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PREDIABETES EDUCATION TO PREVENT THE PROGRESSION TO TYPE 2 DIABETES:

A pilot project

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Abstract

This Evidenced-Based Project (EBP) aimed to decrease the incidence of patients diagnosed with prediabetes converting to Type 2 diabetes. By utilizing the Diabetes Self-Management Education and Support (DSMES) program, the project will enhance patient knowledge of diabetes and self-care practices. Education in patients diagnosed with prediabetes in a small community clinic in Tijuana, Mexico.

Background: The American Diabetes Association (ADA) recommends that patients diagnosed with prediabetes attend Diabetes Self-Management Education and Support (DSMES) classes. DSMES focuses on the lifestyle management of diabetes, and it facilitates knowledge, skills, and abilities necessary for optimal self-care. The focus is on supporting patient empowerment by providing them with tools to make informed decisions on their diabetes management ("Prevention or delay of type 2 diabetes and associated comorbidities: Standards of medical care in diabetes-2022", p. S39-S43).

Evidence-Based interventions: The evidence recommends a weight loss of 7% from baseline and a minimum of One hundred fifty minutes of exercise per week. Participants between the ages of 18 to 75 with an A1c of 5.7% to 6.4% and referred to their primary care provider or community clinic healthcare provider if they did not have a primary care provider. Patients attend diabetic education classes, which include content on diet and exercise.

Results: Of 57 participants, 53 were between the ages of 20 to 81 and had Hgb A1c completed. Nine had Hgb A1c between 5.7% to 6.4%, and three had a history of hypertension. Four participants had Hgb A1c greater than 6.5%, and they all had a known history of Type 2

diabetes. Of the four, three of them had a history of hypertension also. The other 40 participants had Hgb A1c within normal limits of less than 5.6%.

Conclusion: Early detection and education of prediabetes can reduce the incidence of Type 2 diabetes and the complications associated with diabetes. This, in turn, will improve patients' quality of life, and it will also reduce healthcare costs for patients and healthcare facilities.

Keywords: Prediabetes, Diabetes Self Management, and Hemoglobin A1c

Background and Significance

México has a diabetes epidemic (Meza et al., 2015). An overweight and obesity rate of 71.2% puts more at risk of type 2 diabetes. The incidence of self-reported diabetes has risen from 7.34% in 2006 to 9.17% in 2012 (Hernandez-Avila, as cited in Meza et al., 2015). The estimated annual cost of inpatient treatment is \$223,581,099 US dollars and outpatient \$717,764,787 US dollars. This estimated cost does not include the cost related to complications caused by diabetes (Barquera, Campos-Nonato, Aguilar, Lopez, Arredondo, Rivera-Dommarco, 2013). Complications of diabetes include nephropathy, retinopathy, and foot problems (Barquera et al., 2013). In 2015 the prevalence rate of diabetes in Mexico City was estimated to be 9.1%. With nearly two million living with diabetes. By 2040, over three million people in Mexico City, or 11.9% of the population, will have diabetes. With an estimated per capita cost of \$108 billion US dollars (Panton, Bagger, Barquera, 2018). An estimated 19% of Mexican adults have prediabetes, and 40% have metabolic syndrome, which puts them at risk for Type 2 Diabetes. It is important to screen at-risk patients with central body obesity, elevated blood glucose, elevated blood pressure, and elevated cholesterol (Barquera, 2013).

Purpose

This Evidenced-Based Project (EBP) aims to decrease the incidence of patients diagnosed with prediabetes converting to Type 2 diabetes. By utilizing the Diabetes Self-Management Education and Support (DSMES) program, the project will enhance patient knowledge of diabetes and self-care practices. The primary aim is to educate patients diagnosed with prediabetes in a small community clinic in Tijuana, Mexico using the DSMES program to decrease the number of patients converting to Type 2 diabetes.

Evidence-Based Practice Model

The Iowa model was used to carry out my DNP project on Prediabetes education and follow-up. The Iowa Model is an evidence-based model used in making decisions in clinical practices that affect healthcare outcomes (Melnyk & Fine-Overholt, 2019).

The rationale for choosing the Iowa model is that the model uses a template for the implantation of diverse projects (Lloyd, D'Errico, & Bristol, 2015). The model promotes quality care by infusing research findings into patient care (Buckwalter, Cullen, Hanrahan, Kleiber, and McCarthy, 2017). Since the model uses a multidisciplinary team approach to solving a problem, it is a model best suited for an Evidenced-Based Project that may change primary care providers' and diabetic educators' attitudes towards the treatment of prediabetes.

A strength of the model is that it is straightforward and easy to follow (Buckwalter et al., 2017). The 2015 revision added patient engagement, expansion of piloting, implementation, and sustaining the changes. The changes make the model relevant to Evidence-Based Practice and promote excellence in health care in today's healthcare settings (Buckwalter et al., 2017). The 2015 revision uses bullet points to expand each step of the model. Each step of the process is not spelled out, which may be a weakness for a novice user (Buckwalter et al., 2017).

Literature Review/Evidence for the Problem

A comprehensive literature review was completed electronically and at the University of San Diego Copley library. Database searches included PubMed, Cochrane Databases, CINAHL, and CDC. Keywords included prediabetes, diabetes self-care, community diabetes programs, and hemoglobin A1c.

Diabetes self-care

The healthy living partnership to prevent diabetes study (HEPLPD) was a random control trial of 301 participants with prediabetes. They were randomly selected for either the lifestyle weight loss (LWL) or usual care conditions (UCC) study groups (Katula et al., 2013). The inclusion criteria were overweight with elevated fasting glucose. Every six months for 24 months, the participants' assessments consisted of fasting glucose, measurements of BMI, body weight, insulin resistance, and waist circumference. Community health workers who were well-controlled type 2 diabetics, having a Hgb A1C < 7.0%, were trained to carry out the education of the LWL group (Katula et al., 2013). A goal of 0.3 kg of weight loss each week for a total weight loss of 5% to 7% over six months. Analysis between the LWL and UCC showed that the LWL group experienced significant decreases in fasting glucose (-4.35 mg/dL), insulin (-3.01 mU/ml), insulin resistance (- 0.97), body weight (-4.19 kg), waist circumference (-3.23 cm), and BMI (- 1.40), all p-values , 0.01 (Katula et al., 2013). Limitations: It was representative of one county in central North Carolina, highly educated participants, and included very few Latinos (Katula et al., 2013). The HELP PD, the intervention group, had 24 sessions, and the original DPP group had 16 sessions. This study supports a diabetes prevention program as an intervention to decrease the progression of diabetes. For the program to be effective in the Mexican population, the interventions will need to consider the culture and dietary habits of that population living in Mexico.

The 24-month metabolic benefits of the healthy living partnerships to prevent diabetes: A community-based translational study compared the incidence of metabolic syndrome at 12 and 24 months of the Healthy Living Partnership to Prevent Diabetes study (Pedley, Case, Blackwell, Katula, & Vitolins, 2018). The study compared metabolic syndrome in the lifestyle weight loss

(LWL) and enhanced usual care (EUC) groups. Components measured for metabolic syndrome consisted of waist circumference, systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting glucose, triglycerides, and high-density lipids (HDL). Results at baseline, 70% of participants met the criteria for metabolic syndrome using the National cholesterol education program (NCEP) and Adult treatment panel (ATP) guidelines. Both groups had about 50% of the participants taking antihypertensive medications. Based on waist circumference, 84% were obese, 70% had hypertension, 68% had elevated glucose, 34% had elevated triglycerides, and 51% had low HDL (Pedley, Case, Blackwell, Katula, & Vitolins, 2018). At the one-year evaluation, waist circumference decreased significantly, as did the SBP, DBP, triglycerides, and fasting blood glucose in the LWL group. The EUC group showed a slight change over the first year. In the second year, there were significant improvements in metabolic syndrome and the individual components in the LWL group (Pedley, Case, Blackwell, Katula & Vitolins, 2018). The study's strength is that it can be duplicated in other communities and is a cost-effective diabetes prevention program (Pedley, Case, Blackwell, Katula, & Vitolins, 2018). A limitation is that it was in one city in North Carolina. The participants were highly educated, and the number of Latino participants was low (Pedley, Case, Blackwell, Katula & Vitolins, 2018). The study demonstrates the benefits of a diabetes prevention program not only benefit prediabetic participants; it also has metabolic benefits. It helped reduce the incidence of metabolic syndrome in participants in the intervention group. The study builds on the Healthy Living Partnership to Prevent Diabetes study.

A community-based primary prevention program for type 2 diabetes integrating identification and lifestyle intervention to prevention: Let's prevent diabetes cluster randomized control trial (Davies et al., 2018). The researchers' objective was to assess if a structured

education program would prevent the progression of prediabetes to type 2 diabetes. The study is a randomized control trial that consisted of forty-four general practices. Participants were randomly selected for either the intervention group or the control group. The control group received standard care and a booklet on risk factors for diabetes and healthy lifestyle changes. The intervention group received the booklet and 6-hours of an education program called Let's Prevent Diabetes. The intervention group was also invited to participate in a 3-hour refresher course annually. The participants had 6, 12, 24, and 36 months follow-ups consisting of lipid levels, Hgb A1c, body mass index (BMI), weight, blood pressure, and medical and medication history. They also completed a questionnaire on activity levels. The intervention group had 447 participants, while the standard group had 433, for a total of 880 participants (Davies et al., 2018). A total of 131 participants developed type 2 diabetes at the 3-year follow-up, which equates to 60.32 events per 1000 person-years (Davies et al., 2018). The intervention group had lower rates at 57.60 events per 1000 person-years than the standard care group at 63.16 events per 1000 person-years (Davies et al., 2018). The intraclass correlation coefficient (ICC) for the development of type 2 diabetes was 0.02 (95% CI, 0.05) (Davies, 2018). Not a significant reduction in the development of type 2 diabetes. A secondary finding was a substantial reduction in Hgb A1c, LDL, sedentary time, and step count increased in both groups (Davies et al., 2018). The primary outcome of the decrease in type 2 diabetes was non-significant, only 25% (Davies et al., 2018). The study shows that a "type 2 diabetes prevention program leads to modest improvement in biomedical, lifestyle, and psychological outcomes without significantly reducing the risk of type 2 diabetes" (Davies et al., 2016). Strength included the rigorous design to evaluate the program in multiethnic primary care practices. The limitation was the discrepancy between predicted outcomes and actual outcomes in predicting the incidence of type 2 diabetes

(Davies et al., 2016). Though the study had lower expected results than anticipated, it did show some reduction in type 2 diabetes.

Hemoglobin A1c

Point of care hemoglobin A1c has an advantage over traditional laboratory blood draws for hemoglobin A1c is that healthcare providers and patients receive results faster. The study found that the point of care test evaluated is accurate and precise (Arnold et al., 2019).

Design

The project is a quantitative, evidenced-based pilot project. Data collected was from participants who attended a health fair in Tijuana, Mexico, at a community clinic.

Method

A point of care Hemoglobin A1c test (HbA1c) was the diagnostic tool to screen fifty to one hundred participants attending a community outreach health fair. Each participant attending the health fair filled out a questionnaire, including age, sex, medical history, family history of diabetes, and medications. They were weighed, waist circumference measured, and height and blood pressure taken. All participants over the age of eighteen had a point of care HbA1c performed. They were given all results in writing and signed by the registered nurse who collected the data.

Once they were screened, participants are placed in one of three categories, normal Hgb A1c, Prediabetes (A1c 5.7% to 6.4%), or diabetes (A1c \geq 6.5%). If the patient has a Hgb A1c at 6.5% or greater, they will be escorted to the community clinic healthcare provider for further follow-up. All participants received diabetes prevention education, which consisted of diet and exercise recommendations, and other education included oral care and basic hygiene practices. Medical students from a local University provided all their instruction in Spanish. The students

explained the Hgb A1c results and gave the participants a handout explaining the test and how to interpret the results. The planned schedule was to return every three months over one year, and the participants were to have follow-up visits to receive education, Hgb A1c, and discuss their progress.

Ethical Considerations

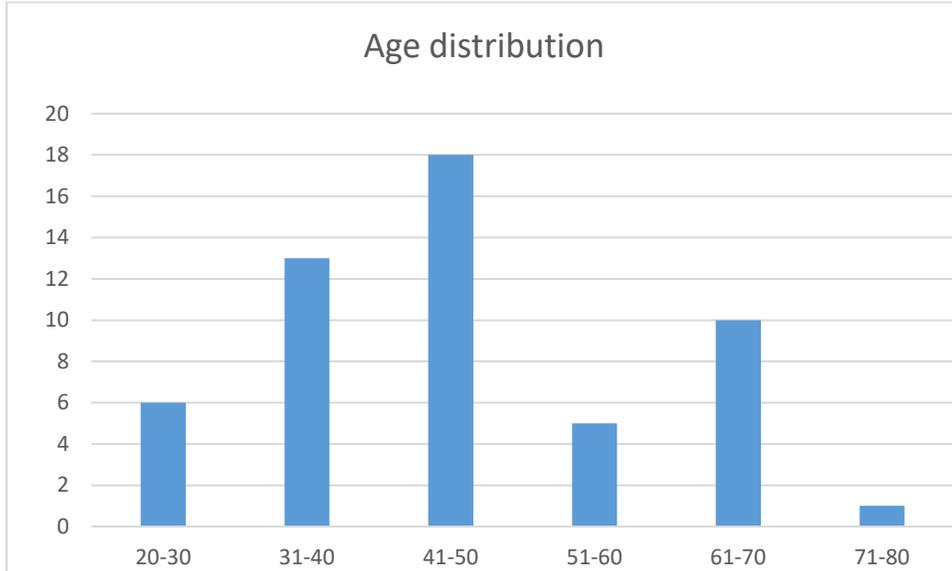
The Institutional Review Board approved this study of the University of San Diego, Hanh's School of Nursing (IRB-2022-131). A letter of support was given by Father Lucio Castillo OMI, the director of the community clinic. I received an International Opportunity Grant from the University of San Diego for \$1400 to purchase point of care Hgb A1c test kits.

Results

Due to the COVID-19 pandemic, this Evidenced-Based Project (EBP) became a quantitative EBP pilot project. The data used for the pilot study is from the first community clinic health fair held in November 2019.

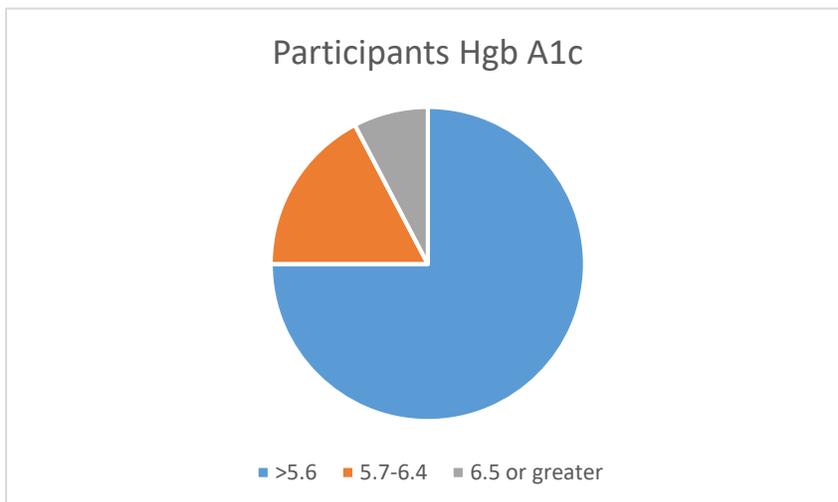
The community health fair had 57 participants; 53 were over 18 years old. Females accounted for 77.35% of participants, while 22.64% were males. Ages ranged from 20 to 81. Table 1 shows a breakdown of ages, consistent with previous health fair numbers at the same community clinic.

Table 1 Age distribution



The point of care Hgb A1c was performed on 53 participants; 9 had Hgb A1c of 5.7% to 6.4%, indicative of Prediabetes, Table 2. Representing 17% of the participants screened. Though this was a lower number than predicted, it is a significant number. Of the nine with prediabetes, two were males, and seven were females.

Table 2 Participants Hgb A1c



Four participants had Hgb A1c greater than 6.5%, and their history indicated that they had a diagnosis of Type 2 diabetes. All four were on medication to treat their diabetes, and one had a Hgb A1c greater than 10%. The participant with Hgb A1c greater than 10% was escorted to the healthcare provider's office for further follow-up.

Three of the nine participants with prediabetes also had a history of hypertension. Of the four with type2 diabetes, three had a history of hypertension.

Study Limitations

The initial health fair had a good turnout of participants compared to previous health fairs, which focused on other health issues. The follow-up health fair scheduled for March 2020 was canceled due to COVID-19. To date, there has not been a follow-up health fair.

Discussion

Though the EBP project was not carried out as planned, the data collected revealed the education needs within the community, figure 1. Sixty-eight percent of the participants had a BMI of 25 to 40, and 18 of 53 people had elevated blood pressure. Nine of the 53 participants had Hgb A1c greater than 5.7%, and four had Hgb A1c greater than 6.5%. These are risk factors associated with Type 2 diabetes, indicating a need for education and follow-up.

Figure 1.

Data November 2019							
Age							N
20 -73	20-30 = 6	31-40 =13	41-50 = 18	51-60 = 5	61-70 = 10	71-80 =1	53
Gender							
Female = 41				Male = 12			
BMI (WHO Definition)							

Underweight less 18.5 = 2 Male = 0 Female = 2	Normal 18.5-24.9 = 15 Male = 3 Female = 12	Overweight 25-29.9 = 19 Male = 6 Female = 13	Obese class 1 = 30- 34.9 = 13 Male = 3 Female = 10	Class 2 = 35 -39.9 = 3 Male = 0 Female = 3	Morbid Obesity 40 or over = 1 Male = 0 Female = 1	
Type 2 DM						
Yes = 4 Male = 0 Female = 4			No = 49 Male = 12 Female = 37			
Waist Circumference						
Male = 12			Female = 41			
Under 102 cm =10	Over 102 cm = 2	Less than 89 cm= 11	Above 89 cm = 29	Unknown = 1		
HgbA1c						
Less than 5.6 = 39 Males = 10 Females = 29	Pre- diabetes 5.7 -6.4 = 9 Males = 2 Females = 7	Diabetic = 6.5- more = 4 Males = 0 Females = 4	Unknown = 1 Males = 0 Female = 1			
HTN (AHA Guidelines)						
Normal 120/80 = 25	Elevated 120- 129/80 = 10	Stage 1 130- 139/80-89 = 11	Stage 11 140- 179/90-119 = 7	Hypertensive Crisis = 180/120 = 0		
Of the 9 Pre diabetics 3 Hx HTN	Of the 4 DM 3 Hx HTN					

Evidence to Action

The literature review shows that community-based programs such as Let's prevent diabetes, Healthy living partnership to prevent diabetes, and health and diabetes education help make our communities healthier. The program participants have seen a decrease in their blood pressure, triglycerides, and fasting glucose. Healthcare organizations and community organizations develop partnerships to provide education to communities at the highest risk for diabetes, hypertension, and cardiac disease.

Implications for Future Research

The assessment and data collected during the community health fair indicates there is a need for further interventions and education in the community.

Conclusions

Prediabetes is a major health issue in Mexico. This pilot project focused on one small community clinic in Tijuana, Mexico and found that 17% of the participants had prediabetes according to their Hgb A1c results. Others who participated had risk factors that put them at risk for developing diabetes. It would be beneficial for the communities overall health to follow-up with future health fairs and EBP projects.

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