ABSTRACT

PRE-DIABETIC INTERVENTIONS IN THE CENTRAL SAN JOAQUIN VALLEY AT A FEDERALLY QUALIFIED HEALTH CENTER: PREVENTING DIABETES, A DISABLING AND DEADLY DISEASE

The purpose of this study was to assess the effectiveness of a pre-diabetes intervention using a unique method of implementation in the medical exam rooms after medical visits at United Health Centers Parlier, a federally qualified health center in a Central Valley rural area. The intervention consisted of an initial encounter with a health educator discussing diabetes prevention and lifestyle change, and follow-ups involving motivation and goal setting. Variables analyzed were hemoglobin A1c (HgbA1c) and BMI. The Paired T-Test was used to test for significant change among the variables of pre and post intervention HgbA1c and BMI. A control group that received no health education was also included in this study for comparison.

The study found significant improvement in HgbA1c among the intervention group, and no significant change in BMI. The control group did not show any change in HgbA1c and a significant increase in BMI. The Centers for Disease Control and Prevention, American Diabetes Association, and various other influential organizations have made diabetes prevention programs a priority for the estimated 86 million pre-diabetics in the U.S. Studies such as this one contribute to literature as an effective diabetes prevention program among a Hispanic rural population using a unique model of implementation.

Irene Rios
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PRE-DIABETIC INTERVENTIONS IN THE CENTRAL SAN JOAQUIN VALLEY AT A FEDERALLY QUALIFIED HEALTH CENTER: PREVENTING DIABETES, A DISABLING AND DEADLY DISEASE

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CHAPTER 1: INTRODUCTION

Type 2 Diabetes Mellitus (DM) is a rising health concern in the United States. The U.S. is home to a diverse population of ethnic minorities and high prevalence of obesity, two risk factors for type 2 DM (Zhang, Wang, & Huang, 2009). Type 2 DM occurs when there is insufficient pancreatic insulin production and insulin resistance that inhibits cellular absorption of glucose in the blood. Left untreated, uncontrolled diabetes can lead to serious health harm and multi-organ failure. It is estimated that of the 29.1 million diabetics afflicted, diabetes reduces life expectancy by 15 years, increases risk for heart disease four-fold, increases blindness, and increases the risk for kidney failure (American Diabetes Association [ADA], 2014b; *Healthy People 2020*, 2014). Preventive strategies and early diagnosis of type 2 DM becomes vital to avoid associated complications. Early intervention at the pre-disease state including health education and awareness is further needed.

Nutritional education and weight management is critical in controlling blood glucose, as reduction to 3-month average glucose levels or Hemoglobin A1c (HgbA1c) measurement has been successfully documented in multiple studies (e.g., Diabetes Prevention Program Research Group, 2002; Uusitupa et al., 2000; Xiao-Ren, Guang-Wei, Ying-Hua, & Ji-Xing, 1997). There is a need for further investigation of how health care providers affect health behaviors of community residents, and investment in programs to improve health care outcomes (Prevention Institute, 2007). The Centers for Disease Control and Prevention (CDC) and the American Medical Association (AMA) encourage diabetes prevention programs that incorporate diet and lifestyle changes to be given utmost priority in type 2 DM prevention. In community health care settings, the

implementation of health and nutritional education, lifestyle changes, and counseling have been shown to reduce at risk or pre-diabetic populations. This thesis cross examines whether or not these recommended interventions have an effect on community health centers. A risk reduction in pre-diabetics with HgbA1c 5.7%-6.4% was proposed and evaluated at an outpatient clinic setting from United Health Centers, a federally qualified heath center in Parlier, California. Study participants were measured on their pre and post Body Mass Index (BMI) and HgbA1c levels along with the implementation of CDC's and AMA's diabetes prevention guidelines. Additionally, the unique role of health education in exam room settings following participants' outpatient clinic visits was examined to determine best practices for health education. The effectiveness of the intervention was measured by changes in variables of Body Mass Index (BMI) and HgbA1c levels among study participants. The results of this study contribute to the literature as an effective health education model for improving pre-diabetic HgbA1c levels.

Background

There are currently 86 million American adults estimated to be living with pre-diabetes while a greater majority (90%) of them are oblivious to the disease outcome (CDC, 2015). Pre-diabetes or at risk for type 2 DM can be generally defined by HgbA1c range between 5.7%-6.4%. The risk for developing type 2 DM is two-fold as early signs of insulin resistance progresses. Multiple factors can influence the development of pre-diabetes such as genetics (strong family history of DM), obesity (BMI of 30 and above), and environment. The Centers for Disease Control and Prevention (CDC), the American Medical Association

(AMA), and the American Diabetes Association (ADA) have nationally outlined goals to reduce the incidence of diabetes.

Prevalence

One third of U.S. adults before age 65 and half following age 65 have pre-diabetes (AMA, 2015). In California alone, about 11.4 million (41%) adults had pre-diabetes (2007-2008), suggesting that future rates of diabetes will continue to rise in the absence of interventions (California Diabetes Program, 2012). The culturally diverse and unique demographics of California may contribute to the higher than average rate of pre-diabetics as well as poor socioeconomic status. California's 16.4% of the population was below national poverty level of 14.8% (United States Census Bureau, 2016).

Data collected by the California Health Interview Survey suggest that Californians who live below 200% federal poverty level are two times more likely to become diabetic compared to those with an income level above 300%. Similarly, those without a high school diploma have two times higher prevalence than those with a college degree in California (Conroy, Lee, Pendleton, & Bates, 2014). Auchincloss, Diez-Roux, Brown, Erdmann, and Bertoni (2008) found that higher diabetes rates in a poverty-stricken neighborhood are directly related to access to resources such as healthy nutrition and safe places for physical activity. Additionally, the inability to purchase healthy foods, food security, and sedentary lifestyle all contribute to the rising incidence of type 2 DM.

Demographics

The American Diabetes Association reports African Americans, Mexican Americans, American Indians, Hawaiians, Pacific Islanders and Asian Americans are at a higher risk of developing type 2 DM (ADA, 2014a). The National Health

and Nutrition Examination Survey 1999-2002 showed the prevalence of diabetes was twice as high in non-Hispanic blacks and Mexican Americans as compared to non-Hispanic Whites (Cowie et al., 2006). Looking at 2015 California demographics, 38.8% of residents are Hispanic/Latino, 6.5% African American, 1.7% American Indian, 14.7% Asian, and 0.5% Hawaiian/Pacific Islander (United States Census Bureau, 2015).

In particular, Hispanics/Latinos who reside in the Central San Joaquin Valley, California have the highest percentage of population living with type 2 DM. Hispanics/Latinos make up an average of 46.9% of the Central Valley region, with individual counties ranging between 40.8 to 63.6% Hispanic/Latino (United States Census Bureau, 2015).

One in 10 who live in the Central San Joaquin Valley has type 2 DM compared to the state's 1 in 13. In particular, the large population of Latinos/Hispanics living in the Central Valley are twice as likely to develop diabetes compared to Whites (Cowie et al., 2006), while 1 in 10 Latinos already suffers from type 2 diabetes (Diabetes Coalition of California, 2012). Predisposing genetic factors associated with insulin resistance found in Hispanic descendants are found to be associated. Additionally, the "Gene x Environment Interactions in Type 2 Diabetes" study found Hispanics to be genetically susceptible to developing DM. This study discovered certain gene mutations are more prominent in Hispanics associated with insulin resistance (Franks, 2011).

Central California is world-known for its agriculture industry, yet is only able to provide a minimum wage job market for many residents. It is estimated that the Central Valley is among the top regions in the United States for having the highest percentage of family income below the poverty line (United States Census Bureau, 2015). Coincidently, "rural and high-poverty schools in the Valley have

lower graduation rates than their counterparts in the rest of the state" (Public Policy Institute of California, San Francisco, 2002, p. 2).

Prevention Interventions

Primary and secondary prevention methods for diabetes are necessary to better the health of the Central Valley. The pre-diabetic screening programs currently implemented by the CDC and AMA have emphasized early detection leads to early intervention with resources given online and community based programs (Jenkins, 2003). Early intervention not only improves health, there is also a cost benefit. The California Medical Association (CMA) confirms that pre-diabetic programs reduce medical costs by improving patient outcomes. The CMA states the average annual medical cost spent on a diabetic patient is $2,671, whereas the average primary care setting cost for a pre-diabetic to participate in a CDC recognized diabetes prevention program is between $400-$500 (California Medical Association, 2017). According to the CMA, California could save about $2,000 for every pre-diabetic who prevents or delays the diagnosis of diabetes.

A study published in the *Annals of Internal Medicine Journal* by Nicolaas Pronk and Patrick Remington discussed the economic evidence and cost effectiveness diabetes prevention programs can have on a community. As a part of the Community Preventative Services Task Force, Pronk and Remington recommend a combination of diet and exercise promotion programs for those at increased risk for type 2 diabetes on the basis of strong evidence of effectiveness in reducing new-onset diabetes (Pronk & Remington, 2015). After reviewing 53 studies that described 66 diabetes prevention programs, the Task Force found cost effectiveness for a pre-diabetic involved in a prevention program. Their study calculated potential savings of $13,761 per quality-adjusted life-year (Pronk &

Remington, 2015). Further investment in diabetes prevention programs for the high-risk population of the Central San Joaquin Valley could be cost-effective.

The intention of the study was to provide support for the implementation of health education consisting of nutrition education and lifestyle change counseling in Central San Joaquin Valley federally qualified health center (FQHC) for the purpose of improving diabetic outcomes. FQHCs are clinics typically in underserved areas that function under grants and reimbursement from the U.S. Department of Health and Human Services, Bureau of Primary Healthcare, and the Centers for Medicare and Medicaid Services. Pre-diabetic HgbA1c levels were collected before health education intervention and post intervention. The effectiveness of the intervention was measured by changes in variables of Body Mass Index (BMI) and HgbA1c levels among involved patients.

Problem Statement

The National Institutes of Health published a study that investigated which factors, lifestyle intervention or metformin (an anti-diabetic medication used to improve blood sugar), had the greatest impact in reducing the incidence of type 2 diabetes among a pre-diabetic population. Conclusions of this study provide support that interventions involving diet change and 7% weight loss (a lower Body Mass Index) were more effective in reducing incidence rates compared to those whose intervention only involved metformin (Diabetes Prevention Program Research Group, 2002). The CDC used this study to create its evidence-based National Diabetes Prevention Program. The literature suggests that a successful conversion from diabetes or pre-diabetes to a pre-disease state is impossible with the absence of intervention. In January 2016, United Health Centers (an FQHC) expanded its health education services to include pre-diabetic interventions for

pre-diabetic patients. This intervention includes a health educator and/or nutritionist conducting a 30-minute health education session in the exam room after the patient has seen their provider for a medical visit. The three goals of this initial session are to (1) increase patient knowledge regarding DM, (2) visually show where their most recent HgbA1c percentage stands on a numerical scale, and (3) explain the importance of making healthy lifestyle changes to best lower the risk of developing DM. Every time the pre-diabetic patient returns for a medical visit, they are also seen by a health educator/nutritionist for a 15-minute follow-up session. The goal of the follow-up visit is to coach the patient to support their efforts to live healthier, set realistic and attainable lifestyle change goals, and address any questions the patient may have regarding their diet or exercise. This unique model of implementation addressed the barriers of transportation and time; the patient received the intervention after an already scheduled medical visit, which saves them a trip back to the clinic for a health education session. Since health education appointments are currently not a billable visit, MediCal, MediCare, and private insurance patients are able to see a medical provider and health educator the same day. The following lists the pre-diabetic intervention learning objectives and curriculum outline:

Learning Objectives:

1. Enhance patient's knowledge about pre-diabetes, how it develops, and how to prevent or delay diabetes.
2. Increase patient's comprehension of different areas of self-improvement such as nutrition, ideal body weight, and exercise.

The curriculum includes the following:

A. What is pre-diabetes?
B. How can diabetes be delayed or prevented?

C. How can I tell if I have pre-diabetes?

D. What are the probable risks of developing pre-diabetes and diabetes?

E. Nutrition

F. Exercise

G. Treatment of pre-diabetes

H. Patient Plan

The model of providing health education proceeding medical provider visits and executing follow-up visits is unique to FQHCs in the Central Valley. This study investigated the effectiveness of the program model by measuring changes in patient HgbA1c (collected every 3 months) and BMI (measured every medical visit). Retrospective data were used starting from program implementation in January 2016 through March 2017. Patient HgbA1c and BMI data for this study came from a secondary data report used for clinical operations, progress report purposes to the Centers for Medicare and Medicaid Services, and for the Transforming Clinical Practices Initiative Grant. The intention of this intervention was to provide support for the implementation of pre-diabetic health education consisting of lifestyle changes counseling and nutrition/exercise education at FQHCs in the Central Valley for the purpose of improving diabetic outcomes using a unique model.

Hypothesis

The following hypotheses were tested:

1. There will be no statistically significant difference in hemoglobin A1c levels in pre-diabetic patients prior to health education/lifestyle coaching and after their last health education encounter between the time frame of January 1, 2016 – March 1, 2017.

2. There will be no statistically significant difference in BMI in pre-diabetic patients prior to health education/lifestyle coaching and after their last health education encounter between the time frame of January 1, 2016 – March 1, 2017.

Delimitations

The delimitations of this study follow:

1. United Health Centers (an FQHC) Parlier clinic was selected for this study due to the occupation of the researcher and accessibility to data.
2. Geographic boundaries of this study consist of a rural community (Parlier) and surrounding communities who seek health care at United Health Centers. The study does not consist of the entire Central San Joaquin Valley.
3. The data used for the purpose of this study were collected and tracked by Structured Query Language software instrument with license owned by United Health Centers.
4. The dependent variables, pre-diabetes (HgbA1c) and BMI, were selected due to the high prevalence among the Central Valley population studied and association as key determinants for a diabetes diagnosis.

Limitations

The limitations of this study follow:

1. This study relied on the behavior of each individual involved, behavior being a variable out of the control of health educators.

2. Patients involved in this study have the choice of attending or not attending their scheduled appointments with a health educator. This affected population size and incomplete data.
3. The development of diabetes could be purely genetic for some patients. In this case, health education on diet and lifestyle change would have little effect on the patient's diagnosis of diabetes.
4. Secondary data were used in this study. The data analyst at United Health Centers collected data.
5. This data set did not exclude any patient who was currently taking medications that may affect glucose levels.

Theoretical Framework

The theoretical framework used for this study was the Health Belief Model (HBM). The HBM is a conceptual model that was developed in the 1950s by a group of psychologists who were investigating why people would or would not use tuberculosis screening programs offered by the U.S. Public Health Service (Hochbaum, 1958; Rosenstock, 1966). The concept of the original HBM "addresses the individual's perceptions of the threat posed by a health problem (susceptibility, severity), the benefits of avoiding the threat, and factors influencing the decision to act (barriers, cues to action, and self-efficacy)" (Rimer & Glanz, 2005, p. 12). This study focused on the effectiveness of an educational program that influenced knowledge, attitude, and behavior change for the purpose of preventing DM; therefore, the HBM was the most appropriate model to use.

The HBM is framed to address individual perceptions, modifying factors, and likelihood of action. This study evaluated the effectiveness of a pre-diabetes intervention (for the purpose of preventing DM) in the United Health Centers

Parlier clinic. The HBM suggests that in order for people to successfully change behavior, they must feel threatened by their current behavior and at risk for developing a specific disease or health problem (perceived susceptibility) (Glanz, Rimer, & Viswanath, 2008). The person must believe the serious consequences of the disease (perceived severity), feel the changed behavior will provide more benefits (perceived benefits) than the cost or barriers involved with changing behavior (perceived barrier), and believe they have the competency and confidence to successfully change behavior (self-efficacy) (Glanz et al., 2008).

Very little literature can be found on the use of HBM as the theoretical framework for pre-diabetic interventions, specifically. However, several studies (e.g., Karimy, Araban, Zareban, Taher, & Abedi, 2016; Tawfik, 2017) used HBM to investigate self-care behaviors among women with DM, and interventions involving knowledge, beliefs, and self-reported practices among women with gestational diabetes mellitus for the purpose of preventing DM postpartum. This study will add to the existing literature using HBM to support pre-diabetic interventions, and contribute a unique perspective of an HBM pre-diabetic program in a rural Central Valley agriculture community.

The purpose of the study was to evaluate the effectiveness of a pre-diabetic intervention by studying changes in participant HgbA1c and BMI. This study assumed improvements in HgbA1c and lowered BMI after intervention through the abundant literature stating the benefits of lifestyle change in preventing DM. This study evaluated an existing program that uses a curriculum that follows the HBM model. The curriculum includes counseling points that address perceived susceptibility of being pre-diabetic, severity of becoming diabetic, the benefits of improving glucose tolerance, address participant barriers to accomplishing lifestyle change, and motivation/empowerment to improve self-efficacy. The

curriculum was designed to increase participant knowledge regarding DM and healthy lifestyle changes, discussed attitudes towards DM, and offered suggestions and support through follow-up visits to assist with barriers and self-efficacy. This study evaluated the effectiveness of focusing on individual perceptions, modifying factors, and likelihood of action. This study could then give reasons to further study other effective methods to deliver health education to other pre-diabetic populations using the HBM model.

Definitions

The following definitions are of significant terms in this study.

BMI: Body mass index, a weight to height ratio. It is used as an indicator of obesity and underweight.

California Central San Joaquin Valley: California region consisting of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern Counties.

Diabetes: HgbA1c levels above 6.5%. A metabolic disease state. Advanced stages of insulin resistance within the body, causing elevated levels of blood sugar due to little to no processing of glucose.

Federally Qualified Health Centers: Clinics typically present in underserved areas. They function under grants and reimbursement designation from the Bureau of Primary Healthcare and the Centers for Medicare and Medicaid Services of the United States Department of Health and Human Services.

Health education: Any combination of planned learning experiences using evidence-based practices and/or sound theories that provide the opportunity to acquire knowledge, attitudes, and skills needed adopt and maintain healthy behaviors.

HgbA1c: Hemoglobin A1c (HgbA1c), commonly used as A1c, is a blood test that provides an average of your blood sugar levels over the past 2-3 months.

Insulin: hormone produced by the pancreas to stimulate absorption of sugar present in blood by cells.

Insulin resistance: The inability to produce enough insulin for normal glucose uptake.

Pre-diabetes: HgbA1c levels of 5.7% - 6.4%. Early stages of insulin resistance within the body are occurring, causing higher than normal blood sugar. It is the pre-disease state of diabetes.

Summary

Diabetes is a chronic disease that drastically lowers the quality of life. Prevention interventions for diabetes have economic cost benefits, as well as improve the health of participants. The Central San Joaquin Valley contains a high prevalence of diabetics, causing stress on the health care system and family life. There is a need to bring more pre-diabetic interventions to these underserved regions in order to reduce the incidence of diabetes. The literature shows that having a healthy diet and physical activity can reduce the onset of diabetes. The purpose of this study was to emphasize prevention of diabetes by focusing on interventions at the pre-diabetic level. This study explored whether the implementation of health education, consisting of nutrition education and lifestyle change counseling, in FQHCs in the Central San Joaquin Valley can delay diabetic diagnosis by lowering BMI and reducing pre-diabetic HgbA1c levels.

CHAPTER 2: LITERATURE REVIEW

The pre-diabetic diagnosis is an opportunity to take action and prevent a chronic disease state, yet it can be difficult to make a lifestyle change without the help of formal health education or counseling. This study investigated whether a health education intervention has a correlation among pre-diabetic variables of HgbA1c and BMI. There is abundant literature on the benefits of lifestyle change and the prevention of type 2 diabetes. This section provides insight on what made this study unique and significant to pre-diabetes research in the Central Valley.

Overview of Diabetes and Pre-diabetes

Diabetes continues to be the seventh-leading cause of death in the United States (CDC, 2016). Diabetes mellitus (DM) occurs when there is not enough insulin produced by the pancreas and present in the blood to stimulate cellular glucose (sugar) absorption. Elevated levels of glucose, therefore, remain in the blood, causing serious health issues if left untreated. There are three types of diabetes: type 1 (no pancreatic insulin is produced), type 2 (limited pancreatic insulin is produced and/or insulin resistance), and gestational (insulin resistance and/or limited insulin production). Glucose levels are measured by HgbA1c, a 3-month average glucose level measurement test. Pre-diabetes is the state of elevated glucose (HgbA1c 5.7%-6.4%) yet not high enough for a DM diagnosis (HgbA1c 6.5% and above). Pre-diabetics are at a very high risk of developing type 2 DM due to their early signs of insulin resistance or poor glucose absorption. Multiple factors can influence the development of pre-diabetes such as genetics (strong family history of DM), obesity (BMI of 30 and above), and environment.

Hemoglobin A1c

Hemoglobin A1c is currently the most accurate blood test of a 3-month glucose average measurement. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) reported the HgbA1c test to be the necessary primary measurement to use for diabetes management and diabetes research (NIDDK, 2014). The HgbA1c test is recommended by an international expert committee to be used as a diagnosis test for diabetes and pre-diabetes (The International Expert Committee, 2009). A normal HgbA1c is below a 5.7%, pre-diabetic range is 5.7% – 6.4%, and diabetes diagnosis is 6.5% and above. NIDDK has stated that pre-diabetics are at risk for developing DM within 10 years, but it is possible to prevent or delay DM through lifestyle changes.

Insulin Resistance and BMI

Body Mass Index (BMI) is a ratio of a person's weight in kilograms and the square height in meters. Although not perfectly accurate, it is typically used as a body fat indicator. BMI is "used to screen for weight categories that may lead to health problems" (CDC, 2015). A person is at risk of developing chronic diseases when BMI is categorized as overweight (BMI 25-29.9) and obese (BMI 30 and above). Specifically, the risk of developing diabetes increases with obesity (BMI greater than or equal to 30) due to the high content of visceral fat and its association with insulin resistance (Beebe, 2003).

Insulin resistance is when muscle, fat, and liver cells do not use the present insulin to its potential to absorb glucose. The higher than normal levels of blood glucose can lead to pre-diabetes and DM. Excess weight and physical inactivity have been found to be major contributors to insulin resistance (NIDDK, 2009). High BMI, or obesity, is a large predictor of insulin resistance. It has been found that excess fat around the waist produces hormones and causes chronic

inflammation that can lead to DM and Cardio Vascular Disease (NIDDK, 2009). Additionally, lack of physical activity not only contributes to a high BMI, it also is associated with insulin resistance. Active muscles burn glucose for energy and become more sensitive to insulin, therefore, lowering blood glucose levels and allowing muscles to absorb more glucose with very little need for insulin (NIDDK, 2009). Having a healthy BMI and regular physical activity can reduce the risk of developing insulin resistance and ultimately limit the risk of developing pre-diabetes or DM.

Chronic disease can arise when glucose levels are elevated. Pre-diabetes and DM are diagnosed and glucose levels are tracked by HgbA1c. A high BMI and physical inactivity are associated with insulin resistance, a predictor for the development of pre-diabetes and DM. National organizations such as NIDDK suggest nutrition education and weight management to significantly reduce blood sugar levels, consequently improving a diabetic or pre-diabetic HgbA1c.

Pre-diabetic Prevention Efforts

There is a new focus on pre-diabetic prevention programs. Numerous research studies (e.g., Diabetes Prevention Program Research Group, 2002; Uusitupa et al., 2000; Xiao-Ren et al., 1997) have been done on effective diabetic prevention methods. Most literature suggests nutrition and lifestyle counseling is the most effective way to prevent chronic diseases such as DM. This issue has called organizations such as the CDC and AMA to take action.

How Nutrition and Counseling can Improve Health Outcomes

There are around 86 million people with pre-diabetes with 90% of them not knowing they are at risk of developing DM (CDC, 2015). The CDC and AMA

have stated that weight loss and a healthy diet could lower diabetic incidence rates (AMA, 2015). Nutrition and counseling are necessary when making a lifestyle change. As stated previously, lifestyle change is crucial to improving the quality of life of a diabetic (CDC, 2015). Current research shows the benefits of focusing on lifestyle more so than relying on medication for disease management.

A 5-7% weight loss can prevent the diagnosis of diabetes as well as help better control diabetes (AMA, 2015). A study conducted by the Diabetes Prevention Program Research Group examined whether the use of metformin or lifestyle change had the greatest impact on preventing DM. Out of 3,234 adult participants in this study, the incidence of diabetes was 7.8% for the group using metformin and 4.8% in the lifestyle modification group (Diabetes Prevention Program Research Group, 2002). The lifestyle modification group consisted of program goal of 7% weight loss and 150 minutes of physical activity a week. The study found the lifestyle intervention to be more effective in preventing DM than the metformin group (Diabetes Prevention Program Research Group, 2002). The CDC created a National Diabetes Prevention Program based on this study, later discussed.

The Community Preventative Services Task Force published recommendations for diabetes prevention through the American College of Physicians. This study looked at the economic evidence in support of prevention programs (Pronk & Remington, 2015). The Task Force recommended “combined diet and physical activity promotion programs by health care systems, communities, and other implementers to provide counseling and support clients identified as being at increased risk for type 2 DM. Economic evidence indicates that these programs are cost-effective” (Pronk & Remington, 2015, p. 465). A similar study (Li et al., 2015) specifically explored the cost effectiveness and

benefit of lifestyle prevention programs over 28 different 3-month programs. Li et al. (2015) concluded that "diet and physical activity promotion programs to prevent type 2 diabetes are cost-effective among persons at increased risk" and "costs are lower when programs are delivered to groups in community or primary care settings" (p. 458).

There is abundant literature with evidence supporting lifestyle change is the most effective way of preventing and managing DM. Studies show the success of prevention programs and their cost efficiency. Nutrition and lifestyle counseling should be an option to every pre-diabetic in order to best prevent developing DM. There is, however, very little literature on the effectiveness of intervention models with a pre-diabetic population. This program model evaluation study contributes to the literature as a successful prevention method.

Current and Specific Diabetes Prevention Programs

The relevant literature shows three major research studies that changed the way healthcare views and treats pre-diabetes. The first significant study was published in 1997 as a clinical trial examining the effects of diet, exercise, and a combination of diet and exercise with a group of 110,660 adult men and women with impaired glucose tolerance in Da Qing, China. Physicians conducted the individual nutrition sessions with participants, then small group counseling sessions involving exercise and nutrition were weekly for 1 month, 1 day a month for 3 months, and then every 3 months for 6 years. The study found significant reductions in the incidence of type 2 diabetes. The control group incidence rate was 67.7%, compared to 43.8% for the diet only group, 41.4% in the exercise group, and 46% in the diet and exercise group (Xiao-Ren et al., 1997). A follow up study was conducted 20 years later and found that 95% of the original

intervention participants were still experiencing long-term effects. These participants persisted with lower risks for type 2 diabetes, cardiovascular disease, and all-cause mortality (Li et al., 2008).

The second is the Finnish Diabetes Prevention Study, published in 2000. This study was conducted among 522 middle aged and overweight pre-diabetic patients. Researchers tested the effectiveness of lifestyle intervention involving diet and exercise information to promote weight loss. Results showed not only an improvement in glucose tolerance that persisted for 3 years post intervention, but also successfully lowered the cumulative incidence of diabetes among the intervention group participants 4 years post study (Uusitupa et al., 2000). This study proved lifestyle modifications could result to long lasting benefits.

The third study was published in 2002 and is known as the Diabetes Prevention Program Study. This trial involved 3,234 obese pre-diabetic adults and consisted of three different groups: the intensive lifestyle modification group that involved weekly and monthly group classes, the treatment with metformin group plus diet and exercise information, and the placebo group plus diet and exercise information. After 3 years of investigation, it was concluded that both the intervention and metformin group showed improvement, but the intervention group showed the most improvement with 16% reduction in diabetes risk with every kilogram in weight lost. The study found 7% weight reduction and 150 minutes of exercise a week could delay or prevent type 2 diabetes (Diabetes Prevention Program Research Group, 2002). A 10-year follow-up study found subjects' health benefits continued post 10 years of the original study (Diabetes Prevention Program Research Group, 2009). This was evidence that diabetes prevention is most strongly correlated with weight loss in men and women alike, and of all ethnic groups. This created the foundation for the National Diabetes

Prevention Program yearlong curriculum that offers nutrition and lifestyle modification classes to pre-diabetics across the U.S.

Prevention programs are becoming a focus for many organizations on national and state levels such as the CDC, AMA, NIH, and California Department of Public Health (CDPH). The CDC and AMA have combined forces to create a type 2 diabetes screening program, Prevent Diabetes STAT, and prevention program called National Diabetes Prevention Program (AMA, 2015). This program entails a screening for DM and evidence-based 19-session program that focuses on pre-diabetics with a weight loss goal of more than 5%. The CDC and AMA consider pre-diabetic prevention programs a “national movement” (AMA, 2015). Organizations around the nation can implement the Prevent Diabetes STAT screening program and the National Diabetes Prevention Program to become recognized by the CDC and AMA as a diabetes prevention center. Additionally, multiple YMCAs offer a community-based Diabetes Prevention Program aimed to help pre-diabetics lose at least 7% of body weight (Thorpe, 2012). This was one of the first diabetes prevention program efforts on a national level (Thorpe, 2012).

There are national and state campaigns focused on teaching the Hispanic community specifically on how to cook traditional foods healthier. The National Diabetes Education Program in collaboration with the CDC and NIH created a program called mas que comida, es vida (CDC, 2009). Hispanic traditional recipes were recreated using less fat and calories then published into cookbooks (CDC, 2009). Champions for Change, a California nutrition program, has also created its own set of traditional cookbooks and materials for diabetics (Champions for Change, 2015). These are great tools to use to help teach families how to continue traditions in a healthier way.

As of 2014, the CDPH committed to the California Wellness Plan that promotes health and aims to "eliminate preventable chronic disease in California" (Conroy et al., 2014, p. 19). This will assist with improving diabetes self-management and prevention among Californians. The California Wellness Plan focuses on five prevention goals that are creating healthy communities, increasing accessibility to health information, improving medical care quality, focusing more on health equity, and building community empowerment to promote healthier environments (Conroy et al., 2014).

There are various efforts on the prevention of diabetes on the national and state level. Most prevention programs focus on lowering HgbA1c and weight loss through exercise and eating healthy. There needs to be a continued effort from communities, the health field, and government to assure successful programs, but also to deliver these programs with an effective model appropriate for the community.

Implementation Models

There is abundant literature discussing the benefits of healthy lifestyle changes for the purpose of preventing DM, but little can be found regarding health education program implementation models among a pre-diabetic population. This study was unique in that it offered initial health education and lifestyle counseling (in patient preferred language), and then ongoing support through follow-up visits, providing the coaching people need to make lifestyle changes. All health education and coaching was conducted proceeding an already established patient appointment with their medical provider. This was a unique model of implementation that addressed the barriers of transportation and time, considering the patient received the intervention after an already scheduled medical visit.

Literature shows physicians and nurses recognize the importance of health education and its effects on HgbA1c and BMI, but reported not having the time to conduct those services (Yarnall, Pollak, Østbye, Krause, & Michener, 2003). Limited time with providers poses a barrier to proper health care (Blendon et al., 2004). In the Central Valley specifically, providers typically try to refer pre-diabetic and DM patients to a diabetes educator or dietitian because this is now a lifelong self-management commitment, and bilingual educators are few (Center for Health Reporting, 2009). There is a need for new testing methods and prevention implementation methods that support clinicians and patients alike (Rich, Shaefer, Parkin, & Edelman, 2013). This study analyzed a program that offered additional time and support providers were not able to provide to their pre-diabetic patients at UHC Parlier.

There is literature (Novo, 2013; Shaikh, Nettiksimmons, & Romano, 2011) however, analyzing the effectiveness of a telemedicine model within rural clinics in California. Telemedicine is a model of delivering health counseling through a live televideo connection. This is a method that addresses the barrier of transportation, saving the participant a visit to an office or clinic. A study tested the effectiveness of a one-time, 2-hour diabetes education and self-management class among a rural diabetic population. Results showed significant improvements in participants' self-confidence, knowledge, and self-care behavior (Novo, 2013). A similar study was conducted with pediatric obesity management, where results showed a successful program while providers used telehealth to communicate with families who were long distance (Shaikh et al., 2011). There is currently a need for more research regarding specific models used to implement effective diabetes prevention programs in the Central Valley.

Cost for Education

There is a need for prevention in the Central Valley. Creating an intervention at the pre-diabetic level could help prevent or prolong the development of DM, thus saving money and resources. It is currently difficult to find the financial support to conduct such interventions. The Yarnall et al. (2003) study suggests that the physician decision to not provide the prevention education could be because insurance does not cover that service (Yarnall et al., 2003). Ann Albright, RD, Ph.D., and director of the Division of Diabetes Translation at the CDC stated, "if insurers do not cover the preventative approach that these programs take within communities, it could just mean more people taking medication…you can out-eat any medication, so it's imperative that lifestyle is the foundation" (Brown, 2015, p. 3). In order for FQHCs to provide health education services and assist providers with patients, there needs to be financial support.

Focusing on prevention is more cost effective. In 2012, the United States spent about $245 billion on diagnosed diabetics (ADA, 2015). California is the state with the largest population with diabetes and spent $27.6 billion in 2012 (ADA, 2015). Having a sustainable and effective diabetes prevention program in the Central Valley may help alleviate diabetes health care costs. This study examined the effectiveness of a unique diabetes prevention program model that could possibly have an influence on reducing the costs for diabetes management in California.

Focusing on the California Central Valley, Bea Perez, Clinical Director for United Health Centers of the San Joaquin Valley, is currently implementing the first FQHC self-sustaining health education program in the Valley. She states in her interview that there are interests from insurances to financially support health education prevention visits: "If this program is successful, all FQHCs in the

Valley can offer this service and help improve the lives of many farm workers who truly need the education" (B. Perez, personal communication, November 10, 2015). Perez stresses there have to be lower diabetic prevalence and incidence rates from her pilot program in order to gain the support from health insurers such as CalViva and Anthem Blue Cross because United Health Centers can charge $68 per educational visit (B. Perez, personal communication, November 10, 2015). Full insurance reimbursement for these health education encounters brings sustainability to have more diabetes prevention programs in the Central Valley. Reimbursements consist of insurance companies essentially paying for the educational visit while the participants gain the benefits of the service.

Limited time and money are health education barriers. Health educators and counselors can assist with the dilemma of providers not having enough time for education with patients. The importance of this intervention is noted and there are efforts to ensure pre-diabetics in the Central Valley someday soon receive the information they need.

Central Valley Demographics and Lifestyle Influences on HgbA1c and BMI

HgbA1c and BMI are multifactorial variables. Insulin resistance can be hereditary among the Hispanic ethnicity. Traditional foods and beverages consist of high calorie, fat, and sugar content. Environmental factors such as poverty and pollution may have the strongest influence on HgbA1c and BMI in the Valley. These influences are what make the Central Valley population and study unique to the pre-diabetic literature.

Genetics

About 32% of the Central Valley consists of Latinos (Public Policy Institute of California, 2006). Literature suggests a higher risk for Hispanics developing DM due to the ethnic genetic makeup. This poses an issue when considering Hispanic cultural foods and traditions/beliefs along with the transportation and geographic limitations of the Central Valley. Many of these factors contribute to the high obesity and poverty rates in this area, which also increases the rates of developing DM.

Research has discovered genes that are associated with insulin resistance and diabetes (Franks, 2011). Hispanics are more prone to certain gene mutations that can lead to early onset diabetes. Specifically, Hispanics are prone to dysfunctional beta cell function and insulin resistance, and low insulin sensitive capacity (AIRg) (Franks, 2011). Franks also stated those of the Mexican descent are more prone to HNF-1alpha and HNF-4alpha mutations associated with diabetes. This poses a barrier to the Central Valley with its highly dense Hispanic population.

Cultural Practices

The Hispanic culture is rich in traditional foods, beliefs, traditions, and alternative remedies. There is evidence that Hispanic beliefs and customs affect diabetes management. A Yale research study explored how Hispanics view diabetes, their barriers to proper health care, and disease treatment. This study showed a majority of participating Hispanics believed the development of diabetes was due to a scare or stress, that it was God-given or hereditary, or it was perceived as a life-threatening; participants also reported a fear of insulin, were not aware to limit sugars, and believed herbal treatments with prayer can cure all (Hatcher & Whittemore, 2007). Participants noted becoming depressed because

diabetes had become their identity and managing it through diet, exercise, and medications/alternative treatments was difficult (Hatcher & Whittemore, 2007). Due to cultural perspectives of diabetes, it can be a challenge for this population to accept they may be at risk for diabetes and to be proactive about their health.

The Central Valley is notoriously known for its Hispanic cuisine. Traditional Hispanic foods typically consist of flour, corn, beans, meat, fat, and sugary drinks, all of which may contribute to a higher BMI and HgbA1c. Carrera, Gao, and Tucker (2007) studied the dietary patterns of Mexican Americans and associations with obesity, found the importance for epidemiologists and nutritionists to understand the cultures of which they work with in order to best promote good health and prevent obesity-related illnesses. The study found a high intake of fat from fried foods and sweetened drinks, with vegetables and fruit consumed infrequently. The results showed an overall higher than recommended BMI and waist circumference for a majority of woman participants (Carrera, Gao, & Tucker, 2007). Mexican Americans are only one of many Hispanic cultures that inhabit the Central Valley. Traditional foods play a large role in many of these cultures, most of which consist of high fat and sugar that can negatively affect health.

The CDC made an effort in 2009 to look at traditional Hispanic foods and how they may be contributing to the high rates of diabetes in this population (CDC, 2009). There are ways of altering traditional foods to fit a healthier diet in order to use less fat and fewer calories. The CDC, National Diabetes Education Program, and National Institutes of Health all addressed the need to educate this population with healthier cooking methods and joined forces to create a healthy cooking program in hopes of reducing HgbA1c and BMI (CDC, 2009). This

coalition will be discussed later in the section of prevention programs in this literature review.

Along with traditional foods, traditional remedies have been carried to the Central Valley as well. Herbal treatment has been found as popular among Hispanics because it is viewed as being a more natural and less expensive form of management (Hatcher & Whittemore, 2007). The most commonly used remedies, due to their ability to lower blood sugar, are nopal (cactus), aloe vera, and nispero (loquat) (Caban & Walker, 2006). Depending on their glucose-lowering properties, some remedies may truly help with reducing HgbA1C, but others may not. It was found that herbal remedies are commonly used in addition to prescribed medications, but patients typically do not inform providers of their alternative medication use (Hatcher & Whittemore, 2007). Withholding this information may cause an issue with drug/food interaction, or a hypoglycemic state. These remedies with medications are often used in hopes of avoiding the need for insulin even if that may be the best form of treatment for a diabetic patient.

Overall, HgbA1c and BMI are multifactorial. Traditional Hispanic cooking may influence higher blood sugar and weight gain. The Central Valley has a strong Hispanic culture with high diabetes rates. It is key to understand the cultural misconceptions and fears of this disease to better improve patient care (Caballero, 2006).

Environmental Factors

The population examined in this study is unique due to the Central Valley environmental factors. The work industry, poverty, transportation, and pollution

may all contribute to the high chronic disease rates in the Central Valley. These factors tend to be unavoidable to the community members.

The Central Valley consists of a large agriculture industry. Many who live in the small, rural, low-income communities are field workers earning minimum wage. The poor are limited to the basic food staples such as beans, rice, tortillas, and cheap bread, all of which diabetics and pre-diabetics should be limiting. There is little variety in fruits and vegetables because fresh produce typically comes from whatever can be harvested from the fields during each season. This is evident when comparing the Valley diabetes incidence rates of 9.4% to the state 7.8% (Center for Health Reporting, 2009). The lack of access to healthy food may contribute to higher HgbA1c levels for those living in poverty in the Valley.

A prominent environmental factor in the Central Valley that imposes multiple barriers to health is poverty. It is estimated that the Central Valley is among the top regions in the United States for having the highest percentage of family income below the poverty line (Saint Agnes Medical Center, 2016). It is suggested that poverty increases the risk of chronic disease, especially the development of DM (Chaufan, Davis, & Constantino, 2011). Claudia Chaufan and colleagues studied the diabetes disparities in low-income Latino and immigrant neighborhoods. The Central Valley has many similar communities. This study found 100% of participants believed diabetes was their greatest health issue, had restricted access to healthy foods, and all relied on food assistance programs (Chaufan et al., 2011). These barriers make it difficult to properly manage diabetes.

The environmental factors of transportation and air pollution in the Central Valley may contribute to the high diabetes incidence rates. Since these rural communities are spread out with little reliable public transportation such as bus

systems, subways, or bike friendly roads, there is a strong driving culture. Most people rely on cars to get around, minimizing the walking one does daily as well as causing more air pollution (Center for Health Reporting, 2009). Researchers at the University of Maryland studied how the exposure to air pollution and particulate matter 2.5 ($PM_{2.5}$) affected the development of mice. The study found the mice with higher exposure to $PM_{2.5}$ experienced negatives effects of energy metabolism, inflammation, insulin resistance, and weight gain, all influencing the development of type 2 diabetes (Liu et al., 2014). The World Health Organization (WHO) released a report stating the Central Valley is one of 36 regions in the world that exceed the WHO quality standards for air quality (Berg, 2011). This same article discussed how "the farming communities of the Central Valley breathe some of the worst air in the nation" (Berg, 2011). It may be that air pollution is playing a large role in insulin resistance and the diabetes incidence rates in the Valley.

The unavoidable factors of low wages, poverty, geography, and pollution may be contributing to the high rates of diabetes. The population used for this study is unique because of the environmental barriers and difficulty of making realistic lifestyle changes. The intervention and implementation model evaluated in this study focused on the time, attention, and transportation barriers, while environmental barriers acted as external factors.

The Parlier Community

This study took place at the United Health Centers (UHC) Clinic (an FQHC) in Parlier, CA. Parlier is a small, rural community on the outskirts of Fresno County. According to the United States Census Bureau 2016 statistics, Parlier's demographics are as follows. The small community has a population of

14,870, of which 96.9% are Hispanic. The U.S. Census Bureau 2016 report showed the most common industry between 2011-2015 was agriculture, the highest employment by occupations is farming, and household income was $31,335. With the majority of residents working for minimum wage jobs in agriculture, Parlier has a 42.3% poverty rate. Additionally 74.6% of residents are native Spanish speakers with 65.3% being U.S. citizens. In 2017, Fresno County reported 9.4% DM prevalence rates, and 26.6% of residents are obese (Data USA: Parlier, CA, 2017). Many Parlier residents utilize UHC health services since it is the only health clinic in town. The majority of UHC clinic patients have Medi-Cal or Medicare for insurance and are either diabetic, pre-diabetic, or at risk for DM due to strong family history. Parlier is considered a high-risk community due to environmental factors, ethnic susceptibility to DM, and poverty barriers. This intervention and implementation model allows patients to receive health education in a convenient way.

Summary

Chapter 2 reviewed the abundant literature on Central Valley demographics and influences on HgbA1c and BMI, barriers to improving diabetic outcomes, and pre-diabetic prevention programs. The Central Valley is unique with its environmental factors of poverty, pollution, and sedentary lifestyle and how it affects population health. Barriers not only consist of access to affordable foods, but also provider's time and efforts to conduct health education. The importance of preventing DM is evident in the efforts of the CDC, AMA, NIH, and other organizations in creating prevention programs with the focus being an improvement in the quality of life and cost efficiency. The purpose of this literature review is to build rationale for the support of a health education

intervention at FQHCs in order to reach the high-risk population of the Central Valley and improve pre-diabetes management.

CHAPTER 3: METHODOLOGY

The purpose of this study was to examine the effectiveness of a health education model for chronic disease prevention. The literature suggests there is a positive association with healthy lifestyle change and reducing the risks of developing diabetes. UHC is the first Central Valley FQHC to implement health education in exam rooms directly proceeding medical provider visits, according to Bea Perez, UHC Clinical Director. Health education is typically given in group classes or one-on-one appointments with a health educator or nutritionist (B. Perez, personal communication, November 10, 2015). This study examined the intervention of nutrition and lifestyle counseling and its unique implementation on Central Valley pre-diabetics who attend UHC Parlier clinic.

Study Population

The subjects for this study were pre-diabetics (HgbA1c range 5.7% – 6.4%) from UHC Parlier clinic. This clinic resides in a rural area of the Central Valley, with the primary occupation for adults being field worker, and demographics being about 97% Hispanic or Latino (B. Perez, personal communication, November 10, 2015). Eligibility for UHC clinics is not determined by insurance or income. UHC accepts all insurances including Medi-Cal and offers a sliding fee payment plan for those who qualify financially.

Criteria for participants of this study were as follows: (1) diagnosed as pre-diabetic with an HgbA1c of 5.7% – 6.4% (in compliance with national standards); (2) English- or Spanish-speaking; (3) enrollment into UHC as an adult (18 years and over) patient; and (4) agree to receive health education through a pre-diabetic curriculum. All UHC Parlier patients who fell into these categories were used as subjects for this study, not selected at random. Health educators use a software

tool called i2i Intelligence to track these patients and were placed on a schedule to be seen after their scheduled medical provider visit. These patients were offered health education regarding pre-diabetes by health educators, or referred to health educators by a provider. The pre-diabetics involved in this study were scheduled to attend a 3- to 6-month follow-up appointment with their medical provider and health educator to examine HgbA1c and BMI levels, in accordance with the National Diabetes Care Guidelines.

There were approximately 367 pre-diabetic subjects involved in this study, including intervention and control groups. All subjects verbally agreed or verbally denied to receive health education information regarding pre-diabetes in the exam room after their medical provider appointment. Each intervention group pre-diabetic was scheduled a follow-up appointment with medical provider and health educator. There were 267 pre-diabetic patients involved in the intervention group. The control group for comparison consisted of 100 pre-diabetics who verbally declined health education services for a pre-diabetic intervention. Out of the 267 pre-diabetic intervention subjects, 100 were selected at random in order to fairly compare to the control group. Therefore, there are a total of 100 randomly selected intervention pre-diabetics and 100 nonintervention pre-diabetics included in the data analysis.

The institutional review board honored a waiver of consent for patient participation in this research study. Data (HgbA1c, BMI, gender, age, ethnicity, and health education encounter dates) were extracted from patient medical records and de-identified for United Health Centers reporting purposes. Patient name, date of birth, medical record number, insurance information etc., were not included in this data set. There is no way information can be traced back to a specific patient. This data set was created and de-identified in order to protect patient information

and minimize the risk category when using this information for reports and research purposes. Retrospective data were used from the time frame of January 1, 2016 – March 1, 2017, and there was no patient identification linked to the data set. The purpose of this research study was to analyze the effectiveness of a health education intervention among pre-diabetics by studying changes in HgbA1c and BMI. Personal information within the data set does not exist; therefore, results only include changes in the variables among the intervention and control groups. The results of this study were shared with United Health Centers and used to improve health care operations at the Parlier clinic. Permission to use the data was obtained by United Health Centers CEO and Health Information Technology Director for this purpose of this study, refer to Appendix A.

Curriculum

The intervention group was given a 30-minute introductory session in the exam room after the patient saw their provider for a medical visit. The goal of this initial session was to gather baseline understanding of type 2 diabetes and awareness immediately following their clinical examination. Subsequent visits were 15-minute sessions given every time the pre-diabetic patient returned for a medical visit. The goal of the follow-up visit was to coach the patient with their desire to live healthier, set realistic and attainable lifestyle change goals, and address any questions the patient had regarding their diet or exercise. All sessions and materials were conducted in the patient's preferred language (English or Spanish) in the following outline:

Learning Objectives

1. Engaging the importance of diabetes prevention.

2. Increase patient's comprehension of different areas of self-improvement such as nutrition, ideal body weight, and exercise.

Curriculum

A. What is pre-diabetes?
B. How can diabetes be delayed or prevented?
C. How can I tell if I have pre-diabetes?
D. What are the probable risks of developing pre-diabetes and diabetes?
E. Nutrition – MyPlate recommendations and diabetic diet
F. Exercise
G. Treatment of pre-diabetes
H. Patient Plan

Participant HgbA1c and BMI were collected and maintained in patient's medical record. Every time a participant was seen for a medical appointment, they were weighed and a medical assistant entered BMI into their medical record. Each time a patient completed lab work for an HgbA1c exam, results were posted in participants' medical records. Therefore, a UHC data analyst obtained all data through patient medical records. See Appendix B for the full curriculum.

Data Collection

Retrospective data were used starting from UHC program implementation on January 1, 2016 through March 1, 2017. Patient HgbA1c and BMI data were extracted from medical records using a software program called Structured Query Language (SQL) by a UHC health information data team member. The Microsoft SQL Server Reporting Services program was used to create a report with HgbA1c and BMI information, and was de-identified. Demographic data of patient age, gender, and ethnicity were also extracted. This report was then translated to an

Excel document for analysis by the data analyst, and was de-identified to keep confidentiality.

Secondary data were collected as a time series, meaning each participant had multiple BMI and HgbA1c measurements and intervention encounters throughout the January 1, 2016 to March 1, 2017 time period. Participants involved in this study all came in at staggered times. For example, some participant initial encounters were in January, whereas others were in March or April, all depending on when their medical appointments were scheduled. For the purpose of measuring change, participant initial HgbA1c and BMI were the values of the first day they received the pre-diabetes health education after a provider visit. Participant HgbA1c and BMI were then available for that specific participant after every follow-up visit up until March 1, 2017. The researcher of this study did not need to communicate with subjects when collecting data due to the data collection tool used to extract HgbA1c and BMI from patient medical records.

Data Analysis

A quasi-experimental design with a staggered time series design with a comparison group was used for the purpose of this study. Participants received the intervention at staggered times. The IBMs SPSS, a research quality statistical software program that allows researchers to solve statistical problems through statistical analysis, data management, and data documentation, was used for data analysis.

The Paired T Test was used to analyze the data through SPSS. This is an inference from two samples test, which compares the means of two independent samples (Ball, 2007). This is a parametric test suited for a large, non-random

sample size. The dependent variables were HgbA1c and BMI. The independent or grouping variables are the intervention group and control group. This test was used to see if there are differences between HgbA1c levels and BMI with health education as the intervention compared to a non-health education control group.

Accepting or rejecting the 2 research hypotheses was determined by using a p value of < 0.05 as the level of statistical significance. Rejecting the null hypotheses at this $p < 0.05$ level establishes a real difference among pre-post HgbA1c and BMI values with a 95% probability (Ball, 2007). This determined whether or not the health education was an effective intervention.

Summary

The intent of this study was to measure the effectiveness of an established pre-diabetes health education intervention at the UHC Parlier clinic. The goal was to study the effectiveness of the intervention by testing for differences in HgbA1c and/or BMI among an intervention group compared to a control group that received no health education. Patient medical records and SQL software system were used to track data. SPSS was used to analyze data and determine correlations. Enrolled pre-diabetics all received similar curriculum as outlined. The California State University, Fresno Public Health Institutional Review Board (IRB) approved this research study prior to data collection. See Appendix C for IRB approval letter.

CHAPTER 4: RESULTS

The purpose of this study was to analyze the effectiveness of a diabetes prevention program focused on pre-diabetics at a Federally Qualified Health Center, UHC Parlier. In this study, differences in HgbA1c and BMI among a pre-diabetic intervention group and a control group were analyzed and compared. A randomized quasi experimental design was used in this study. This chapter discusses analysis of the data set.

Sample Demographics

When this data set was created, there were 267 pre-diabetics who received pre-diabetic health education at the UHC Parlier health clinic between January 1, 2016 – March 1, 2017. There were 100 pre-diabetics who verbally declined health education during the time period and were used as the control group for this study; however, three control group pre-diabetics' data were removed due to incomplete data present. Therefore, 97 pre-diabetics were randomly selected from the intervention group using SPSS to evenly compare to the 97 pre-diabetic control group. The final data analysis consisted of comparing HgbA1c and BMI change in 97 controlled group pre-diabetics and 97 randomly selected intervention participants.

Age

Tables 1 and 2 and Figure 1 show age ranges of participants in the intervention group and those in the control group. The largest age group among the intervention participants was the 50-59 year old range group, 34% (N = 33). The largest age group in the control were those in 30- 39 year old age range, 24.7% (N = 24). The lowest age range participating in the intervention group was 24-29 years old, 4.1% (N = 4), and 18-23 years old, 10.3% (N = 10), in the control group.

Table 1

Demographic Age Data for Intervention Group

Age Ranges	*N*	%
24 – 29 years old	4	4.1
30 – 39 years old	11	11.3
40 – 49 years old	27	27.8
50 – 59 years old	33	34
60 – 69 years old	19	19.6
70 – 79 years old	3	3.1
Total	97	100

Table 2

Demographic Age Data for Control Group

Age Ranges	*N*	%
18 – 23 years old	10	10.3
24 – 29 years old	6	6.2
30 – 39 years old	24	24.7
40 – 49 years old	23	23.7
50 – 59 years old	21	21.7
60 – 69 years old	6	6.2
70 – 79 years old	5	5.2
80 – 86 years old	2	2.1
Total	97	100

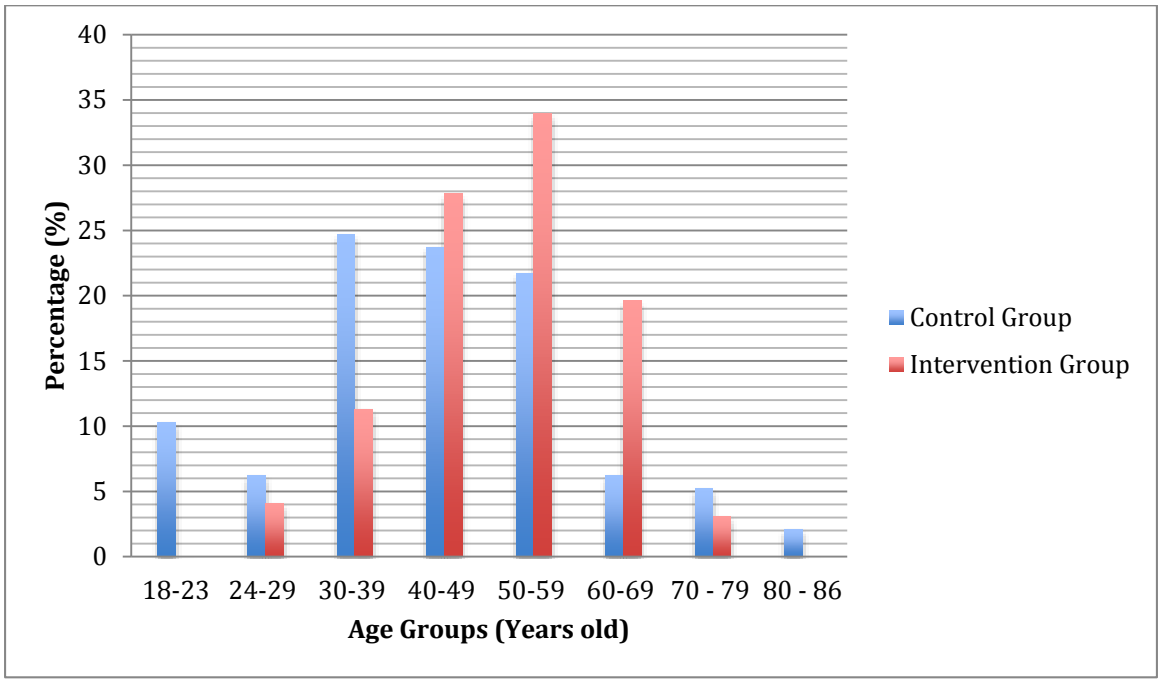

Figure 1. Intervention and control group age categories

Gender

The gender distribution of the intervention group is shown in Table 3 and the control group is depicted in Table 4. The control group consisted of 62.9% (N = 61) females and 37.1% (N = 36) males. The intervention group consisted of 76.3% (N = 74) females and 23.7% (N = 23) males. Overall, more women participated in health education services and declined services as well.

Table 3

Demographic Gender Distribution for Intervention Group

Gender Variable	*N*	%
Female	74	76.3
Male	23	23.7
Total	97	100

Table 4

Demographic Gender Distribution for Control Group

Gender Variable	*N*	%
Female	61	62.9
Male	36	37.1
Total	97	100

Ethnicity

Table 5 indicates sample ethnicity distribution in the intervention group and Table 6 depicts the control group. The control group consisted of majority Hispanic or Latino, 84.5% (N = 82), with 15.5% (N = 15) non-Hispanic or Latino. The intervention group consisted of 94.9% (N = 92) Hispanic or Latino, 4.1% (N = 4) not Hispanic or Latino, and 1% (N = 1) Unknown/Not Reported. Overall, majority of participants and those who declined identified themselves as Hispanic or Latino.

Table 5

Demographic Ethnicity for Intervention Group

Ethnicity Variable	*N*	%
Hispanic or Latino	92	94.9
Not Hispanic or Latino	4	4.1
Unknown/Not Reported	1	1
Total	97	100

Table 6

Demographic Ethnicity for Control Group

Ethnicity Variable	*N*	%
Hispanic or Latino	82	84.5
Not Hispanic or Latino	15	15.5
Total	97	100

Analysis Results

The Paired Samples T Test was used to determine differences in HgbA1c and BMI pre health education and post health education. The latest HgbA1c and BMI on the data set before intervention was used as "first A1c and BMI," the most recent A1c and BMI that appeared on the data set within the January 1, 2016 – March 1, 2017 was used as "last A1c and BMI." The first and last A1c and BMI were seen as pre/post pre-diabetic health education. The pre-diabetics present in the data with no health education encounters were considered the control group. The first A1c and BMI and last A1c and BMI within the data set time frame were used to measure any significant change over time.

The intervention group Paired Samples T Test first and last A1c resulted in a significance of <0.01 (see Table 7). The significance of the confidence interval evaluated was 95%, being that <0.01 < 0.05 significance. Therefore, hypothesis one stating there will be no statistically significant difference in hemoglobin A1c levels in pre-diabetic patients prior to health education/lifestyle coaching and after last health education encounter between the time frame of January 1, 2016 – March 1, 2017, is rejected. There was a significant difference in intervention patient HgbA1c.

Table 7

Paired T Test Results for Intervention Group

Variables	Test Statistic	Significance *p* value
First A1c – Last A1c	5.770	<0.01
First BMI – Last BMI	1.363	0.176

The intervention group Paired Samples T Test looking at first and last BMI resulted in a significance of 0.176 (see Table 7). The significance of the

confidence interval evaluated was 95%, being that 0.176 > 0.05 significance. Therefore, hypothesis two stating there will be no statistically significant difference in BMI in pre-diabetic patients prior to health education/lifestyle coaching and after last health education encounter between the time frame of January 1, 2016 – March 1, 2017 is accepted. There was no significant difference in BMI for intervention pre-diabetics.

The control group Paired Samples T Test first and last A1c resulted in a significance of 0.972 (see Table 8). The significance of the confidence interval evaluated was 95%, being that 0.972 > 0.05 significance. It is then concluded that there was no statistically significant difference in first and last A1c among control group pre-diabetics.

The control group Paired Samples T Test first and last BMI resulted in a significance of 0.033 (see Table 8). The significance of the confidence interval evaluated was 95%, being that 0.033 < 0.05 significance. It is then concluded that there was a statistically significant difference in first and last BMI among the control group pre-diabetics.

Table 8

Paired T Test Results for Control Group

Variables	Test Statistic	Significance *p* value
First A1c – Last A1c	-0.035	0.972
First BMI – Last BMI	-2.163	0.033

Overall change in HgbA1c mean and BMI mean was also found in the intervention and control groups. The intervention group first A1c mean was 5.999% and last A1C mean was 5.875% (see Table 9). The HgbA1c range pre-intervention was 5.7% – 6.4% (study parameters), and the last A1c range post-

intervention was 5.2% – 6.7%. The intervention group first BMI was 33.330 and last BMI was 32.589 (see Table 9). The control group first A1c mean was 5.9% and last A1C mean was 5.9% (see Table 10). The HgbA1c range for first A1c was 5.7% – 6.4% (study parameters), and last A1c range was 5.5% – 6.8%. The control group first BMI mean was 31.890 and the last BMI mean was 33.046 (see Table 10). Figure 2 shows the differences in HgbA1c mean between the intervention and control groups. Figure 3 depicts the differences in BMI mean between the intervention and the control group.

Table 9

Calculated Means for Dependent Variables for Intervention Group

Dependent Variable	*N*	*M*	*SD*
First A1c	97	5.999	0.197
Last A1c	97	5.875	0.270
First BMI	90	33.330	6.718
Last BMI	97	32.589	7.632

Table 10

Calculated Means for Dependent Variables for Control Group

Dependent Variable	*N*	*M*	*SD*
First A1c	97	5.849	0.254
Last A1c	97	5.850	0.310
First BMI	86	31.890	8.251
Last BMI	96	33.046	7.710

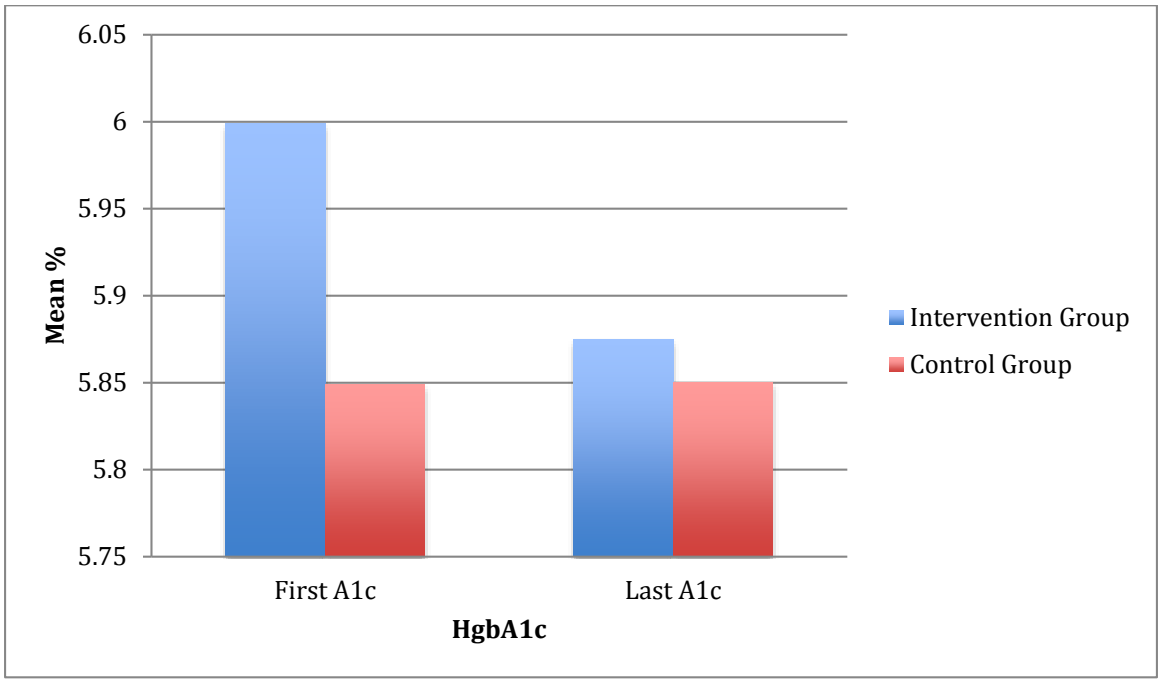

Figure 2. Differences in first and last HgbA1c means comparing the intervention and control group

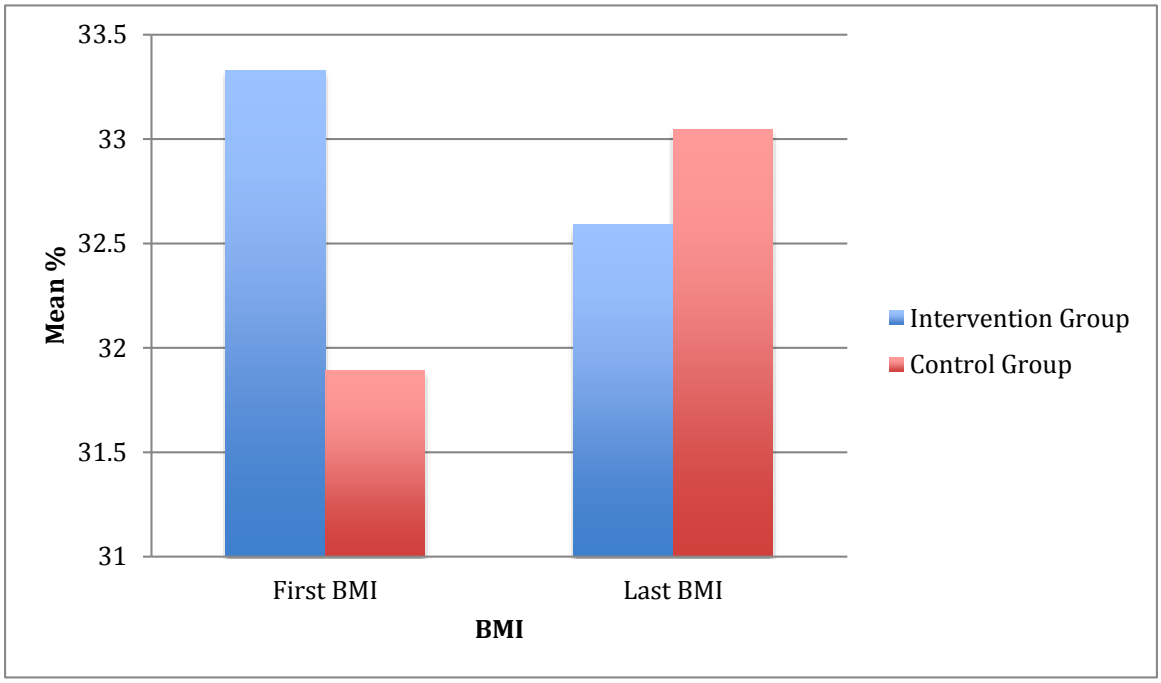

Figure 3. Differences in first and last BMI means comparing the intervention and control group

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Discussion of Hypothesis

Hypothesis 1

The null hypothesis one stated there will be no statistically significant difference in hemoglobin A1c levels in pre-diabetic patients prior to health education/lifestyle coaching and after last health education encounter between the time frame of January 1, 2016 – March 1, 2017. After running the Paired T Test, this hypothesis was rejected with p value < 0.01. At alpha 0.05, there was a significant difference between HgbA1c levels before health education in the exam rooms and last A1c levels. There was an overall A1c reduction as shown with first (mean = 5.999%) and last (mean = 5.875%) A1c means. This positive outcome suggests that the intervention was effective in improving HgbA1c. This suggests that the pre-diabetics who received health education utilized the information given for diabetes prevention. These patients have now reduced their risk of becoming diabetic. The Centers for Disease Control and Prevention (2017) reports pre-diabetics who reduce their HgbA1c prior to diabetes diagnosis can significantly lower their risk of developing cardiovascular diseases, diabetes, kidney disease, will have a lower rate of hospitalizations and emergency department visits, and spend less on health care. The estimated medical costs for diabetics are about $13,700 per year and diabetes continues to be the seventh leading cause of American deaths (CDC, 2017). Controlling HgbA1c at the pre-diabetic level proves to be beneficial.

For simple comparison, the control group did not experience significant change in HgbA1c. The Paired T Test result in p value = 0.972. At alpha 0.05,

there was no significant difference in HgbA1c in patients who did not receive the intervention. There was no significant change in HgbA1c mean between first (mean = 5.849%) and last (mean = 5.850%) A1c means. This shows that patients who chose to receive health education had better HgbA1c outcomes compared to those chose not to receive health education.

Hypothesis 2

The null hypothesis two stated there will be no statistically significant difference in BMI in pre-diabetic patients prior to health education/lifestyle coaching and after last health education encounter between the time frame of January 1, 2016 – March 1, 2017. After running the Paired T Test, this hypothesis is accepted with *p* value 0.176. There was no significant difference in first and last BMI for intervention pre-diabetics. There was an overall BMI reduction as shown with first BMI mean = 33.330 and last BMI mean = 32.589. However, it cannot be concluded that the intervention was effective with BMI improvement. The American Diabetes Association recommends overweight individuals to lose 7% of their body weight to lower their risk of developing type 2 diabetes by 58% (ADA, 2017). Interventions that are effective in weight loss may have more long-term benefits.

For comparison, the control group did experience a significant change in BMI. The Paired T Test resulted in *p* value = 0.033. At alpha 0.05, there was a significant difference between first and last BMI. The change, however, was an overall increase in the average BMI with first BMI mean = 31.890 and last BMI mean = 33.046. Therefore, we can conclude that those pre-diabetics who refused health education had a negative BMI outcome.

Comparison of This Study and Literature Review

Funnell and Anderson studied empowerment among diabetics in a qualitative study in 2004 and concluded that the role of a successful health care team is to support the decision maker with education and psychosocial support. Health care teams can be most effective when the patient freely chooses to make a change. Each individual is unique and health care teams must be able to attend to each situation with a tailored approach (Funnell & Anderson, 2004). This study found effective results with using a similar method of health education and lifestyle coaching. Each pre-diabetic received encouragement, coaching, and goal-setting with each visit.

A randomized control study conducted in Taiwan analyzed the effectiveness of a 4-month empowerment program among 38 pre-diabetic adults. The intervention involved eight 2-hour sessions biweekly group classes delivered over 4 months, and health professionals such as physicians, nurses, diabetes educators, and dietitians taught the curriculum. The intervention was designed to encourage participants to make healthy lifestyle modifications by focusing on three phases: awareness raising, behavior building, and results checking (Chen, Hung, & Chen, 2017). Study results showed a significant reduction in BMI and short-term positive outcomes with behavior, physical, and psychosocial change among the intervention participants. This research study also included similar awareness raising and behavior building phases as in the Chen et al. study, as well as provided evidence for short-term positive outcome in HgbA1c. However, this study did not match the significant improvement in BMI that is conclusive for more long-term benefits.

Diabetes Prevention Programs

This study's results are similar to those of the three major research studies that changed the way healthcare views and treats pre-diabetes. The China Da Qing Diabetes Prevention Study found diet and exercise to effective in reducing weight. This weight reduction was found to improve impaired glucose tolerance among participants and lower the risk of chronic disease (Xiao-Ren et al., 1997). This study was successful in the short-term by improving HgbA1c, but did not have the same results as the China study in terms of significant weight loss. Similar to the Finnish Diabetes Prevention Study (Uusitupa et al., 2000), this study analyzed the effectiveness of a lifestyle modification and had similar improvement in HgbA1c outcomes. However, this study did not match the Finnish study weight reduction outcomes. The CDC Diabetes Prevention Program also evaluated the effectiveness of lifestyle modifications compared to medication therapy with improvement in diabetes incidence rates. Similar to the China and Finnish studies, weight reduction was found to have a long-term effect in delaying or preventing chronic disease. This study could not conclude long-term effects and due to duration of the study and lack of significant weight loss outcomes.

Pre-diabetes in Hispanics

This research study had many similarities to Jessica McCurley, Angela Gutierrez, and Linda Gallo's (2017) findings from their comprehensive research studying 12 diabetes prevention interventions among adult Hispanics in the U.S. in 2017. A comprehensive literature search was conducted through various electronic databases such as PubMed/MEDLINE, Web of Science, PsycINFP, etc. for the primary focus of finding effective pre-diabetic interventions that used tailoring strategies towards the Hispanic culture. Similar to this research study, the McCurley et al. study looked at interventions that included behavioral lifestyle

modifications of diet and exercise, consisted of primarily Hispanic populations, and evaluated the dependent variables of weight and hemoglobin A1c to measure outcomes (McCurley et al., 2017).

Results from this study are comparable to many of the studies found by McCurley et al. (2017). Females were the majority in this study consisting of 76.3% in the intervention group and 62.9% in the control group. Several studies (Buckley et al., 2015; Millard et al., 2011; Parikh et al., 2010; Ruggiero, Oros, & Choi, 2011) discussed in the McCurley et al. review consisted of large female sample sizes of ≥ 70%. It appears that Hispanic females are more likely to participate in prevention programs. This could be attributed to more Hispanic females having more availability to participate or see diabetes prevention as more of a concern.

This study had the same curriculum content as all 12 studies reviewed by McCurley et al. (2017). These topics consisted of establishing healthier eating habits and nutrition, increasing exercise, general diabetes education, and participant self-confidence and self-efficacy. In addition, all information was given in-person by either a health care worker or peer educator. Following this curriculum, this study proved significant improvement in HgbA1c among this intervention group, statistical significant p value < 0.01. Only 2 (Ockene et al., 2012; Parikh et al., 2010) of the 12 studies reviewed resulted in significant HgbA1c improvement among the adult pre-diabetic Hispanics. These results also match those of the prestigious CDC Diabetes Prevention Program study (Diabetes Prevention Program Research Group, 2002), Finnish Diabetes Prevention Study (Uusitupa et al., 2000), and China Da Qing Diabetes Prevention Study (Xiao-Ren et al., 1997). There was no significant change in BMI among the intervention participants in this study, which is contradictory to majority of the relatable

literature. There were six studies found following this curriculum that consisted of adult pre-diabetic Hispanics in the U.S. (Coleman et al., 2010; Gutierrez et al., 2014; O'Brien et al., 2015; Sorkin et al., 2014; Camp et al., 2016; Vincent, McEwen, Hepworth, & Stump, 2014), all of which proved significant improvement in BMI as a clinical outcome. This study's BMI results do not match those of the CDC Diabetes Prevention Program study, Finnish Diabetes Prevention Study, and China Da Qing Diabetes Prevention Study. This study, therefore, can conclude effectiveness for improving HgbA1c, but cannot conclude effectiveness for significant weight improvement.

All studies included in this discussion and compared to this study have been reviewed and given a respectable global rating by the Effective Public Health Practice Project Quality Assessment Tool. This is a tool used to test the quality of the evidence based on study sample bias, study design, confounders, blinding, assessment methods, and attrition (McCurley et al., 2017).

Implications for Public Health Practice

This study contributes to the field of public health practice by determining the effectiveness of a pre-diabetes intervention program using a unique model of individual health education and lifestyle modification coaching after medical provider visits at the United Health Centers Parlier Clinic, a federally qualified health center. This intervention proved to have positive short-term HgbA1c outcomes, which will assist in improving diabetes incidence rates in the Central Valley. More can be done to address the needs of the high-risk rural and dominantly Hispanic communities in the Central Valley.

This current study could serve as a pilot study for further research with similar target populations and long-term outcomes. There is very little research

done on diabetes prevention programs in the Central Valley nor on implementation models tailored to address community barriers. Results from this study could provide support for the health education department at United Health Centers for the purpose of grants and insurance reimbursements for health education encounters after patient medical visits.

Conclusions and Recommendations

This study showed improvement in HgbA1c with intervention efforts. The intervention slightly improved participant BMI, however, study cannot conclude a significant improvement in BMI. This could be because participants adopted the information and made moderate lifestyle changes, but did not fully commit to healthier eating habits and exercise in order to promote weight loss. Although this intervention accomplished the goals of reducing the risk of developing type 2 diabetes by HgbA1c improvement, we do not know if it is short-term or long-term effective. According to the literature, weight reduction is the key to long-term benefits of reducing the risk of developing type 2 diabetes. Since this intervention did not accomplish that, researcher recommends tailoring the curriculum and offering training to health educators to add a stronger influence of nutrition and exercise for the purpose of weight reduction. Recommendations from other empowerment studies could be helpful with the development of the curriculum and intervention.

More information is needed on model implementation since no other study could be found similar to this implementation model of providing the intervention in the exam rooms after medical visits. Very little is known regarding effectiveness of models of implementation. This study simply suggested this model of intervention in the exam rooms to be effective in improving HgbA1c, but

there was no comparison to a different implementation method other than the control group. In addition, a few studies were conducted among high-risk Latinas in California such as (Sorkin et al., 2014), or looking at Latinas' diabetes behaviors as in (O'Brien, Davey, Alos, & Whitaker, 2013), but not enough research has been done on prevention programs for pre-diabetic adult Hispanics in rural communities in the Central Valley.

The overall goal was to prevent type 2 diabetes. The researcher wanted to see an HgbA1c decrease with intervention as it correlates with the literature. This study suggested short-term benefits, but further studies are needed to determine long-term benefits among this population. Future qualitative studies could be used to gather data regarding whether the patients felt they received the health education in a convenient way, saving time and transportation, to better support the effectiveness of the intervention model. The researcher recommends further training and curriculum reevaluation among the health education department at United Health Centers in order to have more consistent weight loss results and build on the current effectiveness of this intervention.

Summary

The purpose of this study was to access the effectiveness of a pre-diabetes intervention using a unique method of implementation in the medical exam rooms after every visit at a federally qualified health center in a Central Valley rural area. The variables assessed were HgbA1c and BMI. This study analyzed changes in hemoglobin A1c and BMI pre and post intervention using the Paired T Test. A control group was also included in this study. Outcomes were a significant improvement in HgbA1c and no significant change in weight. Major diabetes prevention program research shows weight loss as being the key to long-term

health benefits, including delaying or preventing type 2 diabetes. This study therefore proved short-term HgbA1c benefits, but cannot conclude long-term significance. The Centers for Disease Control and Prevention, American Diabetes Association, and various other influential organizations have made diabetes prevention programs a priority for the estimated 86 million pre-diabetics in the U.S. Studies such as this one contribute to literature as an effective diabetes prevention program among a Hispanic rural population using a unique model of implementation.

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APPENDICES

APPENDIX A: PERMISSION TO USE UHC DATA

United Health Centers
of the San Joaquin Valley

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(559) 646-6618 · Fax (559) 646-8125 · www.uhcofsjv.org

August 31, 2016

RE: Irene Rios - Thesis

To Whom It May Concern:

This letter is to advise California State University, Fresno that, Irene Rios, has been granted access to the proprietary data of United Health Centers of the San Joaquin Valley for the sole purpose of conducting research.

If you have any questions, please do not hesitate to call me.

Sincerely,

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APPENDIX B: INTERVENTION CURRICULUM

Health Education Program-Pre-Diabetes

(Based on Basic Guidelines for Diabetes Care)

- Assess Knowledge of Pre-Diabetic condition
- Assess Knowledge of medications
- Assess self-monitoring
- Discuss acute/chronic conditions
- Assess physical activity and prescribe activity based on needs/condition of patient
- Assess weight management and individualize plan for patient
- Review Pre-Diabetes Self-Management form/problem-solving skills
- Registered Dietician referral if needed
- Assist patient in setting nutrition goals
- Create tracking type on i2i.

During the Health Education visit

- Health Educator reviews with patient or caregiver the following information

Review patient basic knowledge about pre-diabetes

Assist patient with healthy lifestyle changes to prevent pre-diabetes

Assist patient with proper nutrition

Review diet

Asses on healthy lifestyle changes to prevent pre-diabetes

Asses physical activity and prescribe activity based on needs/condition of patient.

CONTENT

Basic knowledge about pre-diabetes

How to delay or prevent diabetes type 2

Family history of chronic diseases

Proper nutrition

Fitness for health

CURRICULUM

TEACHING OBJECTIVES:

1) Assess patient's knowledge about pre-diabetes
2) Identify areas of self management
3) Assess on healthy lifestyle changes to prevent pre-diabetes

LEARNING OBJECTIVES:

1) Enhance patient's knowledge about pre-diabetes, how it develops, and how to prevent it or delay it
2) Increase patient's comprehension of different areas of self-improvement such as nutrition, ideal body weight, and exercise.

1. Subjective data

    1.1 Assess patient on the basic knowledge of pre-diabetes and how this condition can develop into on diabetes type 2.

2. Objective data

    2.1 Collect available data such as:

        2.1.1 Current age

        2.1.2. Current weight

        2.1.3 Current chronic diseases if any

        2.1.4 Current lab results

        2.1.5 Current BMI

3. Assessment

3.1 What is pre-diabetes?

3.1.1 Pre-diabetes is a condition that develops before Diabetes type 2

3.1.2 Blood glucose levels are higher than normal, but not high enough to be Diabetes type 2

3.1.3 Pre-diabetes is a silent disease, many people will have this condition before they notice any symptoms.

3.2 How can pre-diabetes be delayed or be prevented?

3.2.1 Maintaining an ideal weight can be essential to delay any complications.

3.2.2 A low caloric diet and a low amount of fat in the body can delay and prevent the development of diabetes type 2.

3.2.3 People that are overweight and lose the excessive weight have reduced the risk of developing diabetes type 2 at early stages in their life.

3.2.4 It is recommended to reduce the amount of fat

3.2.5 It is recommended to reduce the amount of calories ingested

3.2.6 Exercise five times a week at least for thirty minutes.

3.3 How can I tell if I have pre-diabetes?

3.3.1 Pre-diabetes can be develop at all ages and in all different races

3.3.2 Some racial groups have higher risk of developing pre-diabetes

3.3.3 Pre- diabetes and Diabetes type 2 is more prevalent in:

3.3.3.1African Americans

3.3.3.2Hispanics or Latinos

3.3.3.3Native Americans

3.3.3.4Asian/Americans/Pacific Islanders

3.3.3.5All aged populations

3.3.4 There are two different tests to determine if a person has pre-diabetes

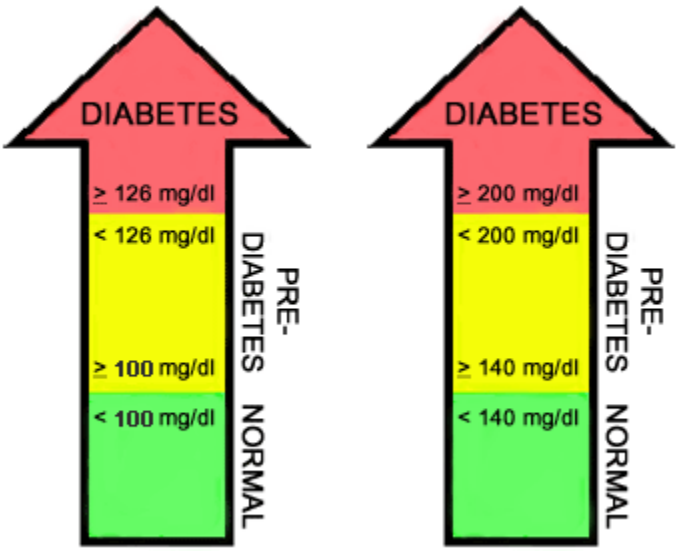
3.3.5 Blood glucose levels are checked to determine if the person has a normal metabolism

3.3.6 The Fasting Plasma Glucose test (FPG) and the Oral Glucose Tolerance Test (OGTT)

3.3.6.1These tests measure if blood glucose level is abnormal following the (FPG) the person has impaired fasting glucose (IFG). If blood glucose level is abnormal following the (OGTT), the person has impaired glucose tolerance (IGT). (American Diabetes Association)

See table number I.

Table I



FPG **OGTT**

3.5 What are the probable risks of developing pre-diabetes

3.5.1 Overweight

3.5.2 Being 45 years old or older

3.5.3 No exercise

3.5.4 Genetic pre-disposition

3.5.5 Racial background

3.5.6 High blood pressure (more than 140/90 mmHg)

3.5.7 Giving birth to a 9 lb. or heavier baby

3.5.8 Low HDL cholesterol and high triglycerides

3.6 Nutrition

3.6.1 Food is an essential part of preventing pre-diabetes

3.6.2 Recommend to follow guidelines from the Food Guide Pyramid

3.6.2.1Dairy products= 3-4 portions per day

- 1 cup of 1% milk
- 1 cup of soymilk
- 1 Slice of mozzarella cheese
- 1 cup of fat free yogurt
- 1 scoop of fat free ice cream

3.6.2.2 Meats, legumes, seeds and nuts= 3 portions or 5 ½ ounces per day

- 3 oz. of boiled, steamed or grill beef, chicken, turkey, tuna or fish
- 1 egg
- ½ cup of boiled beans, garbanzo beans, lentils, or lima beans
- 1 handful of non-salted peanuts, almonds, cashews, pecans, sunflower seeds, or pumpkin seeds
- 2 tabs of peanut butter

3.6.2.3 Vegetables= 3-5 portions or 2 1/2 cups

- 1 cup of fresh vegetables
- 2 cups of green leaf vegetables
- 2 cups of boiled vegetables

3.6.2.4 Fruits= 3-4 portions or 2 cups

- 1 cup of fresh juice
- 1 cup of fresh chopped fruits

3.6.2.5 Grains for fiber = 6 portions

- 1 slice of whole wheat bread
- ½ cup of rice or pasta
- 1 cup of cereal

- 1 corn tortilla

3.6.3 Recommended to eat non-starchy vegetables

3.6.4 Choose whole grain foods over processed grain products. Try brown rice with your stir-fry or whole wheat spaghetti with your favorite pasta sauce

3.6.5 Try to eat fish in your meals 2-3 times a week

3.6.6 Always remove skin from chicken and turkey

3.6.7 Choose water and calorie-free “diet” drinks. Avoid regular sodas and processed juices

3.6.8 Never use lard, use liquid oils such as canola or olive oil.

3.6.9 Avoid eating dressings, fried chips, desserts, alcohols, donuts, chocolates, and cookies.

3.6.10 During the holidays and special family events it is recommended to use fat free products in the preparation of foods. Also measure the portions on your plate.

3.6.11 It is also recommended to eat three regular meals with intervals of 4-5 hours, and eat healthy snacks in between meals if necessary

3.7 Exercise

3.7.1 Exercise is vital for the human body

3.7.2 Exercise helps to eliminate toxic waste from the body and also helps to reduce the amount of stress

3.7.3 Exercise is body movement also known as physical activity

3.7.4 Exercise also helps to reach goals for losing weight, maintaining weight, and reduce the chance of high blood pressure

3.7.5 Recommend to exercise 30-45 minutes a day

3.7.6 There are three types of exercise aerobic, strength training and Flexibility

3.7.7 What are some of the activities a person can do to increase physical activity?

3.7.7.1 Use stairs instead of the elevator

3.7.7.2 Park your car at the end of the parking lot

3.7.7.3 Do an activity that you enjoy, such as

- Gardening
- Bicycling
- Dancing

3.7.7.4 Try to walk every day for 30 minutes for 5 days a week

4.1 Treatment

4.1.1 Patient needs to have yearly medical examination to determine if patient is at risk of developing pre-diabetes

4.1.2 If patient if overweight or obese, it is advisable to drop some weight and to get close to his/her ideal weight as soon as possible, utilizing natural methods to lose weight

4.1.3 Eat only products that are beneficial to the body (Avoid junk foods)

4.1.4 Assess patient in stressful situations that could lead to depression, denial and anger.

4.1.5 Blood glucose tests need to be perform every year after 40.

5.1 Plan

5.1.1 Identify risks that would lead towards pre-diabetes

5.1.2 Exercise and nutrition go hand-in-hand

5.1.3 Maintain an ideal weight

5.1.4 Assist doctors' appointments when recommended

5.1.5 Walk 30-45 minutes a day

5.1.6 Don't smoke or drink alcohol

5.1.7 Choose lean meal choices (Never fried)

Handouts

- Prediabetes and diabetes
- Choose MyPlate
- Ready, Set, Start Counting
- Exercise to Stay Healthy

Sources

www.novoNordisk.org

www.ChooseMyPlate.gov

www.trackerdiabetes.org/explore

www.NextGen.org

APPENDIX C: LETTER OF HUMAN SUBJECTS APPROVAL

FRESNO STATE
College of Health and Human Services

May 11, 2017

Suzanne Kotkin-Jaszi, Ph.D.
Professor
Department of Public Health

Dear Dr. Kotkin-Jaszi,

The Department of Public Health, Committee on the Protection of Human Subjects, has approved the research project proposal submitted by you and your graduate student Irene Rios titled: "Prediabetic Interventions in the San Joaquin Central Valley at a Federally Qualified Health Center: Preventing Diabetes, a Disabling and Deathly Disease." The project was approved. Should any research protocol in the study change, please be advised you will need to resubmit your application for further review.

I hope the project goes well.

Sincerely,

Greg Thatcher, M.S.P.H., Ph.D.
Chair, Committee for the Protection of Human Subjects
Department of Public Health

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