diabetes self-management knowledge and practices. For example, participants perceived an increase in nutrition knowledge and improved skills in reading food labels and portion control, along with mindfulness of food consumption in preventing sudden blood sugar spike. Participants also reported improved diabetes self-care techniques such as regular blood glucose monitoring and lowering blood glucose level. Other intervention research (e.g., *¡Si, Yo Puedo Controlar Mi Diabetes!* and the *Diabetes Empowerment Education Program*) also found similar results when implementing DSMES programs in predominantly Hispanic faith community settings (Castillo et al., 2010; McEwen et al., 2010; Pena-Purcell et al., 2011).

The strength of this pilot study was the utilization of both quantitative and qualitative methods in assessing program feasibility and effects. While the quantitative methods provide objective measures of program effect, the addition of qualitative data help explain quantitative results. In addition, qualitative methods allow for the acquisition of participants' in-depth insights to program barriers, facilitators, and suggestions for improvement. Such a combination of methodological approaches provides a comprehensive understanding of the implementation

process and impact of delivering the SMRC DSMP in the predominately Hispanic faith community setting. There were a number of limitations associated with this pilot study. First, this pilot study was a one sample pre and post-test design which may threaten internal validity of program outcome evaluation (McKenzie et al., 2017). Second, the relatively small sample size may result in insufficient statistical power in testing program impact. Third, time constraints played a factor in data collection. Lastly, return rate for HbA1c and BMI data collection at the 3-month time point (i.e., 6-weeks after completion of the SMRC DSMP) was relatively low, mainly due to no continued contact between the research team and program participants, along with the lack of incentives for study endpoint completion.

CONCLUSION

Evidence-based DSMES programs delivered via the Hispanic faith community setting appears feasible and promising. The SMRC DSMP was well received by program participants with high retention rate. The program also led to a reduction in HbA1c levels, increase diabetes self-management self-efficacy, and improving health-related quality of life, as well as improving eating and physical activity behavior patterns.

Implications for Research and Practice

The faith community setting is a promising setting for delivering diabetes self-management programs for the Hispanic population. Program planners could consider incorporating incentives such as gift cards, raffles, gym memberships, etc. to collect follow-up program evaluation data such as HbA1c, especially thereafter program completion. To help maximize the social support among parishioners, program planners could incorporate events at the church, such as group reunions that could possibly provide on-going peer-support for diabetes self-management and maintain program impacts on diabetes related outcomes. Program planners could also incorporate widespread program promotion into their program protocol to reach and engage more surrounding community members and church members in the diabetes self-management program. The widespread program promotion can include announcements at the pulpit from the pastor or fellow church member during service, church members and leaders actively discussing and inviting individuals to the program and using program flyers at the church. For future research, a diabetes self-management program needs to consider recruiting an appropriate sample size and incorporating a spiritual dimension to amplify the benefit of social support and program outcomes. It is also recommended that the research team provide multiple opportunities for data collection such as at the church and at the individual's place of residence to ensure completed dataset with repeated measures.

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