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Barriers to Participating in Diabetes Care Behaviors in Hard to Reach Older Hispanics

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ABSTRACT

The purpose of this study was to present the challenges faced when implementing a diet and exercise intervention for low-income older Hispanics with type 2 diabetes. This was a first of its kind observational study of recruitment, attendance, and characteristics in a Spanish-speaking community government funded congregate meal site. This report evaluated retention and diabetes self-management beliefs of Hispanic adults ≥ 60 years with type 2 diabetes ($n=17$) at baseline, and completion of the six-month intervention in terms of the Health Belief Model. There was limited interest in controlling diabetes with diet and exercise. Major barriers included lack of perceived vulnerability to diabetes complications and a belief that medication alone is sufficient to stabilize blood glucose. Environmental barriers included lack of transportation, access to exercise groups, access grocery stores, and limited ability to pay for healthy foods. A lesson learned from this intervention was that the diet and exercise intervention given was insufficient as a cue to action to engage in diet and exercise behavior changes. Interventions to engage low-income, older Hispanics with diabetes in diet and exercise need to consider strategies to overcome barriers such as health beliefs, transportation issues, and lack of access to nutritious food.

Keywords

Diet and exercise intervention, Health Belief Model, Low-income Hispanics, Older adults, Type 2 diabetes.

Introduction

Type 2 diabetes (T2DM) is a major health concern in the U.S. affecting 9.3% of the general population, 26% of adults 65 years and older and nearly twice as many Hispanics have type 2 diabetes compared to non-Hispanic Whites [1]. According to the American Diabetes Association, the estimated cost of diabetes in the U.S. was \$327 billion in 2017 [2]. Many older adults with type 2 diabetes have mobility impairments and experience falls which may be prevented by diet and exercise [3]. The direct medical costs of fall-related injuries in the U.S. was \$31 billion in 2015; it is estimated that it will reach \$68 billion in 2020 [4,5].

The recommended method to reduce diabetes-related complications and costs is to provide diabetes self-management education, which includes diet and exercise consultation, and strategies to maintain glycemic control [6,7]. Despite the fact that changes in diet and exercise behavior has been shown to reduce diabetes complications, the standard of care provides only one diabetes self-management session per year. A once a year intervention may not be sufficient to help persons with diabetes make lifestyle changes. Additional sessions are recommended only when medical complications occur [8]. Diabetes education programs are less likely to be offered and more likely to be discontinued in economically disadvantaged communities due to lack of referrals and reimbursement [8]. In addition, socioeconomic deprivation is associated with decreased physical activity and increased sedentary behavior in older adults [9]. Potentially preventable hospital admissions in Florida have

increased 21% from 2014-2015 to 2016-2017 and diabetes ranked eight among the conditions leading to admission at 5.5% for 2016-2017 [10]. Hispanics have over twice the percent of undiagnosed cases compared to non-Hispanic Whites (4.5% versus 2.0%) [11]. Hispanics also experience higher rates of diabetes complications than non-Hispanic Whites and 1.4 times the death rate from diabetes compared to non-Hispanic Whites [11, 12]. Low-income Spanish-speaking older adults with type 2 diabetes (T2DM) are a hard to reach population that can benefit from diabetes and exercise interventions. It has been well-established that diet and exercise along with medication is needed for diabetes control and to prevent future complications [7]. However, there is a major gap in the literature for studies among this population, hence, our study is the first of its kind.

There are several diabetes self-management studies in younger Hispanic populations [13,14]. Hu, Wallace, McCoy and Amirehsaniv [13] conducted a family-based diabetes intervention for Hispanic adults, however the average age was 41 years and their lesson content and approach differed greatly from this current study. Health literacy and health beliefs are barriers for diet and exercise interventions in Hispanics [14]. The purpose of the current study was to test a culturally appropriate diet and exercise intervention for Hispanics 60 years old or older with T2DM. This report presents the challenges encountered in implementing an interactive diet and exercise intervention in terms of recruitment, the relationships among participants' characteristics, retention, participation, and diabetes self-management beliefs.

Materials and Methods

Study design

This report evaluates the 'diet and exercise arm' from recruitment, baseline, and completion of the intervention at six-months of a larger study. The study was approved by the institutional review board and all participants read and signed an informed consent form in Spanish.

Setting

A senior center and congregate meal site serving low-income, primarily Hispanic adults ages 60 and older in the in the southeastern United States.

Participants

The participants were older Hispanics with T2DM. *Inclusion criteria:* 1) Have T2DM confirmed by hemoglobin A1C (A1C) and blood glucose testing; 2) Age ≥ 60 years; 3) Score ≥ 3 on the Mini Cognitive Screener [15] indicating sufficient cognitive ability to comprehend diet and exercise lessons; 4) Score ≥ 17 on the Mini Nutrition Screener (MNS) [16] indicating that medical nutrition intervention was not needed. Malnourished seniors (score < 8) were referred to the site's social worker to be referred for medical treatment. *Exclusion criteria:* not willing or not able to exercise in standing due to medical issues or physical limitations (e.g. wheelchair-bound); malnutrition; on dialysis; with liver disease, cancer, HIV/AIDS, or other physical/psychological condition

preventing participation. In addition, participants who were found to have A1C >8.5 during the baseline assessment were referred to medical care for safety reasons.

Recruitment procedures and ethics

This study was approved by Institutional Review Board of Florida International University. This study was performed in line with the principles of the Declaration of Helsinki. The manuscript is based on a study that was approved by the Institutional Review Board (IRB) through Florida International University's IRB Protocol: IRB-190037AM04 and filed as grant number NCT04132739 under clinical trials: <https://clinicaltrials.gov/ct2/show/NCT04132739?term=NCT04132739&draw=2&rank=1>. Informed consent forms were signed by all participants. Flyers were posted at the site and team members made announcements about the study during periods of high attendance (e.g. prior to lunch). Potential participants provided their phone numbers for further explanations and scheduling.

Conceptual framework

The conceptual framework for this study was based on the Health Belief model adapted from Green and Murphy [17] (Figure 1). Diabetes education, diet and exercise fit into "cues to action". The intervention goal was to alter the participants' perceptions and increase in the likelihood of improving diet and increasing exercise. The anticipated Mechanism of Action of the diet and exercise interventions include improved diet quality and lipid profile [18], increased protein, vitamin D and calcium intake, increased antioxidants from fruits and vegetables, reduced hemoglobin A1C, improve physiological function, increased energy for physical activity, increased muscle mass, and reduce falls and hospitalizations.

Intervention Materials

Interactive interventions were conducted in Spanish by dietetics and nutrition and by physical therapy students twice a week with 30 minutes of diet lessons followed by 30 minutes of exercise lessons. A 10-minute break was given in-between the diet and exercise classes with water and fruit provided.

Diet lessons

Diet lessons were based on materials from Dietary Guidelines for Older Americans [19], MyPlate for Diabetes [20] and Diabetes Educator's food and nutrition recommendations [21]. Various interactive methods of instruction were applied during the six months. First, power point presentations were used with discussions for the first three months. The final interactive intervention delivered from three to six months was done with individual assessment in a small group setting. The participants provided their 24-hour recalls and doable dietary modifications were discussed. The participants then agreed to one small dietary change in alliance with the diabetes diet. Discussion of hyperglycemia and scheduling of meals and exercise were integrated into the format as per the needs of the participants. The food quality change was

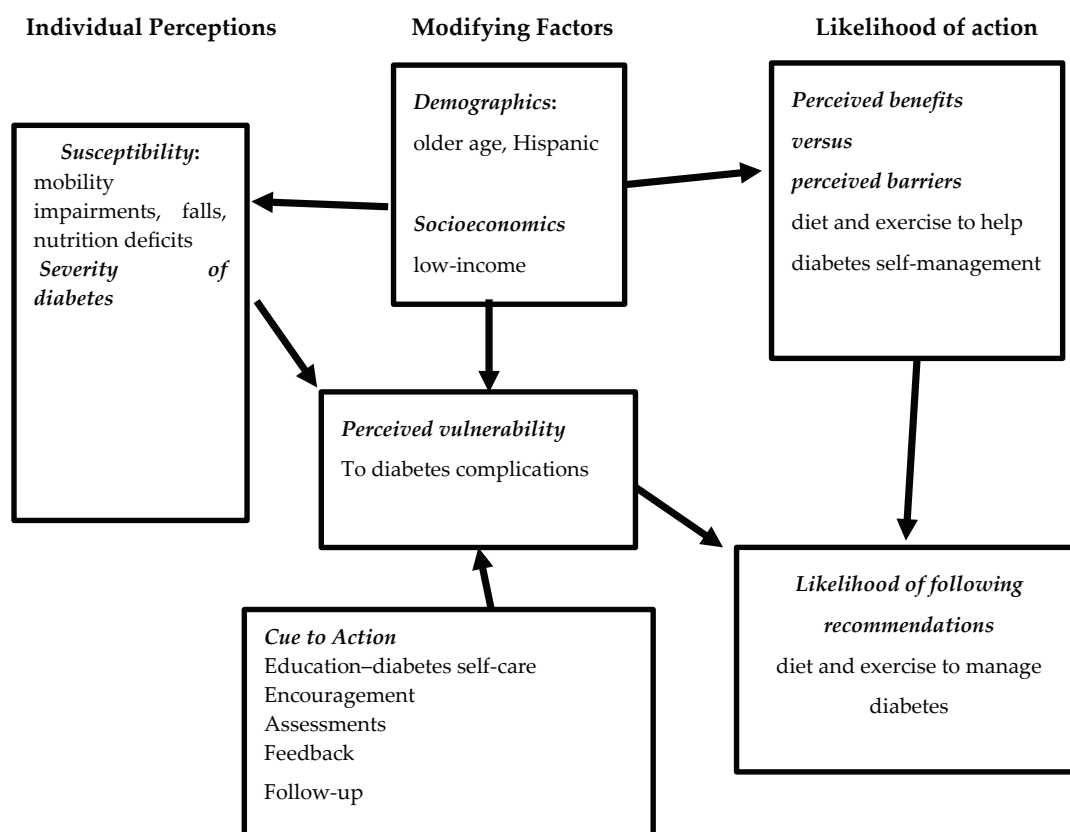


Figure 1: Health Belief Model adapted to this study from Green and Murphy [17].

measured using a Food Frequency Questionnaire and validated in Hispanic populations. The goals were to increase the participants' self-efficacy (belief and self-confidence) that they could follow the diabetes diet.

Exercise lessons

Interactive exercise lessons were tailored for needs and capabilities of the participants and involved short conversations (~5 min) about physical function, falls risks and prevention, exercise effects on diabetes and other exercise-related topics, followed by 30-minute exercise sessions. The intervention was developed based on the *Otago Exercise Program*, which is effective in reducing falls in community-dwelling older adults [22-24]. It was piloted and well accepted by older Caribbeans [25], but it had not been tested in older Hispanics, nor in people with T2DM. The exercises involved lower and upper limb strengthening, balance training and a walking plan. Based on the baseline assessment, the participants received individualized exercise parameters and instructions on which resistance bands to use, walking time (up to 30 minutes 2x/week) and safety instructions.

These interactive exercises were demonstrated by Physical Therapy students and bilingual students assisted in helping and guarding participants to prevent improper form, injuries, or falls. Exercises included stretch and warm-up, balance, aerobics, strength, and cool down. Aside from the 30 minutes of exercise twice a week on site, the participants were encouraged to do the exercises by themselves on days the group sessions were not offered and provided with

exercise log sheets.

Data Analysis

Attendance was calculated as percent of participation for the total number of available sessions (Table 1). Demographics and biomarkers were presented as means and standard deviations for continuous variables such as age, years with diabetes, hemoglobin A1c (A1C), and blood pressure. Demographics for categorical variables (sex, education, marital status, and method of controlling diabetes) were calculated and presented as frequency and percent (Table 2). The scale for diabetes self-management was the total of Likert scores coded for the higher numbers to reflect better diabetes self-management. In addition, a sub-scale for diabetes self-efficacy was created. Pearson's correlations were used to show the association of perceived diabetes self-management and diabetes self-efficacy with attendance (Table 3).

Results

Recruitment results

There were approximately 40 Hispanic members of the predominately Spanish-speaking, government funded congregate meal center that were known to have diabetes according to the site. The site director called them and provided information about the study. From the potential participants, 23 showed an initial interest in the study; six did not pass the screening (one failed the cognitive test and five were not willing to come in for the assessment) leaving N=17 participants all of whom spoke Spanish only.

Participant	Number of days Attended 3 months (%)	Number of days Attended 6 months (%)
1	26 (96)	42 (95)
2	22 (81)	26 (59)
3	12 (44)	17 (39)
4	4 (15)	4 (9)
5	15 (56)	15 (34)
6	0	0
7	3 (11)	3 (7)
8	9 (33)	14 (32)
9	0	0
10	0	0
11	4 (15)	4
12	1 (4)	1 (2)
13	0	0
14	22 (81)	32 (73)
15	7 (26)	15 (34)
16	6 (22)	6 (14)
17	3 (11)	3 (7)

Table 1: Attendance for diet and exercise site lessons: 3-months and 6 months (completion).

*site closures and holidays accounted for less sessions than anticipated.

<i>Continuous variables</i>	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>SD</i>
Age (years)	17	68	89	78.4	6.7
Hemoglobin A1C	13	5.4	9.6	7.0	1.0
Years diagnosed with diabetes	17	2	41	15	10
Systolic blood pressure	15	131	182	147	16
Diastolic blood pressure	15	68	90	78	6.8
<i>Categorical variables</i>	<i>Frequency</i>	<i>Percent</i>			
Males	4	23.5			
Females	13	76.5			
Education					
8 th grade or less	7	41.2			
High school diploma/GED	3	17.6			
Some college, college, technical	7	41.2			
Marital status					
Currently married	1	5.9			
Widowed	9	52.9			
Separated or divorced	5	29.4			
Never married	2	11.9			
How do you control your diabetes?					
Insulin	3	17.6			
Hypoglycemic medications	10	58.8			
Diet or exercise	4	23.5			

Table 2: Demographic and metabolic characteristics of the participants.

Abbreviation: GED = General Education Development or General Education Diploma

Diabetes self-management scores	Percent 3-month attendance	Percent 6-month attendance
Full score, DSM	r=0.22 p=.407	r=0.32 p=.209
DSM subscale: DSM is not difficult, and I am confidence I can manage my diabetes	r=0.16 p=.548	r=0.29 p=.257

Table 3: Perceived diabetes self-management and intervention attendance

Abbreviation: DSM = diabetes self-management. Higher scores indicate better DSM.

Program participation

During the recruitment phase, those who were interested were provided additional information regarding the study. Approximately half of eligible members stated that they did not believe they needed diet and exercise to manage their diabetes because they could regulate their blood glucose using medication. Others expressed enthusiasm for the educational sessions that would be offered or the A1C screening at each evaluation session from baseline to 3, 6, and 9 months. Most of the people who approached the recruitment team mentioned how they were pre-diabetic and were very interested in learning, but unfortunately fell into our exclusion criteria and could not participate. During the intervention, the average class size was four participants. Individual attention for diet and exercise was given. The diet recalls and individual counseling resulted in only one participant modifying their diet. The exercise logs showed there was little change in their exercise routine from the beginning to the end of the program. Participants' attendance is shown in Table 1. There were four no shows. For the first three months, three participants had greater than 80% attendance. The overall attendance for the six-month intervention shows only two participants with 70% or greater attendance. Two participants fell during the study period: one male fell as a result of vertigo, and a female was without her walker and fell due to loss of balance outside her home.

The participants' demographic and metabolic characteristics are shown in Table 2. The majority of the participants were between 72 and 84 years. There were wide variations in years diagnosed with diabetes, glycemic control, and blood pressure. Three-quarters of the participants were women. There was a bimodal distribution for education with the majority either having a low education level or some college, full college, or technical school. The majority of the participants were widows/widowers. Medications were reported as the means for controlling diabetes for 58% of the participants. Four participants who stated that they used diet and/or exercise to control their diabetes never attended classes. Waist circumference >102 cm for males and >88 cm for females characterize central obesity [26]. The International Diabetes Federation (IDF) [27] defines central obesity and risk for metabolic syndrome at smaller waist measures (males: >94 cm; females: > 80 cm). Ethnicities from Central and South America are considered to have central obesity if their measures are >90 cm for males and >80 cm for females [27]. Among the participants (n=4, males; n=13 females) 50% to 75% of males and 69% to 92% of females had central obesity depending on the cutoffs used.

Participants' Feedback

Participants' feedback during lessons revealed several barriers to diabetes management. Barriers to adequate diet included not knowing specifically what to eat and/or when to eat it, economics, ability and desire to prepare meals, food preferences, health beliefs - in particular, that medication can take the place of healthy eating to regulate blood glucose. One participant with 80% attendance for three months stopped attending after she was criticized by her classmates for her eating habits. Barriers to exercise included mobility issues, vertigo, pain, and fear of falling.

Correlation of diabetes self-management (DSM) with attendance is shown in Table 3. There were no relationships among attendance and the participants' perception of their diabetes self-management beliefs, motivation, and practices. The association of diabetes education on perceived vulnerability to diabetes complications could not be assessed due to low attendance and retention.

Health belief diabetes care	Agree N (%)	Disagree N (%)
I would have to change too many habits to follow my diabetes diet	10 (58.8)	7 (41.2)
I would have to change too many habits to become more active	6 (35.3)	11 (64.7)
I would have to change too many habits to take meds	4 (23.5)	13 (76.5)

Table 4: Health beliefs for diabetes self-management

Health beliefs for diabetes self-management are presented in Table 4. A significant percent of the population reported that they would have to change too many habits to follow their diet and to take their medications. Approximately two-thirds of members believed that they could become more active without changing any habits. Three-quarters disagreed that too many habits need to be changed for them to take their medication. This corresponded with the four who said they controlled their diabetes with diet. The four who controlled their diabetes with diet were younger and were the dropouts.

Discussion

To date there are no other publications of an interactive diet and exercise intervention in low-income, older (60 years and above) Spanish-speaking Hispanics with T2DM. We reached out to approximately 40 Hispanic members with diabetes of a large congregate meal site serving a low-income, Spanish-speaking neighborhood. Of those, 23 showed an initial interest and 17 had the initial assessments and began the diet and exercise intervention. The common response of the members who were not interested in participating was that their 'blood sugar was good' and they did not need the lessons. Those that attended wanted specific guidance on what to eat and when to eat it.

We chose to use the Health Belief Model in our study, to further understand the participants' perceptions of their diabetes. We found that many of our participants did not perceive the severity of their condition and their susceptibility to declining health and loss of physical function. The belief that medication alone was enough to successfully manage their diabetes was widespread among the eligible members and limited their interest and willingness to join and complete the study.

Approximately half of the eligible members for the current study explained that they can manage their diabetes with medication, and they did not need to change their diet or increase exercise. Attrition was 88% as compared to 24% attrition reported in an exercise intervention for a cohort of older adults (primarily White non-Hispanic) [28]. Attrition may be attributed to diabetes health beliefs. Since the majority of participants stated that they would

have to change too many habits to follow the diabetes diet (58.8%) and one-third indicated that they would have to change too many habits to become more active (35.3%). Attrition has been related to low-self efficacy for several intervention studies in non-Hispanic White older adults [28,29].

Barriers for following the diabetes diet have not been established for low-income, older Hispanics with T2DM. Several barriers to achieving diet were reported for cohorts of younger Hispanics at risk for diabetes [30, 31]. Stress, lack of willpower, and the food home environment and exercise: time, fatigue, and lack of motivation were the major barriers stated by a middle-aged group of low-income Hispanics at risk for diabetes [30]. Hispanic community focus groups revealed that the family and intergenerational households, common in low-income Hispanic adults, were barriers to preparing healthy food [31]. The focus groups stated changing the way meals are prepared or how grocery shopping is done would not be tolerated by other members of the household [31].

The dietary barriers expressed by participants in our study were that healthy foods such as fish, lean meats, and vegetables were too expensive, dislike of or unfamiliarity with preparing many vegetables, habit, and lack of motivation to prepare healthy meals. The dietary recalls of the participants in our study revealed limited fruit and vegetable consumption. Although frozen vegetables are cheaper than fresh, one participant only enjoys fresh spinach and can only buy it when it is on sale. Due to their financial status, several participants ate very little outside of the meal received at the congregate site. Meals eaten away from the center usually involved dairy (yogurt was very common) and some form of crackers or bread, leaving little room for, or desire to include, fruits and vegetables in the diet. Eating fruits and vegetables to help diabetes was considered a barrier due to economic constraints for low-income Hispanics with diabetes [14].

In the current study, pain, fear of falling, vertigo, and mobility issues were expressed by the participants as reasons for avoiding exercise. Possible reasons for mobility issues in older adults with T2DM were reported as follows: diabetes-related polypharmacy, musculoskeletal pain, poorer self-perceived health, lower levels of physical activity and muscle strength, impaired gait or balance, and cognitive impairment [32]. The aging process positively trends towards lower muscle mass, higher visceral fat, and osteoporosis, which commonly affects individuals of advanced years and can lead to poor outcomes after falls [33]. Although lack of motivation was not expressed for participants in the current study, most participants failed to provide exercise logs and/or showed little change in current exercise throughout the intervention. The initial interview of the 17 participants revealed that shopping and light housework were common forms of reported exercise. Barriers for participants in the current study may be a combination of advanced age and multiple medical issues and lack of knowledge as to what constitutes sufficient daily exercise for diabetes self-management. Effective diabetes self-management was associated with self-efficacy to make behavioral changes, knowledge, and education

level [34]. Lack of knowledge on what and how to eat healthy food was evident in our participants independent of education. This may be due to the changing dietary recommendations over the decades. One participant reported being told not to eat avocado due to its high fat content based on earlier dietary recommendations. Now avocados would be considered a healthy fat source.

Health beliefs are another barrier to diabetes care for this population of older Hispanics. Persons of low education and income tend to rely on medication to stabilize their condition and negate the role of diet and exercise as demonstrated in Danish adults (40-60 years old) diagnosed at risk for heart disease [35]. Medication was considered providing tangible results as opposed to diet and exercise according to low-income urban Hispanics and Blacks with diabetes [36]. Aside from having limited access to healthy foods, they expected an exact diet prescription from their physician [33]. Testerman and Chase [37] reported similar barriers for attendance of diabetes self-management classes for 12 participants and 3 no-shows in a younger group of low-income Hispanics from clinics as found in the current study: lack of interest, transportation problems, and lack of knowledge of the effect of diabetes on health. The authors had 3 patients with full attendance of the 8 weekly session and found positive group support motivated diabetes self-management [37]; whereas, our participants made negative comments to their classmates about their eating behavior. Thus, group interventions may not be effective with this population and should be further tested in a larger cohort against one-on-one consultation with the patient, their endocrinologist and their certified diabetes care and education specialist (CDCES).

The interactive exercise sessions were adapted to the level of the participants. Most of the strength and balance exercises needed supervision for those participants of limited mobility. Participants explained that they did not have the transportation to go to the free exercise classes available to seniors such as Silver-sneakers. Caballero [38] suggested that fears concerning diabetes treatment are more prevalent in Hispanics of low socioeconomic income in a review of health beliefs of Hispanics with T2D. Caballero [38] indicated that low-income Hispanics with a common health belief that their disease is beyond their control were less likely to exercise and perceive themselves as overweight.

This study has several limitations. The participant's stage of change for motivation and confidence to improve their diet and activity level was not measured. Participants who dropped the study were not available to discuss their reasons for not continuing. The barrier of access to healthy food was not addressed in the initial diet lessons. An initial meeting before the intervention inquiring as to what the participants wanted to learn could have been one approach to increase cues to action and minimize perceived barriers. Participants were asked at the second lesson what they wanted from the diet intervention and their responses were 'what should we eat?' and where can we buy healthy food on a budget?' We developed and integrated these lessons (process evaluation) into the ongoing lessons instead of addressing them immediately.

The initial lessons were presentations with questions and answers rather than dynamic discussions on dietary recall and suggested modifications. Whittemore et al. [39] reported that lack of access to healthy foods was a major barrier for Mexican with type 2 diabetes. The strength of this study was initiating diet and exercise education for members at their community site and presenting the challenges for a hard-to-reach population. In fact, there was only one other study similar to our study in which only 3 participants completed the 8 weekly classes provided for young low-income Hispanics in several clinics. Testerman and Chase [37] interviewed 15 participants (12 attendees and 3 no-shows) about attendance enablers and barriers for diabetes self-management class. Their findings and ours highlighting the need for refinements in the delivery and design of interventions for low-income, older Hispanics with T2DM.

Conclusions

In the current study, we found that half the eligible Hispanic participants in a low-income, government funded congregate meal site were not interested in attending diet and exercise class conducted by bi-lingual Spanish speakers once a week for one hour at their community site. The reasons are unclear, but may be related to the stigma of participating, not wanting others to know they had diabetes, or lack of understanding about the importance to diabetes education and modest lifestyle changes as well as distrust of the research process [40]. Although a modest incentive was provided for assessment, many did not want to be involved in research and others thought medication was enough to manage their diabetes. According to the Health Belief Model, the interactive diet and exercise intervention provided was insufficient as a cue to action to motivate participants to change their behavior.

The major theme induced from this study was that members of this congregate meal site with T2DM believe medication is sufficient to regulate blood glucose/manage their diabetes without actively engaging diet and exercise recommendations. We suggest that the health care team, including endocrinologists, primary care providers, certified diabetes care and education specialist (CDCES), nutritionist/dieticians, physical therapist/exercise physiologist, address the importance of lifestyles modification in conjunction with medication in the control and management of T2DM for this underserved community.

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References

1. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>
2. American Diabetes Association. Economic Costs of Diabetes in the U.S. in 2017. *Diabetes Care*. 2018; 41: 917-928.
3. Vieira ER, Mendy A, Prado CM, et al. Falls physical limitations confusion and memory problems in people with type II diabetes, undiagnosed diabetes and prediabetes and the influence of vitamins A, D and E. *J Diabet Complications*. 2015; 29: 1159-1164.
4. Florence CS, Bergen G, Atherly A, et al. Medical Costs of Fatal and Nonfatal Falls in Older Adults. *J Am Geriatr Soc*. 2018; 66: 693-698.
5. Englander F, Hodson TJ, Terregrossa RA. Economic dimensions of slip and fall injuries. *J Forensic Sci*. 1996; 41: 733-746.
6. American Diabetes Association. Foundations of Care and Comprehensive Medical Evaluation. *Diabetes Care*. 2016; 39: S23-S35.
7. American Diabetes Association. Lifestyle Management. *Diabetes Care*. 2018; 40: S38-S50.
8. Powers MA, Bardsley J, Cypress M, et al. Diabetes self-management education and support in type 2 diabetes a joint position statement of the American Diabetes Association the American Association of Diabetes Educators and the Academy of Nutrition and Dietetics. *Diabetes Educ*. 2017; 43: 40-53.
9. Xiao Q, Keadle SK, Berrigan D, et al. A prospective investigation of neighborhood socioeconomic deprivation and physical activity and sedentary behavior in older adults. *Prev Med*. 2018; 111: 14-20.
10. https://ahca.myflorida.com/Medicaid/Finance/data_analytics/BI/docs/Quarterly_SMMC_Report_PPE_Winter_2018.pdf.
11. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>.
12. <https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=63>
13. Hu J, Wallace DC, McCoy TP, et al. A family-based diabetes intervention for Hispanic adults and their family members. *Diabetes Educ*. 2014; 40: 48-59.
14. Hu J, Amirehsani K, Wallace DC, et al. Perceptions of barriers in managing diabetes perspectives of Hispanic immigrant patients and family members. *Diabetes Educ*. 2013; 39: 494-503.
15. Borson S, Scanlan JM, Chen PJ, et al. The Mini-Cog as a screen for dementia Validation in a population based sample. *J Am Geriatr Soc*. 2003; 51: 1451-1454.

16. Rubenstein LZ, Harker JO, Salva A, et al. Screening for Undernutrition in Geriatric Practice Developing the Short-Form Mini Nutritional Assessment MNA-SF. *J. Geront.* 2001; 56A: M366-M377.
17. Green EC, Murphy E. Health Belief Model. *The Wiley Blackwell Encyclopedia of Health Illness Behavior and Society.* Hoboken. NJ: John Wiley & Sons. 2014.
18. Morley JE, Argiles JM, Evans, et al. Nutritional recommendations for the management of sarcopenia. *J Am Med Dir Assoc.* 2010; 11: 391-396.
19. <https://www.dce.org/publications/education-handouts>
20. <https://www.cdc.gov/diabetes/managing/eat-well.html>
21. https://www.cdc.gov/diabetes/ndep/pdfs/dietary_guidelines_slides.pdf
22. Campbell AJ, Robertson MC, Gardner MM, et al. Psychotropic medication withdrawal and a home-based exercise program to prevent falls a randomized controlled trial. *J Am Geriatr Soc.* 1999; 47: 850-853.
23. Campbell J, Robertson M. Otago Exercise programme to prevent falls in older adults. A homebased individually tailored strength and balance retraining programme. Otago Medical School, University of Otago. 2003.
24. Campbell AJ, Robertson MC, Gardner MM, et al. Randomised controlled trial of a general practice programme of homebased exercise to prevent falls in elderly women. *BMJ.* 1997; 315: 1065-1069.
25. Vieira ER, Tappen R, Gropper SS, et al. Changes on walking during street crossing situations and on dorsiflexion strength of older Caribbean Americans after an exercise program a pilot study. *J Aging Phys Act.* 2017; 25: 1-26.
26. Alberti KG, Eckel RH, Grundy SM, et al. Harmonizing the metabolic syndrome a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention National Heart Lung and Blood Institute American Heart Association World Heart Federation International Atherosclerosis Society and International Association for the Study of Obesity. *Circulation.* 2009; 120: 1640-1645.
27. <https://www.idf.org/e-library/consensus-statements/60-idfconsensus-worldwide-definition-of-the-metabolic-syndrome.html>
28. Mullen SP, Wójcicki TR, Mailey EL, et al. A profile for predicting attrition from exercise in older adults. *Prev Sci.* 2013; 14: 489-496.
29. Jancey J, Lee A, Howat P, et al. Reducing attrition in physical activity programs for older adults. *J Aging Phys Act.* 2007; 15: 152-165.
30. Ockene IS, Tellez TL, Rosal MC, et al. Outcomes of a Latino community-based intervention for the prevention of diabetes the Lawrence Latino Diabetes Prevention Project. *Am J Public Health.* 2012; 102: 336-342.
31. Coleman KJ, Ocana LL, Walker C, et al. Outcomes from a culturally tailored diabetes prevention program in Hispanic families from a low-income school Horton Hawks Stay Healthy HSHS. *Diabetes Educ.* 2010; 36: 784-792.
32. Skalko TK, Sauter W, Burgess L, et al. Assessing balance and fall efficacy in community-dwelling older adults. *Ther Recreation J.* 2013; 47: 291-306.
33. Alejandro P, Constantinescu F. A Review of Osteoporosis in the Older Adult. *Clin Geriatr Med.* 2017; 33: 27-40.
34. Jiang X, Jiang H, Li M, et al. The Mediating Role of Self-Efficacy in Shaping Self-Management Behaviors Among Adults With Type 2 Diabetes. *Worldviews Evid Based Nurs.* 2019; 16: 151-160.
35. Jarbøl DE, Larsen PV, Gyrd-Hansen D, et al. Determinants of preferences for lifestyle changes versus medication and beliefs in ability to maintain lifestyle changes. A population-based survey. *Prev Med Rep.* 2017; 6: 66-73.
36. Breland JY, McAndrew LM, Gross RL, et al. Challenges to healthy eating for people with diabetes in a low-income minority neighborhood. *Diabetes Care.* 2013; 36: 2895-2901.
37. Testerman J, Chase D. Influences on diabetes self-management education participation in a low-income Spanish-speaking Latino population. *Diabetes Spectrum.* 2018; 31: 47-57.
38. Caballero AE. Understanding the Hispanic/Latino patients. *Amer J Med.* 2011; 124: S10-S15.
39. Whittmore R, Vilar-Compte M, De La Cerda S, et al. Challenges to diabetes self-management for adults with type 2 diabetes in low-resource settings in Mexico City a qualitative descriptive study. *Int J Equity Health.* 2019; 18: 133.
40. George S, Duran N, Norris K. A systematic review of barriers and facilitators to minority research participation among African Americans Latinos Asian Americans and Pacific Islanders. *Am J Public Health.* 2014; 104: e16-e31.