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Utah State University

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IMPROVEMENT IN NUTRITION KNOWLEDGE AND RETENTION ABOUT
GESTATIONAL DIABETES MELLITUS AMONG HISPANIC PREGNANT WOMEN

by

Debra M. Waldron

A plan B report in partial fulfillment
of the requirements for the degree

of

MASTER OF DIETETICS ADMINISTRATION

in

Nutrition, Dietetics, and Food Sciences

Approved:

Janette Kudin, MS, RD, CD
Major Professor

Nedra Christensen, PhD, RD
Committee Chair

Ann Martin-Mildenhall, MS, RD, CD
Committee Chair

UTAH STATE UNIVERSITY
Logan, Utah

2011

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ABSTRACT

Improvement in Nutrition Knowledge and Retention about Gestational Diabetes Mellitus
among Hispanic Pregnant Women

by

Debra M. Waldron, Master in Dietetic Administration

Utah State University, 2011

Major Professor: Janette Kudin, MS, RD, CD
Department: Nutrition, Dietetics, and Food Sciences

Objective The objectives of this study were to evaluate the demographic data of the study population, compare nutrition knowledge and retention in Hispanic pregnant women who were newly diagnosed with gestational diabetes (GDM) or with a history of GDM at time of GDM diagnosis and prior to delivery, and determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in pregnant women with GDM.

Design A quasi-experimental design was used with a convenience sample.

Subjects/Setting Ninety women between the ages of 18 and 45 years and of Hispanic or Hispanic American descent were recruited for this study. Participants were selected from Van Nuys, California area that had been diagnosed with GDM for the first time or had a history of GDM.

Interventions After being diagnosed with GDM, women were referred by their obstetrics-gynecologist (OB-GYN) to Valley Presbyterian Hospital's (VPH) Perinatology Clinic for GDM management. Women received a two hour group education session with a registered dietitian (RD), were enrolled in the Sweet Success education program, and received a follow up education session one to two weeks after their first visit to the clinic.

Outcome Measure A questionnaire, along with a pre-and post-test were administered in English and Spanish to participants to assess knowledge about GDM, diet, and blood glucose management at their initial visit to the clinic. At the completion of the first follow-up visit to the clinic, the participant completed a post-test.

Statistical Analysis Demographic characteristics were first evaluated. Increase in percentage in regards to the number of questions participants got correct was also evaluated along with paired *t*-tests comparing overall knowledge improvement.

Results A majority of participants were noted to be primary of Hispanic descent, Spanish speaking, over-weight or obese, low income, having an educational level of less than 12th grade, and receiving medical care through Medi-Cal. An increase in percentage in regards to the number of questions participants got correct improved for all questions and mean test scores improved overall in participants between pre- and post-tests with a significant difference also noted.

Conclusions In conclusion, the results of this study showed an increase in knowledge retention among Hispanic pregnant women with GDM and validate the importance and impact that the Sweet Success program's education curriculum and model of care has on a women's health and the health of her unborn child.

(91 pages)

DEDICATION

To my husband, Spencer, for encouraging me to finish my Master of Dietetic
Administration degree.
To my family and friends for their love and support.

ACKNOWLEDGMENTS

I would like to thank Megan Bunch for her continuous help with my research as well as my committee members, Janette Kudin, Ann Martin-Mildenhall, and Nedra Christensen for their support and assistance throughout my entire thesis process.

I would also like to thank my co-workers at Valley Presbyterian Hospital (VPH) for their help in creating and administering the questionnaire as well the administration for allowing this study to be conducted at their facility. I hope that these findings will benefit VPH's Perinatology Clinic.

Debra M. Waldron

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LIST OF ACRONYMS

GDM=Gestational Diabetes Mellitus

US=United States

CDAPP=California Diabetes and Pregnancy Program

DM=Diabetes Mellitus

LGA=Large Gestational Age

BMI=Body Mass Index

LA=Los Angeles

VPH=Valley Presbyterian Hospital

CDHHS= California Department of Health and Human Services

HHS=US Department of Health and Human Services

HgA1C=Glycosylated Hemoglobin

OGTT=Oral Glucose Tolerance Test

NICU=Neonatal Intensive Care Unit

MNT=Medical Nutrition Therapy

OB-GYN= Obstetrics-Gynecologist

RD=Registered Dietitian

IRB=Institutional Review Board

SMOG=Simple Measure of Gobbledygook

HRE=Huerta Readability Ease

NHANES=National Health and Nutrition Examination Survey

CHAPTER 1

Gestational diabetes mellitus (GDM) affects as many as 7-10% of all pregnancies in the United States (US) each year and occurs more often in those of Hispanic, Native American, African American, Asian American, and Pacific Islander descent (1-3). The prevalence of GDM is two to three times higher in Hispanic women than that of the general population, and in the state of California alone, over fifty percent of women with GDM are of Hispanic origin with a strong association of living below the federal poverty level (4-6). In a report conducted by the California Diabetes and Pregnancy Program (CDAPP) between 2001 and 2003 on pregnant women diagnosed with GDM and who were receiving Sweet Success care, almost 9% of the women had a history of type 1 or type 2 diabetes mellitus (DM) (6).

When diabetes complicates a pregnancy, perinatal mortality and morbidity are significantly increased, as well as future complications for the mother and child (6). Children of women with GDM are at an increased risk of complications associated with hyperglycemia, such as macrosomia (large birth weight), hydroamnios (excessive or little amniotic fluid), delayed lung maturation, birth injury, cesarean delivery, newborn hypoglycemia, and stillbirth (2, 7, 8). Moreover, intensive blood glucose control is essential in preventing such complications from occurring at birth and throughout a child's lifetime.

In order to reduce poor pregnancy outcomes related to diabetes, the CDAPP has developed an educational program for GDM called Sweet Success¹. This program provides comprehensive technical support and nutrition education to healthcare

¹ Sweet Success Education Materials can be purchased only at:
<http://www.sweetsuccessexpress.com/guidelines.htm> or (714)-968-0735

professionals to assist in promoting improved pregnancy outcomes for high risk pregnant women with pre-existing diabetes and for women who develop GDM (6, 7). This management approach has shown to reduce diabetes related complications during pregnancy in comparison to the rate seen in the non-diabetic population (7).

Previous studies have measured nutrition knowledge of diabetes in those with type 1 and 2 DM but, little research has been conducted on nutrition knowledge in the GDM population (9). To date, there has been no research determining the effectiveness of the Sweet Success education program on improving nutrition knowledge about GDM among Hispanic pregnant women.

Statement of the Problem

Nutrition education and intensive blood glucose control can positively affect a child's health throughout his/her lifetime. However, it is unclear if the Sweet Success education program is effective in improving nutrition knowledge and retention about GDM among Hispanic pregnant women.

Purpose and Objectives

The purpose of this study was to determine the effectiveness of the Sweet Success education program in improving nutrition knowledge about GDM among Hispanic pregnant women. The following research objectives were formulated:

1. To evaluate the demographic data of the study population.
2. To compare nutrition knowledge and retention in Hispanic women who were newly diagnosed with GDM or with a history of GDM at time of GDM diagnosis and prior to delivery.

3. To determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in pregnant women with GDM.

Literature Review

History of Gestational Diabetes Mellitus

For over 150 years, elevated blood glucose levels have been seen in older, obese pregnant women who deliver large babies and develop diabetes later in life (10). It was not until 1949 that Priscilla White of the Joslin Clinic first diagnosed diabetes during pregnancy as "Class A diabetes" (10). Then, in 1961, O'Sullivan and Mahan (10) proposed the term GDM and established criteria for diagnosis. The authors studied 752 women to establish the criteria and 1,013 women to test the criteria, which later became a basis for diagnosing women with GDM. The International Workshop Conferences on GDM held in 1979, 1984, and 1990 further defined GDM as "a carbohydrate intolerance of variable severity with onset or first recognition during pregnancy" (10, 11).

Risk Factors

A number of risk factors have been linked to the development of GDM during pregnancy. First, women with a history of GDM during pregnancy are at risk for having GDM in subsequent pregnancies (2, 12). The risk of recurrence for GDM has been shown to increase 35.8% in a subsequent pregnancy and is also predicted to increase due to maternal weight prior to pregnancy and previous birth of a large for gestational age (LGA) infant (2, 8, 13). Other risk factors include having a family history of diabetes or being overweight. In fact, the data report from the CDAPP from Sweet Success affiliate

sites found that almost one-third of women with GDM had a body mass index (BMI) greater than 30 prior to pregnancy and almost eight percent were morbidly obese or had a BMI greater than 40 prior to pregnancy (6). Furthermore, the incidence of GDM has also been found to be 7-10 times higher among pregnant women older than 24 years old than among those younger than 24 (2, 14).

Incidence and Ethnic Variables

According to the American Diabetes Association, GDM affects about 7-10% of all pregnancies each year in the US or 200,000 women annually (1-3, 15). It occurs more often in women of Hispanic, Native American, African American, Asian American, and Pacific Islander descent and is especially prevalent in women with these ethnicities who were also born outside the US (1, 3, 16, 17). The prevalence of GDM is also two to three times higher in Hispanic women than that of the general population, and in the state of California alone, over fifty percent of women with GDM are of Hispanic origin (5, 6). In a report conducted on data from Sweet Success affiliate sites from 2001-2003, approximately 52.3% of patients enrolled in the Sweet Success program were of Hispanic descent (6).

History of Diabetes Mellitus in Los Angeles County

Diabetes mellitus is a chronic condition that has been increasing in prevalence not only globally and nationally but, also locally in Los Angeles (LA) County. Considered the sixth leading cause of death since 1997, diabetes is one of the most costly medical conditions (18). However, it can be prevented in some cases and well controlled through appropriate medical care and self-management.

A study among high-risk individuals showed that lifestyle interventions, such as improved diet and exercise or treatment with oral glycemc agents, reduced the incidence of diabetes from 58% to 31%, respectively, during a three-year period (18). Although lifestyle interventions improve diabetes outcomes, diabetes rates continue to rise rapidly especially among those of younger ages, those living in poverty, and those of Hispanic and African American descent (18). Such populations often have limited access to food, healthcare, transportation, and funds making it difficult to adequately control and manage their diabetes. Table 1 illustrates the trends in prevalence of diabetes among adults from 1997 to 2007 in LA County (18).

Table 1 Prevalence of Diabetes among Adults from 1997 to 2007 in Los Angeles County

	1997 (%)	1999 (%)	2002-03 (%)	2005 (%)	2007
Los Angeles County	6.6	7.5	7.6	8.6	9.1
Gender					
Male	6.7	7.7	7.7	8.8	9.4
Female	6.6	7.4	7.6	8.4	8.8
Race/Ethnicity					
Latino	9.5	11.3	11.4	12.3	12.8
White	4.6	5.5	5.4	5.6	5.7
African American	10.1	9.5	9.4	12.0	11.4
Asian/Pacific Islander	5.9	5.6	5.1	7.1	9.0
Age Group					
18-29	0.8	1.7	0.9	1.3	1.3
30-39	2.8	2.9	2.1	3.3	3.6
40-49	5.1	6.1	6.0	7.0	7.0
50-64	11.6	11.8	13.4	15.2	16.8
65 or over	14.3	16.8	17.8	18.3	19.2
Federal Poverty Level					
0-99% FPL	9.0	11.1	12.7	14.0	14.7
100-199% FPL	9.0	9.2	9.1	10.2	9.1
200 or above FPL	5.3	6.1	5.8	6.5	7.1

Demographic History and Diabetes Rates in the San Fernando Valley

Thirty years ago, the San Fernando Valley was a large farming community comprised mostly of Caucasians (19). Since then and according to the 2008 San Fernando Census Report, demographics have shifted in this area with Hispanics comprising over half the population in the valley (19). The highest concentrations of Hispanics can be found in the northeastern and central parts of the San Fernando Valley (i.e. Van Nuys, North Hollywood, Pacoima, and North Hills) with poverty rates also the highest and the lowest income in these areas compared to the rest of the county. In addition, an increasing prevalence of GDM in LA County has been noted in the past years. Baraban et al. (20) observed an increase in prevalence of GDM in women from 1991 to 2003 with rates increasing three-fold (from 14.5 cases per 1000 women in 1991 to 47.9 cases per 1000 in 2003). Moreover, prevalence rates were highest among Hispanics (9.9%) during this time period (20). With a shift in demographics surrounding VPH and the Van Nuys area, and with diabetes and GDM rates continuing to rise in those of Hispanic and African American descent, education is necessary to help manage diabetes.

History of Gestational Diabetes Mellitus at Valley Presbyterian Hospital

Valley Presbyterian Hospital (VPH) located in Van Nuys, California of LA County is a 350 bed acute care hospital serving those in the surrounding area, with the highest concentration of people consisting of Hispanics. With diabetes and GDM so prevalent in Hispanics and Hispanic women and prevalence rates continuing to increase each year in LA County, it was evident that there was a need for medical care especially in pregnant women (20). Thus, VPH established a perinatology clinic specializing in high

risk pregnancies including GDM and adopting the Sweet Success program's model of care. This model of care consists of educational counseling, consistent follow-up care, and active participation by women with GDM to help prevent complications at time of delivery and in their future offspring's lives.

History and Effectiveness of Sweet Success

With this in mind, the CDAPP by the Maternal, Child, and Adolescent branch of the California Department of Health and Human Services (CDHHS) established a program called Sweet Success in 1984 (6). The Sweet Success program has affiliates and providers throughout California that implement the Sweet Success program's model of care. This model of care is based on a multidisciplinary approach and emphasizes early referral to diabetes and pregnancy programs, outpatient based client education, nutrition, psychological, and medical services, and active client participation in managing diet, exercise, and medication regimens necessary to achieve optimal blood glucose control (6, 7). This management approach has shown to reduce diabetes related complications during pregnancy in comparison to the rate seen in the non-diabetic population (7).

Scheffler et al. (7) assessed the cost effectiveness of the Sweet Success program and found it to be cost effective in relation to hospital charges and length of stay for diabetic mothers and their infants. Moreover, for every dollar spent on the program, \$5.19 was saved (7). Likewise, cost-effect savings in regards to GDM screening and lifestyle change for the prevention of type 2 DM was also seen in pregnant women with GDM in India and Israel (21).

Effectiveness of Other Pregnancy Programs

While the Sweet Success program has shown to be cost effective and places a positive impact in the care of women with GDM, other pregnancy care programs have also shown to be effective. Murphy H et al. (22) evaluated regional pre-pregnancy care programs in women with type 1 and 2 DM. The study found that these programs improved pregnancy preparation among women with DM and reduced the risk of adverse outcomes in those with type 1 and 2 DM. Likewise, Mendelson et al. (13) examined a community based parish nurse intervention program for Hispanic women with GDM and found improvement in health promoting lifestyle behaviors among women with GDM indicating that programs such as this improve health behaviors in the Hispanic population.

Disease Process

Extensive research has been conducted in regards to the etiology and pathogenesis of GDM. It is known that at time of conception an increase in various diabetic causing hormones is observed. Animal studies have also shown that insulin resistance is progressive and is related to an increase in circulating levels of hormones, such as human placental lactogen, prolactin, estrogen, and free and bound cortisol, especially during the second and third trimesters (23-25). Because of elevated gestational hormones and increased maternal weight, insulin requirements double or triple by time of delivery. Most pregnant women can compensate for the increase in diabetic causing hormones while maintaining normal blood glucose levels; however, women with GDM cannot meet the increased need for additional insulin requirements thus, causing their blood glucose

the increased need for additional insulin requirements thus, causing their blood glucose levels to be elevated.

It is unclear what exactly contributes to the glucose intolerance observed in those with GDM. It is known that women with GDM are unable to produce sufficient insulin to compensate for the dramatic increase in gestational hormones during the second and third trimesters. Also, those with GDM have impaired cellular sensitivity to insulin. This has been shown to mainly occur in the skeletal muscles; however, the mechanism for action is uncertain (26). Moreover, pro-insulin, the precursor to insulin is excessive in women with GDM. It is possible that this might place stress on β -cells causing decreased insulin sensitivity during pregnancy (26).

Screening and Diagnosis

Just recently, the U.S. Department of Health and Human Services (HHS) presented new guidelines recommending women to be screened for GDM at no additional cost between 24 and 28 weeks gestation and at the first prenatal visit for women identified to be at high risk for diabetes (27). This includes women with a previous history of GDM, macrosomia or congenital malformations in her offspring, or family history of diabetes. By identifying and treating those women at risk for GDM earlier, it heeds off potential complications in both the mother and the baby.

Normal blood glucose levels are 60-130 mg/dL (10). Screening for undiagnosed type 2 DM at a women's first prenatal visit should be completed using standard diagnostic criteria which is as follow:

- 1-Glycosylated hemoglobin (HgA1C) of $\geq 6.5\%$ or
- 2-Fasting blood glucose ≥ 126 mg/dl

3-Two hour plasma glucose ≥ 200 mg/dl during oral glucose tolerance test (OGTT)

If blood glucose is normal, women will be rescreened again at 24 to 28 weeks. A screening test involves giving a woman 50 grams of oral glucose at any time of the day and measuring blood glucose one hour later. If blood glucose is >200 mg/dl, then the second step, a full diagnostic OGTT is needed and scheduled at another time. The pregnant woman is asked to fast for 8 hours and to consume a normal carbohydrate load of at least 150 grams for three days (10). The OGTT is given consisting of 75 grams of oral glucose and then followed by measuring fasting, 1 hour, 2 hour, and 3 hour blood glucose levels (27). A woman is considered positive for gestational diabetes if two or more glucose values meet or exceed the following: fasting: >95 mg/dl, 1 hour >180 mg/dl., 2 hours >155 mg/dl., and 3 hours >140 mg/dl (28).

Fetal Risks

When GDM is detected early, it can be managed and controlled by diet, exercise, and medication as needed. If normal blood glucose cannot be achieved, two main conditions could affect the baby: macrosomia and hypoglycemia. Macrosomia, also known as LGA infant, occurs in cases of maternal hyperglycemia. This occurs when blood glucose in the mother is high causing high levels of blood glucose to cross the placenta into the baby causing the baby to produce more insulin and consequently grow faster and larger (5). In addition, macrosomia has also been associated with childhood obesity with the risk of developing childhood obesity being nearly double compared to children born to non-diabetic mothers (2, 13, 29).

Hypoglycemia, also known as low blood glucose, occurs when there is a sudden drop in blood glucose when a baby is born due to excessive insulin production in the womb (2). Oftentimes, such infants will need to be admitted to the neonatal intensive care unit (NICU) until their blood glucose can be stabilized. Moreover, children of women with diabetes and hyperglycemia are at risk for organomegaly (organs that are excessively large), delayed lung maturation, birth injury, polycythemia (excess red blood cells), hyperbilirubinemia, shoulder dystocia, diabetes, hypertension, obesity, and cardiovascular diseases (6).

Maternal Risks

Not only can an infant experience complications, but a mother can also experience complications. As an infant grows larger and becomes too big to deliver vaginally due to excessive blood glucose, it places a woman at risk of having a cesarean section delivery. In addition, a woman with GDM is also at risk for preeclampsia, eclampsia, urinary tract infections, and stillbirth. If maternal blood glucose levels are kept within normal ranges, such complications are less likely to occur (6).

Medical Nutrition Therapy

Medical nutrition therapy (MNT) is the primary intervention for managing blood glucose levels in women with GDM (1, 30). The goal of MNT is to maintain normal blood glucose with the absence of urinary ketones while providing sufficient energy and nutrients to meet the needs of pregnancy. In summary, this is achieved by regularly monitoring blood glucose, encouraging the consumption of a 2,000-2,200 kilocalorie diet of healthful foods in general, managing carbohydrate intakes, promoting adequate weight

gain, testing for urinary ketones, and engaging in physical activity. If adjustments in diet therapy cannot be achieved to achieve normal blood glucose, insulin therapy and/or anti-oral glyceic agents can be prescribed to bring blood glucose down to normal.

Glucose Control

Self-monitoring of blood glucose allows a woman to actively participate in her care and reinforces the need for food modification. Health consequences related to diabetes and pregnancy also justify the need for intensive blood glucose monitoring during pregnancy, especially since it can affect a child's health throughout his/her lifetime. Although blood glucose target goals during pregnancy differ depending on the organization, there is a consensus that glucose control is critical to prevent complications of GDM (6, 31, 32).

Women enrolled in the Sweet Success program are taught how to monitor their blood glucose using a glucometer and are advised to check their blood glucose when they wake up in the morning and two hours after each meal (32, 33). With this in mind, target blood glucose levels for women enrolled in the Sweet Success program are:

Fast blood glucose: <60-90 mg/dL

2 hour post prandial: <60-120 mg/dL

Calorie and Carbohydrate Recommendations

Recommendations about how many kilocalories and carbohydrates a woman should consume vary among programs treating women with GDM. One particular study conducted by Jovanovic-Peterson et al. (34) examined percentages of carbohydrate at meals and glyceic responses in women with GDM. The researchers determined that

percentages of carbohydrates in meals in regards to glycemic response varies among individuals and that daily food records, blood glucose monitoring, and individualized diets are needed to maintain optimal blood glucose levels. However, the position of the American Dietetic Association states that at least 175 grams of carbohydrate is needed (30).

The Sweet Success program recommends women with GDM to consume approximately 2,000 to 2,200 kilocalories. Of those kilocalories, 40 to 45% should come from carbohydrate sources that are distributed into three meals and three snacks, with breakfast consisting of a smaller meal with less carbohydrate (3, 25). Breakfast recommendations are based on the increased insulin resistance noted in relation to the morning release of cortisol (28, 30, 35, 36). As the day progresses, carbohydrate and caloric intake can be increased. A typical Sweet Success program meal plan for GDM consists of the following carbohydrate recommendation ranges for each meal and snack (33):

*Breakfast: 15 grams

* Lunch: 45 to 75 grams

*Dinner: 45 to 75 grams

*Snacks: 15 grams

In addition, women are advised to limit their intake of milk to 1 cup for lunch, dinner, or snacks and to not consume milk for breakfast. Breakfast cereals are often discouraged at breakfast as the total amount of carbohydrate exceeds the recommendation of 15 grams.

Need for Physical Activity

Physical activity has been found to be effective in lowering blood glucose levels and improving insulin resistance in those with diabetes and GDM (23). Some evidence also suggests that pregnant women who engage in physical activity have a 50% chance of lowering their risk of GDM (30). Women enrolled in the Sweet Success program are encouraged to lower their blood glucose by exercising immediately following a meal for 20 to 30 minutes. Such examples of exercise include walking or swimming. These recommendations stem from the fact that blood glucose is highest immediately after a meal and physical activity will help lower blood glucose levels (32, 33).

Medications

The use of oral medications or exogenous insulin is recommended when nutrition management cannot consistently maintain normal blood glucose levels. Historically, using insulin to control blood glucose was the only option for pregnant women with GDM (10). But in 2000, Langer (24) demonstrated that blood glucose control could be achieved by using the oral agent, glyburide, as compared to exogenous insulin in women with GDM. In fact, the study, which consisted of 404 women diagnosed with GDM, found that glyburide was an equally effective alternative to insulin. Moreover, glyburide was not detected in the cord serum of any of the infants whose mothers were administered glyburide, eliminating worries that the drug would harm the baby (24). Since then, other studies have validated these findings and showed that glyburide therapy was an effective alternative to insulin in cases of GDM (10, 26).

Women who are prescribed glyburide are generally given a starting dose of 2.5 mg once or twice daily, depending on their blood glucose levels (33). The maximum daily dosage is 20 mg.

Post-Partum Management of Gestational Diabetes Mellitus

In most women, blood glucose levels return to normal after delivery of the placenta. This is due in part to the drop in pregnancy hormones associated with the release of the placenta (8). However, woman who develop GDM in one pregnancy, have a 90% chance of developing it in future pregnancies with 60% of women developing type 2 diabetes in their lifetime (8).

With this in mind, it is recommended that women with GDM be screened 6-12 weeks postpartum using either a 2 hour OGTT or fasting blood glucose with continual screening every three years after initial GDM diagnosis (37). Stasenکو et al. (37) found that even simple educational counseling during a women's pregnancy increased postpartum diabetes testing. Thus, if healthcare professionals educate women about their increased risk of developing type 2 DM, the importance of preventing DM by achieving and maintaining appropriate weight, and the need for annual blood glucose monitoring, it is possible that early onset of DM in pregnant women can be prevented (38).

Effectiveness of Education on Nutrition Knowledge about Gestational Diabetes Mellitus

Little research has been done to assess the effectiveness of the Sweet Success education program on nutrition knowledge in Hispanic women with GDM. However, some research has been conducted on nutrition knowledge in Hispanic women with

GDM. Crishi (26) evaluated improvement in knowledge of GDM management in women before and after receiving MNT. Fifteen participants with GDM were recruited for this pilot study from the Howard Center, a diabetes research and educational facility at Baylor Medical Center in Irving, Texas. A questionnaire was administered to each participant before receiving MNT at her initial and follow-up visits. It was found that knowledge of GDM management significantly improved after receiving MNT thus indicating that nutrition education is essential in managing GDM.

Likewise, when Spirito et al. (39) assessed diabetes knowledge and pregnancy, she also found a strong need for nutrition education. A total of 125 pregnant women (50 with type 1 or 2 DM and 56 with GDM) were recruited for this study. On the first clinic visit, women met with an obstetrics-gynecologist (OB-GYN), a nurse educator, and a registered dietitian (RD) to review the management of diabetes during pregnancy. At that time, they were given education materials about GDM and every week during the study, the participant's blood glucose was evaluated. Each woman was given a test called the Diabetes in Pregnancy Knowledge Screen. The test consisted of three versions of knowledge tests: one for women with GDM who were diet controlled, one for women with GDM who were treated by diet and insulin, and one for women with type 1 or type 2 DM prior to pregnancy (39). It was found that the women who had type 1 or 2 DM had higher nutrition knowledge scores compared to those who were recently diagnosed with GDM (50% vs. 70%) (39). These findings suggested that women have rudimentary knowledge of diabetes especially in cases of preexisting DM.

Programs with an integrated education component can improve patient knowledge and self-care better than programs without an education component as evidenced by a study by Van den Arent et al. (9). The study compared the effectiveness of four different primary care programs to a structured type 2 DM care plan with or without integrated education in regards to patient knowledge of diabetes, diabetes care, and disease perception. Knowledge questionnaires were given to participants (n=243) at the beginning of the program, after six months, and at twelve months. It was found that patient knowledge improved in the primary care program throughout the 12-month duration with no significant differences observed in disease perception in all the programs compared to the structured plan (9). The percentage of patients performing self-care increased in all programs, but increased more so in the programs with an educational component (9).

Moreover, Murphy A. et al. (40) compared the effectiveness of nutrition education for patients with GDM in small-group versus individual counseling sessions. Seventy-six patients participated in the study with 41 patients receiving individual counseling and 35 patients instructed in small groups consisting of 2-4 women. After patients were educated, a knowledge assessment test was administered assessing the content covered in the counseling session. Post counseling results showed a significant improvement in knowledge, regardless of counseling method, with no significant difference in knowledge improvement between patients in small-group counseling and those who received individual counseling (40). Also, a total of 27 dietitian hours were

saved when educated in a small group session, indicating cost-effectiveness for small group education sessions.

In 2001, the California Health Interview Survey also conducted a study examining diabetes management among Hispanics in California. One out of five Hispanics reported not having medical insurance compared to one out of ten Caucasians (41). Hispanics who were insured with diabetes reported a significant increase (72.5% vs. 48.9%) in taking their medications for their condition compared to those who were uninsured, and these Hispanics were also more likely to check their blood glucose levels daily (41). Thus, it could be inferred that Hispanics are at risk for more complications associated with diabetes due to the lack of insurance, language barriers, and income.

Diabetes and GDM is a problem, especially in the San Fernando Valley serviced by VPH. GDM is of particular concern because of the fetal and maternal health risks associated with uncontrolled blood glucose levels. VPH's Perinatology Clinic has a program to help better manage GDM, but it has not been evaluated. The research indicates that educational components help treat GDM with improved outcomes. Therefore, the goal of this study is to determine if there is improvement in nutrition knowledge and retention about GDM among Hispanic pregnant women.

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CHAPTER 2

Sweet Success Newsletter Article

Gestational diabetes mellitus (GDM) affects as many as 7-10% of all pregnancies in the US each year and occurs more often in those of Hispanic, Native American, African American, Asian American, and Pacific Islander descent (1-3). The prevalence of GDM is two to three times higher in Hispanic women than that of the general population (3). In the state of California alone, over fifty percent of women with GDM are of Hispanic origin with a strong association of those living below the federal poverty level (4).

When diabetes complicates a pregnancy, perinatal mortality and morbidity are significantly increased, as well as future complications for the mother and child (4). Children of women with GDM are at an increased risk of complications associated with hyperglycemia, such as macrosomia (large birth weight), hydroamnios (excessive or little amniotic fluid), delayed lung maturation, birth injury, cesarean delivery, newborn hypoglycemia, and stillbirth (2, 4, 5). Moreover, intensive blood glucose control is essential in preventing such complications from occurring at birth and throughout a child's lifetime.

In order to reduce poor pregnancy outcomes related to diabetes, the California Diabetes and Pregnancy Program (CDAPP) have developed an educational program for GDM called Sweet Success. This program has shown to reduce diabetes related complications during pregnancy in comparison to the rate seen in the non-diabetic population (6).

However, little research has been conducted on nutrition knowledge in the GDM population. To date, there has been no research determining the effectiveness of the Sweet Success education program in improving nutrition knowledge about GDM among Hispanic pregnant women.

The purpose of this study was to determine the effectiveness of the Sweet Success education program in improving nutrition knowledge about GDM among Hispanic pregnant women. The following research objectives were formulated:

1. To evaluate demographic characteristics of participants from this study.
2. To compare nutrition knowledge and retention in Hispanic women who were newly diagnosed with GDM or with a history of GDM at time of GDM diagnosis and prior to delivery.
3. To determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in pregnant women with GDM.

Project Implementation

Population and Sample

The study was conducted at Valley Presbyterian Hospital's (VPH) Perinatology clinic in Van Nuys, California in the San Fernando Valley of LA County from December 2010 to July 2011. Participants were selected from women who had been diagnosed with GDM for the first time or had a history of GDM. These participants were referred to the clinic by their OB-GYN. Women with a history of type 1 or type 2 DM were excluded

from this study. Participants (n=90) recruited for this study were between the ages of 18 and 45 years and of Hispanic or Hispanic American descent.

Procedures

A questionnaire (Appendix A) was developed to obtain demographic data. A pre-and post-test (Appendix A and B) were also developed and validated by researchers from this study as well as registered dietitians from VPH. The questionnaire and pre-and post-tests were provided to participants in either English or Spanish, depending on the reading preference of the participant and had been translated from English to Spanish by VPH's language services translator. Also, approval to conduct this study was obtained by the Institutional Review Board (IRB) at VPH and at Utah State University (Appendix C).

The questionnaire and pre-and post-tests assessed participant's knowledge about GDM, diet, and blood glucose monitoring management. The questionnaire and pre-tests were given to each participant at their initial visit to the perinatology clinic prior to receiving any nutrition education. At that time, the participant was enrolled in the Sweet Success education program and received a two-hour group educational session with a dietitian. During this initial visit, education materials were provided and the participant was educated about GDM principles such as blood glucose management, diet, and exercise.

One to two weeks after the initial two-hour session, participants returned to the clinic for an individual half hour session with a dietitian and were advised to bring their completed record of blood glucose levels. The dietitian reviewed the participant's blood glucose levels, compared what she ate with the times she ate, assessed the participant's

exercise regimen, and reviewed any nutrition education as needed. Following the completion of the first follow-up visit to the clinic, the participant completed a post-test. The dietitian and the participant met every two to four weeks until delivery.

At no time during the study were the participants' names used for data identification purposes. Rather, the participant was assigned an identification number that was used for purposes of comparing knowledge of participants before and after the education was given.

Data and Instrumentation

Data was collected from December 2010 to July 2011. One hundred thirty-two participants completed the pre-test with 90 of the 132 participants completing the post-test. The 42 participants who did not complete the post-test did not return for follow-up care due to various reasons, such as pre-term labor, fetal demise, spontaneous abortion, misdiagnosis of GDM, or follow-up care at another perinatology clinic in the area.

Data was managed and analyzed using Microsoft Excel. Demographic data was assessed using means and medians. Increase in percentage in regards to the number of questions participants got correct were also evaluated along with paired *t*-tests comparing overall knowledge improvement prior to and after completion of the education sessions.

Question Development

The pre- and post-tests were developed by researchers from this study as well as VPH dietitians. The tests were validated by ten registered dietitians with the goal to address the most important topics for GDM management. Table 2 summarizes the individual questions along with the GDM care principle.

Table 2: Development of Knowledge Questions for Survey Use and the Gestational Diabetes Mellitus (GDM) Care Principles Assessed by Them

Question	GDM Principle Addressed	References Used
1. It is important for me to eat three meals and three snacks at regularly scheduled times.	Regular meal times and snacks	2, 7, 8
2. Which of the following is one serving of carbohydrate?	Portion sizes and meal planning	7
3. Which one the following is one serving of fruit?	Portion sizes, carbohydrate counting	7
4. Circle the food that is in the “free food” group.	Portion sizes and meal planning	7
5. What could you substitute for protein if you did not want chicken?	Portion sizes and meal planning	7
6. Which of the following is in the fat group?	Portion sizes and meal planning	7
7. Which breakfast would be the best choice if you have gestational diabetes?	Portion sizes and meal planning	7-9
8. My blood sugar levels two hours after a meal should be between?	Blood glucose monitoring	7, 10, 11, 12
9. It is important to bring your blood glucose monitoring sheet to every appointment at this clinic.	Blood glucose monitoring	7
10. How many times a day should I check my blood sugars?	Blood glucose monitoring	7, 8, 17, 18
11. If my blood sugar levels are not controlled during pregnancy, which of the following could happen?	Importance of diet and glycemic control	2, 4, 5, 8, 14, 15
12. To reduce my chances of having diabetes later in life, I should...	Maintaining healthy lifestyle after pregnancy	5, 16, 17
13. Gestational diabetes usually goes away after delivery.	Likelihood of GDM returning in other preg.	5, 18, 19
14. When is the best time to exercise?	Exercise timing	13, 20
15. What should you do if your blood sugars are less than 60?	Hypoglycemia and treatment	7
16. Why is breastfeeding important?	Benefits of breastfeeding	7, 20
17. Your plate should be filled with non-starchy vegetables.	Plate method, meal planning	7
18. The food groups that contain sugar are:	Foods containing carbohydrates	7
19. Which of the following vegetables contain the most carbohydrate?	Foods containing carbohydrates	7
20. A good choice for a snack is:	Appropriate snack options	5, 7

Results

Demographics

Our first objective was to evaluate the demographic data of the study population. A total of 90 Hispanic pregnant women with GDM were included in the study. Select demographic characteristics can be seen in Table 3 with additional demographic characteristics shown in Appendix D.

Table 3: Select Demographic Characteristics of Participants

Age	N=90	Percentage Total
18-24	10	11%
25-29	21	24%
30-34	31	35%
35-39	21	22%
40+	7	8%
Body Mass Index (BMI)		
<18.5:	2	2%
18.5-24.9:	21	25%
25-29.9:	30	37%
30-39.:	29	32%
>40:	2	2%
City in Which One Lives		
Van Nuys	30	34%
Panorama City:	13	15%
North Hollywood:	9	10%
Pacoima:	5	7%
Sun Valley:	6	7%
Reseda, Northridge, Canoga Park, and North Hills	4 participants each	5%
*Other cities with 1-2% (Valencia, Winnetka, Encino, Tujunga, Palmdale, Sylmar, Mission Hills, and Studio City)		
Education Level		
Less than 8 th Grade:	33	38%
8 th to 12 th Grade:	29	33%
High School Graduate:	13	15%
College Graduate:	7	8%
Advanced Degree:	5	6%
Primary Language		
Spanish:	74	82%
English:	16	18%
Income		
Less than \$10,000:	58	66%
\$10,000-\$20,000:	17	19%
\$20,000-\$30,000:	10	11%
\$30,000+	4	4%
Type of Insurance		
Medi-Cal:	85	94%
Private:	2	2%
Self-Pay:	1	1%
Other:	2	2%

Nutrition Knowledge and Retention

Our second objective was to compare nutrition knowledge and retention in Hispanic women who were newly diagnosed with GDM or with a history of GDM at time of GDM diagnosis and prior to delivery. To better understand what the women did or did not know about GDM during pregnancy, a pre-test was administered. Table 4 summarizes the number of questions participants (n=90) got correct from the pre- and post-tests along with percentage increase for each correct question. It was noted that all questions showed an increase in number of questions correct between the pre- and post-tests along with increase in percentage change.

Table 4: Increase in Number of Questions Participants (n=90) Got Correct

Question	# Correct on Pre-Test	# Correct on Post-Test	Difference in # of Participants with a Correct Score	% Increase in # of Participants with a Correct Response
1) It is important for me to eat three meals and three snacks at regularly scheduled times.	73	85	12	16% (12/73)
2) Which of the following is one serving of carbohydrate?	45	52	7	16% (7/45)
3) Which of the following is one serving of fruit?	42	69	27	64% (27/42)
4) Circle the food that is in the "free food" group.	22	47	25	114% (25/22)
5) What could you substitute for protein if you did not want chicken?	22	37	15	68% (15/22)
6) Which of the following is in the fat group?	14	28	14	100% (14/14)
7) Which breakfast would be the best choice if you have gestational diabetes?	14	43	29	207% (29/14)

...Table 4 Continued

8) My blood sugar levels two hours after a meal should be?	28	71	43	154% (43/28)
9) It is important to bring your blood glucose monitoring sheet to every appointment at this clinic.	70	80	10	14% (10/70)
10) How many times a day should I check my blood sugars?	37	72	35	95% (35/37)
11) If my blood sugar levels are not controlled during my pregnancy, which of the following could happen?	46	81	35	76% (35/46)
12) To reduce my chances of having diabetes later in life, I should...	37	67	30	81% (30/37)
13) Gestational diabetes usually goes away after delivery.	57	84	27	47% (27/57)
14) When is the best time to exercise?	33	46	13	39% (13/33)
15) What should you do if your blood sugars are less than 60?	41	71	30	73% (30/41)
16) Why is breastfeeding important?	31	40	9	29% (9/31)
17) Your plate should be half filled with non-starchy vegetables.	40	52	12	30% (12/40)
18) The food groups that contain sugar are:	31	55	24	77% (24/31)
19) Which of the following vegetables contain sugar?	46	59	13	28% (13/46)
20) A good choice for a snack is:	19	31	12	63% (12/19)

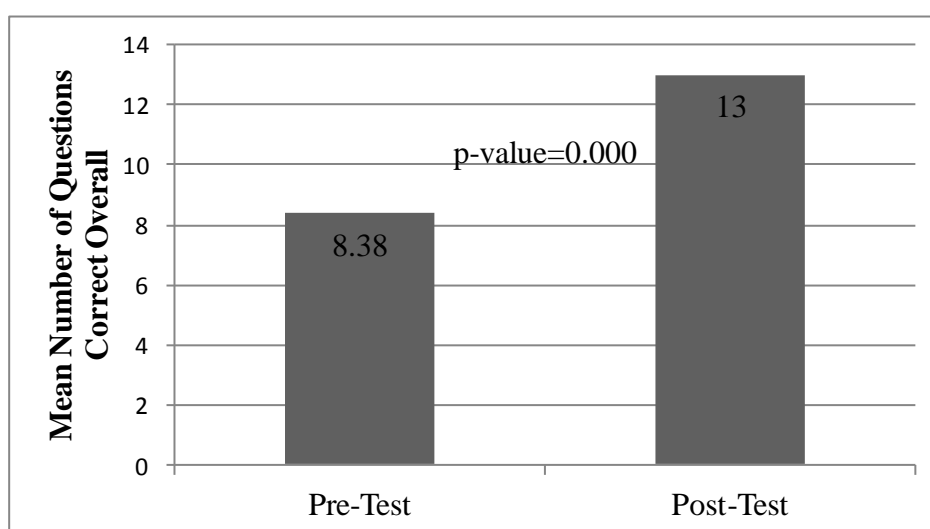
Effectiveness of Sweet Success Program Based on Overall Improvement in

Knowledge in Hispanic Pregnant Women

Our third objective was to determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in Hispanic pregnant women

with GDM. The mean knowledge for the pre-test for all participants was 8.38 with a standard deviation of 17.99, and the mean knowledge for the post-test for all participants was 13.0 with a standard deviation of 15.75. A statistically significant difference was set at a value of <0.05 . The results showed a p-value of 0.000 indicating a significant difference in improvement in knowledge overall in participants.

Figure 1: Overall Improvement in Knowledge Based on Mean Pre and Post-Test Scores



Discussion

Much research has been done to develop instruments to measure knowledge about diabetes and its management in children and adults. In 1990, Spirito et al. (20) reported a study assessing knowledge of diabetes in pregnancy in those with a history of type 1 or 2 diabetes before pregnancy and those with GDM. Likewise, Reader et al. (21) reported a study on the impact that GDM nutrition practice guidelines implemented by registered dietitians have on pregnancy outcomes. However, no study has examined the

effectiveness of the Sweet Success program in improving overall knowledge about GDM in Hispanic pregnant women.

Based on the results, demographic characteristics confirmed to researcher's prior observations about the population served at VPH. A majority of participants were noted to be primary of Hispanic descent, Spanish speaking, over-weight or obese, low income, having an educational level of less than 12th grade, and receiving medical care through Medi-Cal, California's Medicaid health program.

Percentage increase in the number of participants with a correct response increased for all questions between the pre- and post-tests. However, some questions demonstrated the need for more emphasis on carbohydrate counting, identifying foods containing fat and protein, and breastfeeding benefits. On the contrary, a majority of participants appeared to grasp the importance of blood glucose monitoring, regular meal times and snacks, and the importance of diet and glycemic control for them and their baby.

Finally, the results also found that mean test scores improved overall in participants between pre- and post-tests with a significant difference also noted, suggesting that knowledge is likely to increase one's behavior about GDM care and dietary choices as seen in the Hispanic pregnant women of this study. Likewise, it also suggests that the Sweet Success education curriculum is an effective education program and tool in teaching and increasing one's knowledge and behavior about GDM especially in Hispanic pregnant women.

These findings would be of benefit to VPH's Perinatology clinic and other area clinics as it would healthcare professional to better serve and meet the low literacy needs for this population. This can be best accomplished by clear health communication to participants as indicated by Osborn et al., Parker, and Paterson (22-24). Literature indicates that low income individuals learn best through using simple language for both written and verbal information, reducing the reading level of text written to a sixth to eighth grade level, replacing medical jargon or technical terms with everyday terms that people use, making information that is appropriate and culturally sensitive to that population, and/or using pictograms or drawings to increase understanding (22, 23).

Moreover, healthcare providers can also better serve this population by not assuming that patients understand new information when often they do not. It would be of benefit to use the 'teach back' method which involves asking participants to explain or demonstrate what they have been told and not simply asking, "do you understand?" because participants often will answer "yes" when they really do not understand (22). This type of method improves a participant's retention, recall, and comprehension of information (22).

Other factors VPH's Perinatology clinic should consider for the population being served is time spent in arranging childcare in lieu of appointments, time spent by each participant at the clinic, and location and flow of the clinic.

After reviewing the data, it was felt that if this study were to be repeated the following recommendations should be implemented:

- 1) Check HgA1C levels at initial diagnosis of GDM and at the participant's last appointment at the perinatology clinic. This will allow healthcare professionals to evaluate glycemic control prior to diagnosis and throughout pregnancy so blood glucose levels can be managed more effectively through diet, oral medications, and/or insulin.
- 2) The management of GDM should not be solely the participant's responsibility but should involve the family, significant other, spouse, and so forth. Participants should be encouraged to bring relatives, friends, or others to their counseling appointments. When someone else is present at these appointments, it means that someone else is there to support the patient and listen to and remember the advice given (22, 24).
- 3) Determine the best teaching style for adult learners when developing educational materials and lesson plans.
- 4) Based on the results, more emphasis and instruction should be placed meal planning, breastfeeding, post-partum care, and on foods that do not contain carbohydrate such as fat and protein.

However, some possible limitations of this study warrant mention. Pre- and post-tests were developed and validated by researchers from this study and VPH's registered dietitians, but the reading level was not assessed or accounted for when developing the pre- and post-test questions. It would have been beneficial to assess the readability level of the pre- and post-test English versions using a test like the Simple Measure of Gobbledygook (SMOG) Reading Formula or the Huerta Reading Ease (HRE) Formula

for the Spanish versions (25, 26). These tests would have ensured that the pre- and post-test were written at a sixth to eighth grade reading level, which is considered the average reading level of most Americans and also took into consideration the population used in this study (22, 24).

In conclusion, the results of this study makes a significant contribution to this field and validates the importance and impact that the Sweet Success program has on a women's health and the health of her unborn child.

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CHAPTER 3

Although gestational diabetes mellitus (GDM) only affects 7-10% of all pregnancies, it is still two to three times higher in Hispanic pregnant women than that of the general population, and in the state of California alone, over fifty percent of women with GDM are of Hispanic origin (1-3). The CDAPP has an educational program in managing GDM called Sweet Success. This program provides a model of care consisting of educational counseling, consistent follow-up care, and active participation by women with GDM to help achieve optimal blood glucose levels. Through intensive blood glucose control, it helps prevent complications to the mother and baby at birth and throughout a child's lifetime.

VPH is located in Van Nuys, California and services a high concentration of Hispanics people. With a historically high prevalence of GDM among Hispanic women, it was necessary to provide specialized medical care for pregnant women in this area. Thus, VPH established a perinatology clinic specializing in high risk pregnancies including GDM and adopting the Sweet Success program's model of care.

Previous studies have measured nutrition knowledge of diabetes in those with type 1 and 2 DM but, little research has been conducted to determine the effectiveness of the Sweet Success education program has on improving nutrition knowledge about GDM in the Hispanic population. Thus, the objectives of this study were to:

1. To evaluate the demographic data of the study population.
2. To compare nutrition knowledge and retention in Hispanic women who were newly diagnosed with GDM or with a history of GDM at time of GDM

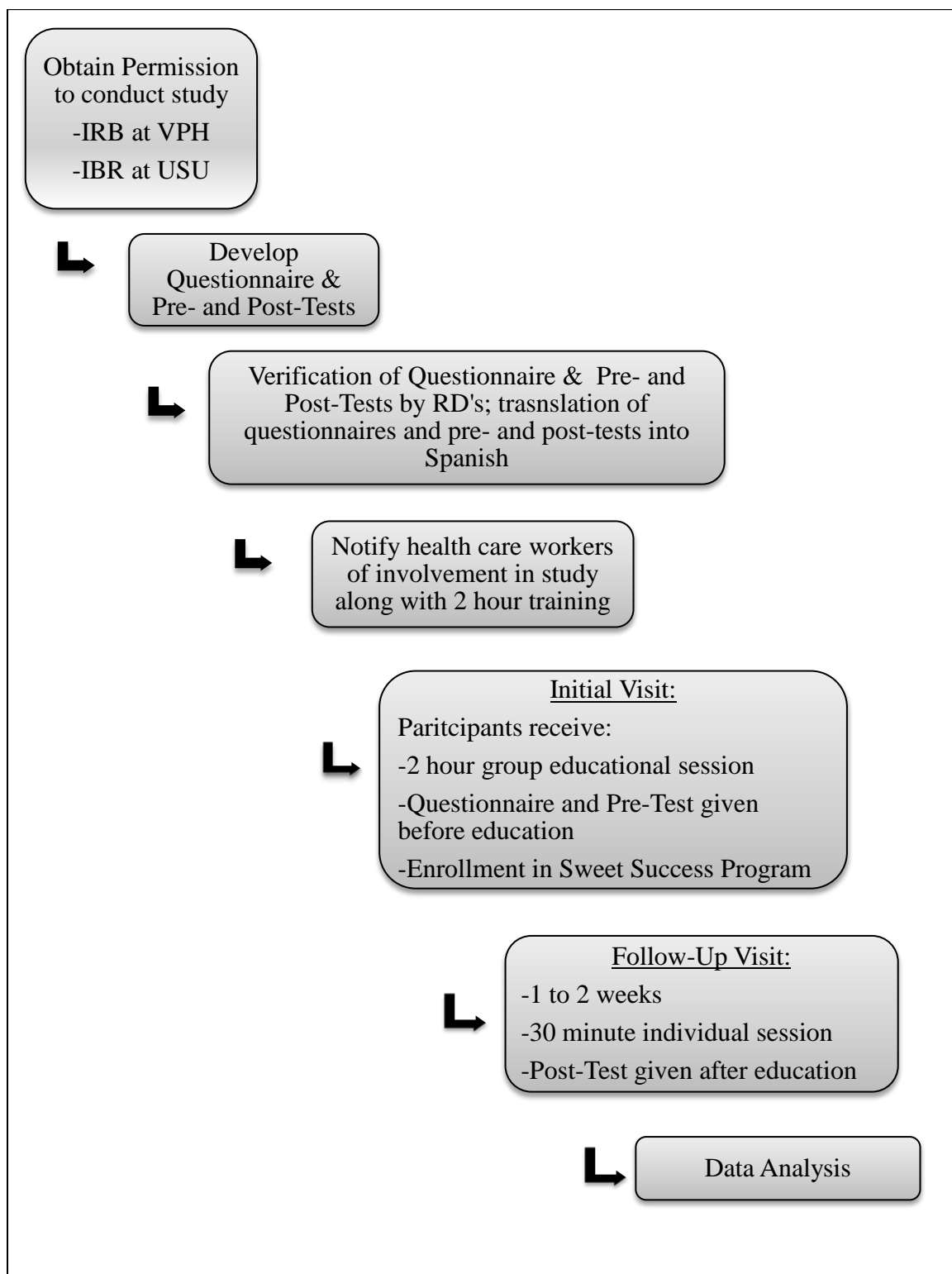
diagnosis and prior to delivery.

3. To determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in pregnant women with GDM.

Project Implementation

Figure 2 summarizes the steps taken to implement and conduct this study. It is important to note the following in regards to this project implementation:

1. All registered dietitians at the clinic participated in a two hour training in regards to the education to be given along with the time when the questionnaire and pre- and post-test were to be distributed.
2. We used the questionnaire and pre- and post-tests in Appendix A and B for recruitment and distribution to 90 participants in the clinic. The questionnaires and pre- and post-tests were translated into Spanish for those participants who preferred to read in Spanish.
3. Permission to conduct research by the IRB at VPH and at Utah State University took about one month.
4. Collecting data for pre- and post-tests for 90 participants took about 8 months. One hundred thirty-two participants completed the pre-test and received initial GDM education. Forty-two patients did not complete the post-test or return for follow-up care for a variety of reasons such as pre-term labor, fetal demise, spontaneous abortion, misdiagnosis of GDM, or follow-up care at another perinatology clinic in the area.

Figure 2: Flow Chart of Project Implementation

Question Development

Table 2 in Chapter 2 summarizes the individual questions along with the GDM care principle and importance in project implementation.

Table 2: Development of Knowledge Questions for Survey Use and the GDM Care Principles Assessed by Them

Question	GDM Principle Addressed	References Used
1. It is important for me to eat three meals and three snacks at regularly scheduled times.	Regular meal times and snacks	2, 4, 5
2. Which of the following is one serving of carbohydrate?	Portion sizes and meal planning	4
3. Which one the following is one serving of fruit?	Portion sizes, carbohydrate counting	4
4. Circle the food that is in the “free food” group.	Portion sizes and meal planning	4
5. What could you substitute for protein if you did not want chicken?	Portion sizes and meal planning	4
6. Which of the following is in the fat group?	Portion sizes and meal planning	4
7. Which breakfast would be the best choice if you have gestational diabetes?	Portion sizes and meal planning	4-6
8. My blood sugar levels two hours after a meal should be between?	Blood glucose monitoring	4, 7, 8, 9
9. It is important to bring your blood glucose monitoring sheet to every appointment at this clinic.	Blood glucose monitoring	4
10. How many times a day should I check my blood sugars?	Blood glucose monitoring	4, 5, 10, 11
11. If my blood sugar levels are not controlled during pregnancy, which of the following could happen?	Importance of diet and glycemic control	2, 5, 12-14
12. To reduce my chances of having diabetes later in life, I should...	Maintaining healthy lifestyle after pregnancy	10, 12, 21
13. Gestational diabetes usually goes away after delivery.	Likelihood of GDM returning in subsequent pregnancies	11, 12, 16
14. When is the best time to exercise?	Exercise timing	17-18
15. What should you do if your blood sugars are less than 60?	Hypoglycemia and treatment	4

...Table 2 Continued

16. Why is breastfeeding important?	Benefits of breastfeeding	4, 18
17. Your plate should be filled with non-starchy vegetables.	Plate method, meal planning	4
18. The food groups that contain sugar are:	Foods containing carbohydrates	4
19. Which of the following vegetables contain the most carbohydrate?	Foods containing carbohydrates	4
20. A good choice for a snack is:	Appropriate snack options	4, 12

Question 1 and 20 was developed to ensure participants understood the importance of regular meal times and snacks. The Sweet Success program recommends women with GDM to consume approximately 2,000 to 2,200 kilocalories. Of those kilocalories, 40 to 45% should come from carbohydrate sources that are distributed into three meals and three snacks, with breakfast consisting of a smaller meal with less carbohydrate (5, 17). Eating regular meals and snacks helps in achieving better and more consistent blood glucose levels whereas infrequent or sporadic eating can result in uncontrolled and less consistent blood glucose levels (4).

Questions 2-7 and 17-19 addressed participant's knowledge about portion sizes, carbohydrate counting, and meal planning. Carbohydrate-rich foods are important to moderate as they contribute significantly to a person's blood glucose level (4). In addition, women are advised to limit their intake of milk to 1 cup for lunch, dinner, or snacks and to not consume milk for breakfast. Breakfast cereals are often discouraged at breakfast as the total amount of carbohydrate exceeds the recommendation of 15 grams. This recommendation is based on the increased insulin resistance noted in relation to the morning release of cortisol (16, 19).

Questions 8-10 addressed blood glucose monitoring. Self-monitoring of blood glucose allows a woman to actively participate in her care and reinforces the need for food modification. Health consequences related to diabetes and pregnancy also justify the need for intensive blood glucose monitoring during pregnancy, especially since it can affect a child's health throughout his/her lifetime (2, 7-8, 12, 20).

Question 11 was written to assess if participants understood the importance of diet and glycemic control. Two main conditions could affect a baby as a result of uncontrolled blood glucose levels: macrosomia and hypoglycemia. Macrosomia occurs when blood glucose in the mother is high causing high levels of blood glucose to cross the placenta into the baby causing the baby to produce more insulin and consequently grow faster and larger (12). It also has been associated with childhood obesity (2, 13, 14). Hypoglycemia, also known as low blood glucose, occurs when there is a sudden drop in blood glucose when a baby is born due to excessive insulin production in the womb (2). Not only can an infant experience complications, but a mother is also at risk for preeclampsia, eclampsia, urinary tract infections, and stillbirth. If maternal blood glucose levels are kept within normal ranges, such complications are less likely to occur (4).

Question 11 was included to assess if participants were aware of the fact that they had a greater chance of developing diabetes later in life. Participants were encouraged to minimize their risk by maintaining a healthy weight, practicing healthy eating habits, and testing their blood glucose routinely during education. Simple educational counseling during a women's pregnancy about post-partum care and diabetes testing showed to be effective in increasing post-partum diabetes testing after delivery (11). By increasing

post-partum awareness in regards to diabetes and testing, it is possible that early onset of DM in pregnant women can be prevented as shown by Baun et al. (10, 16).

Question 12 was important to include in the tests to ensure that women with GDM were aware that they have a 90% chance of developing it in future pregnancies with a 60% chance of developing type 2 DM later in life (12).

Not only was this, but question 13 was important to include to assess if participants understood when it was the best time to exercise. Women enrolled in the Sweet Success program were encouraged to lower their blood glucose by exercising immediately following a meal for 20 to 30 minutes. This recommendation stems from the fact that blood glucose is highest immediately after a meal and physical activity will help lower blood glucose levels (17, 21) Some evidence also suggest that pregnant women who engage in physical activity have a 50% chance of lower their risk of GDM (16).

Question 14 was important to include in the tests to assess if participant's understood how to treat low blood glucose especially if they missed a meal or snack, exercised too much, drank alcoholic beverages with their food, or injected too much insulin. In such cases, it is advised to drink four ounces of milk or juice, wait 15 minutes, and recheck blood glucose to ensure that blood glucose levels have returned to normal. (4).

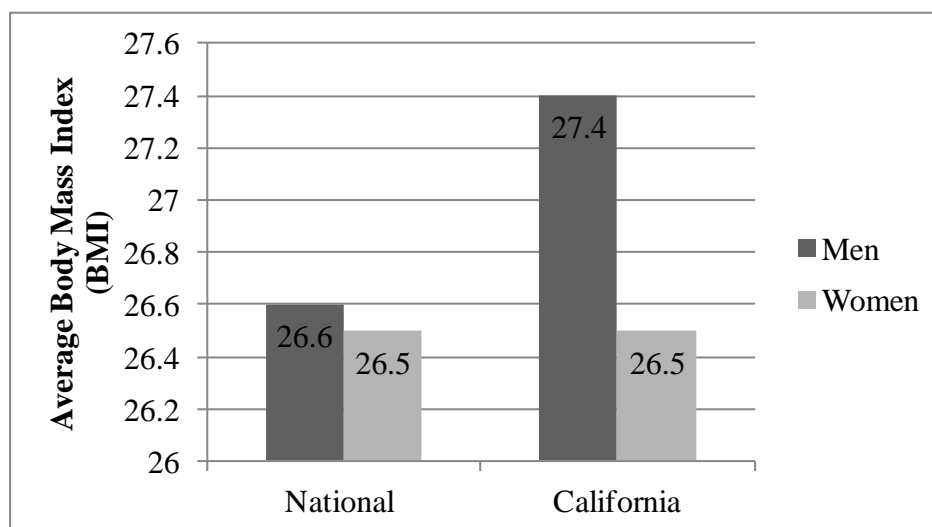
Although only touched upon during initial and follow-up education counseling sessions, question 15 was important to include in the tests to encourage breastfeeding following delivery. Breastfeeding is rich in antibodies to help infants fight infections, is convenient, free, and helps promote postpartum weight loss (4, 16).

Discussion

Demographics

Our first objective was to evaluate the demographic data of the study population. Results from the 2007-2008 National Health and Nutrition Examination Survey (NHANES) using BMI indicated that an estimated 34.2% of US adults aged 20 years and over are overweight, 33.8% are obese, and 5.7% are extremely obese with the average adult man having a BMI of 26.6 and the average adult woman having a BMI of 26.5 (22-23). In 2003, the average California women noted to have a BMI of 26.5 with the average Californian man having a BMI of 27.4 (24).

Figure 3: Average Body Mass Index (BMI) in Men and Women Nationally and in the State of California



With these statistics in mind, the results of this study indicated that participants were between the ages of 25-39 years old, which are also the ages when GDM is most

prevalent in women (12, 25). Similarly, 30 of the 90 women (33%) with GDM in our study were overweight, 29 of 90 women (32%) were obese, and 2 of 90 women (2%) were morbidly obese. The average BMI for all the women in the study was 28.64, which is above the national and California average. Moreover, a BMI greater than 25 has also been shown to increase a woman's chances of developing GDM (10, 25).

As stated previously, VPH services a high concentration of Hispanic clients around the Van Nuys area with a high prevalence of these people being Hispanic pregnant women with GDM. The study confirmed that one-third of the participants lived in Van Nuys, California. It could also be suggested that the reason for a higher number of participants from the Van Nuys area could be due to VPH accepting Medi-Cal Insurance—California's Medicaid healthcare program for children and adults with limited income and resources (26). Eighty-five of 90 women in the study received their medical care through Medi-Cal with 66% having an annual income of less than \$10,000. With such a high prevalence of this population and this type of insurance in the area, it is essential that healthcare professionals recognize insurance issues and honor this type of medical coverage from the state.

Furthermore, over one-third (38%) of the women in the study had an education level less than 8th grade with one third of the women having an education level between 9th and 12th grade. Moreover, a vast majority of these women (82%) spoke Spanish as their primary language. These demographic characteristics are important for future researchers as they must consider and attend to the needs of the population being served.

Nutrition Knowledge and Retention

Our second objective was to compare nutrition knowledge and retention in Hispanic women who were newly diagnosed with GDM or with a history of GDM at time of GDM diagnosis and prior to delivery. While percentage in correct responses improved for all questions, there were some important findings in the results. It is evident that more emphasis should be placed on carbohydrate portions as question 2 saw only a 16% increase. Another concept that may need emphasis is identifying which foods contain carbohydrate, protein and fat. Although questions 5, 6, and 19 saw a 68%, 100%, and 28% increase respectively, these questions had one of the least difference in number of participants with a correct score. Question 5 might have been confusing to participants as participants may have thought that bacon is considered a protein as it comes from a pig; however, bacon is listed as animal fat in the meal guide. Question 6 might also have been confusing to participants as they may have thought that milk or pork chops contain fat in them and chose this option; however, salad dressing contains the most fat.

Participants also seemed to not grasp the concept of the importance of breastfeeding. Question 16 showed also a lesser noticeable improvement in knowledge with only a 29% increase. This may be due to it only being briefly mentioned during nutritional counseling.

However, women seemed to grasp the importance of blood glucose monitoring, regular meal times and snacks, and the importance of diet and glycemic control for them and their baby. These three concepts showed the highest correct responses compared to

other questions thus, indicating that education may not need to be increased or altered in these areas.

Effectiveness of Sweet Success Program Based on Overall Improvement in Knowledge in Hispanic pregnant women

Our third objective was to determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in Hispanic pregnant women with GDM. The results found that mean test scores improved overall in participants between pre- and post-tests with a significant difference also noted. The results suggest that knowledge is likely to increase one's behavior about GDM care and dietary choices as seen in the Hispanic pregnant women of this study. Likewise, the findings suggest that the Sweet Success education curriculum is an effective education program and tool in teaching and increasing one's knowledge and behavior about GDM to Hispanic pregnant women.

These findings would be of benefit to VPH's Perinatology clinic and other area clinics as it would healthcare professional to better serve and meet the low literacy needs for this population. This can be best accomplished by clear health communication to participants as indicated by Osborn et al., Parker, and Paterson (27-29). Literature indicates that low income individuals learn best through using simple language for both written and verbal information, having the reading level of text written at a sixth to eighth grade level, replacing medical jargon or technical terms with everyday terms that people use, making information that is appropriate and culturally sensitive to that population, and/or using pictograms or drawings to increase understanding (27-28).

Moreover, healthcare providers can also better serve this population by not assuming that patients understand new information when often they do not. It would be of benefit to use the ‘teach back’ method which involves asking participants to explain or demonstrate what they have been told and not simply asking, “do you understand?” because participants often will answer “yes” when they really do not understand (27). This type of method improves a participant’s retention, recall, and comprehension of information (27).

Other factors VPH’s Perinatology clinic should consider for the population being served is time spent in arranging childcare in lieu of appointments, time spent by each participant at the clinic, and location and flow of the clinic. Such factors may have influenced whether the patients could attend and continue to attend the educational classes and follow-up appointments. Thus, it would be beneficial and important that VPH’s Perinatology Clinic recognizes the population served to improve access and GDM management for participants in the future.

Limitations

This study has some limitations. Ninety participants completed the pre and post-tests, with over 132 participants completing the pre-test and receiving initial GDM education. Forty-two patients did not complete the post-test or return for follow-up care for a variety of reasons such as: pre-term labor, fetal demise, spontaneous abortion, misdiagnosis of GDM, or follow-up care at another perinatology clinic in the area.

Not only this, but the reading level was not assessed or accounted for when developing the pre- and post-test questions. The questionnaire was only reviewed to assess accuracy and validity by ten registered dietitians. It would have been beneficial to assess the readability level of the English pre- and post-test versions using a test like the SMOG Reading Formula (30). However, assessing the readability level for the Spanish pre- and post-tests versions using the SMOG equation would not have been helpful as this readability equation is biased for texts written in Spanish (31). It would be more beneficial to have used the HRE formula as this formula assesses the readability of Spanish content (32-33). The SMOG and HRE equations would have ensured that the pre- and post-test for the English and Spanish versions were written at a sixth to eighth grade reading level, which is considered the average reading level of most Americans and also took into consideration the population used in this study (27, 29).

Another limitation to this study was the differences in follow-up appointments for each participant. Depending on the month, census in the clinic, and/or the number of GDM participants receiving initial diabetic education, patient follow-up appointments varied. Some participants received follow-up appointments within two weeks whereas other participants did not receive a follow-up appointment for four weeks.

Conclusions

Although GDM is estimated to occur in 7-10% of all pregnancies, prevalence rates have shown to be higher in ethnic groups such as Hispanics, African Americans, Native Americans, and Asians (1-3). Thus, intensive blood glucose control by diet,

exercise, medications, and frequent monitoring can prevent potential complications to a mother and baby from occurring.

Previous studies have measured nutrition knowledge of diabetes in those with type 1 and 2 DM but, little research has been conducted to determine if the Sweet Success education program is effective in improving nutrition knowledge about GDM in the Hispanic pregnant women. With this in mind, the objectives of this study were to evaluate the demographic data of the study population, compare nutrition knowledge and retention in Hispanic pregnant women who were newly diagnosed with GDM or with a history of GDM at time of GDM diagnosis and prior to delivery, and determine if the Sweet Success education program's curriculum was effective in improving overall knowledge in pregnant women with GDM.

The study was conducted at VPH's Perinatology clinic in Van Nuys, California in the San Fernando Valley of LA County from December 2010 to July 2011. Ninety participants were selected from women who had been diagnosed with GDM for the first time or had a history of GDM, were between the ages of 18-45 years old, and of Hispanic or Hispanic American descent. A pre-test along with demographic information was provided to each participant at their initial visit to the clinic and before any nutrition education was given. One to two weeks after the initial two hour session, participants returned for an individual half hour session with a RD to evaluate blood glucose records, diet, exercise, and review any nutrition education needed after which they were given a post-test.

Based on the results, the study found that:

- 1) A majority of participants were noted to be primary of Hispanic descent, Spanish speaking, over-weight or obese, low income, having an educational level of less than 12th grade, and receiving medical care through Medi-Cal.
- 2) Percentage increase in the number of participants with a correct response increased for all questions. However, some questions demonstrated the need for more emphasis on carbohydrate counting, identifying foods containing fat and protein, and breastfeeding benefits. On the contrary, a majority of participants appeared to grasp the importance of blood glucose monitoring, regular meal times and snacks, and the importance of diet and glycemic control for them and their baby.
- 3) The results found that mean test scores improved overall in participants between pre- and post-tests with a significant difference also noted. The results suggest that knowledge is likely to increase one's behavior about GDM care and dietary choices as seen in the Hispanic pregnant women of this study. Likewise, it also suggest that the Sweet Success education curriculum is an effective education program and tool in teaching and increasing one's knowledge and behavior about GDM to Hispanic pregnant women.

After reviewing the data, it was felt that if this study were to be repeated the following research recommendations should be implemented:

- 1) Check HgA1C levels at initial diagnosis of GDM and at the participant's last appointment at the perinatology clinic. This will allow healthcare

professionals to evaluate glycemic control prior to diagnosis and throughout pregnancy and manage blood glucose levels more effectively through diet, oral medications, and/or insulin.

- 2) The management of GDM should not be solely the participant's responsibility but should involve the family, significant other, spouse, and so forth.

Participants should be encouraged to bring relatives, friends, or others to their counseling appointments. When someone else is present at these appointments, it means that someone else is there to support the patient and list to and remember the advice (27, 29). Thus, further research can assess how family involvement influences knowledge and management outcomes of GDM care.

- 3) Determine the best teaching style for adult learners when developing educational materials and lesson plans. Some questions to consider when developing educational materials and lesson plans are:
- a. Do adult learners learn best in 15 minute increments? 30 minute?
 - b. Do adult learners learn better in a group setting? How big is the best group setting?
 - c. What is their thinking style? Reflective? Creative? Practical? Conceptual?
- 4) More emphasis and instruction should be placed on foods that do not contain carbohydrate such as fat and protein. Participants were able to recall basic foods containing carbohydrate as these foods affect blood glucose levels;

however, they had a difficult time identifying foods containing carbohydrate and fat.

Not only this, but placing more emphasis on meal planning, especially at breakfast can help participants fully understand the need for a low carbohydrate meal at this time. Participants should be taught the rationale for a low carbohydrate meal at breakfast and the role of hormones in relation to blood glucose levels in the morning.

Breastfeeding is touched upon during initial and follow-up education sessions. With VPH placing more and more emphasis on breastfeeding, it would be beneficial and an excellent opportunity to encourage participants to breastfeed, help them understand the benefits of breastfeeding, and provide resources and contact information if for breastfeeding help.

Although blood glucose levels in most women with GDM return to normal postpartum, women who develop GDM in one pregnancy, have a 90% chance of developing it in future pregnancies (10). In addition, women with GDM have a 60% chance of developing type 2 DM later in life (12). Thus, healthcare professionals should place more emphasis on postpartum care by encouraging participants to maintain a healthy weight, practice healthy eating habits, and test their blood glucose six weeks after delivery of their baby. By abiding by these recommendations, a woman's chances of developing type 2 DM drops to 25% (12).

However, some possible limitations of this study warrant mention. Pre- and post-tests were developed and validated by researchers from this study and VPH registered dietitians, but the reading level was not assessed or accounted for when developing the pre-/post-test questions. It would have been beneficial to assess the readability level of the pre- and post-test English versions using a test like the SMOG Reading Formula or the HRE Formula for the Spanish versions. These tests would have ensured that the pre- and post-test were written at a sixth to eight grade reading level, which is considered the average reading level of most Americans and also took into consideration the population used in this study (27, 29).

In conclusion, the results of this study makes a significant contribution to this field and validates the importance and impact that the Sweet Success program has on a women's health and the health of her unborn child.

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APPENDICES

APPENDIX A
(Questionnaire and Pre-Test in English and Spanish)

VALLEY PRESBYTERIAN HOSPITAL PERINATOLOGY CLINIC
GESTATIONAL DIABETES EDUCATION PROGRAM

DO NOT PUT YOUR NAME ON THIS PAPER

You are invited to participate in this research study which is about assessing the effectiveness of the Sweet Success Education Program given by the registered dietitians (RD) has on nutrition knowledge given to you. I am a graduate student at Utah State University, and I am conducting this study as part of my coursework. I am interested in finding out if the education given to you is effective and improves your knowledge about gestational diabetes and how to control it.

Your participation in this study will require completion of the following questionnaire at the beginning of the gestational diabetes class and again at your last appointment to this clinic. The questionnaire should take approximately ten to fifteen minutes and will be kept confidential. Your participation will be anonymous and you will not be paid for being part of this study. This questionnaire involves minimal risk to you. However, the benefits of your participation will show how well I and the other RD's have done in educating you about gestational diabetes and if any changes need to be made with the education curriculum.

I would appreciate you answering the questions below; however, this is not part of Valley Presbyterian Hospital's Perinatology Clinic. You do not have to be in this study if you do not want to be. We will be happy to answer any questions you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact me, Debbie Waldron, at (818)-902-2976. If you have any questions about your rights as a research participant, you may contact the IRB Administrator; Utah State University, 9530 Old Main Hill; Logan, Utah 84322; true.fox@usu.edu or (435)-797-1821. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Thank you for your participation.

By completing this set of questions, you are giving your informed consent to participate in this study.

DEMOGRAPHICS

Please circle or fill in the best answer.

1. What is your age?

2. How many weeks pregnant are you?

3. When is your date of delivery?

4. How tall are you?

5. What was your weight before your pregnancy?

6. What is your current weight?

7. Where were you born?
 - a. United States
 - b. Central America
 - c. South America
 - d. Other
8. What city do you live in?

9. What is the highest education level you have completed?
 - a. Less than 8th grade
 - b. 8th to 12th grade
 - c. High school graduate
 - d. College graduate
 - e. Advanced degree
10. What is your current marital status?
 - a. Single, never married
 - b. Married
 - c. Separated
 - d. Divorced
 - e. Widowed
11. What is your primary language?
 - a. English
 - b. Spanish
 - c. Other (please specify)

12. How many living children do you have?
 - a. 0
 - b. 1
 - c. 2
 - d. 3
 - e. 4
 - f. 5
 - g. 6+
13. What is your main means of transportation to this clinic?
 - a. Personal car
 - b. Taxi
 - c. Bus
 - d. Bike
 - e. Walk
 - f. Through a friend
14. Are you currently employed?
 - a. Yes
 - b. No
15. What is your total household income, including all earners in your household?
 - a. Less than \$10,000
 - b. \$10,000 to \$20,000
 - c. \$20,000 to \$30,000
 - d. \$30,000 to \$40,000
 - e. \$40,000 to \$50,000
 - f. \$50,000 to \$60,000
 - g. \$60,000 to \$70,000
 - h. \$70,000 to \$80,000

16. What type of insurance do you have?
- Medical
 - Medicaid
 - Private (HMO, PPO)
 - Self-pay

17. Do you receive any supplemental income (such as Women, Infants, and Children (WIC), Food Stamps, etc.)?
- Yes
 - No

Continue below--

GESTATIONAL DIABETES EDUCATION

Please circle or fill in the best answer.

- It is important for me to eat three meals and three snacks at regularly scheduled times.
 - Yes
 - No
 - Not sure
- Which of the following is **one** serving of carbohydrate?
 - ¼ cup lettuce
 - 3 ounce hamburger patty
 - 1/3 cup of cooked rice
 - 2 tortillas
 - Not sure
- Which of the following is one serving of fruit?
 - 3 whole peaches
 - 1 whole mango
 - 1 large apple
 - 1 small banana
 - Not sure
- Circle the food that is in the “free food” group.
 - Decaf coffee
 - Grapes
 - Yogurt
 - Peas
 - Not sure
- What could you substitute for protein if you did not want chicken?
 - 2 slices of bacon
 - 1 slice of bread
 - 2 Tablespoons of peanut butter
 - 1 banana
 - Not sure
- Which of the following is in the fat group?
 - Milk
 - Pork Chops
 - Tortillas
 - Salad dressing
- Which breakfast would be the best choice if you have gestational diabetes?
 - 1 cup milk, ½ cup orange juice, 1 cup cereal
 - 1 egg, 1 cup oatmeal, ½ cup apple juice
 - 2 tablespoons peanut butter, 2 slices of toast
 - 3 pancakes, ¼ cup maple syrup, 1 Tablespoon butter, ½ cup grape juice.
 - Not sure
- My blood sugar levels two hours after a meal should be between?
 - 80 to 120
 - 150-200
 - 200-300
 - 60-120
 - Not sure
- It is important to bring your blood glucose monitoring sheet to every appointment at this clinic.
 - Yes
 - No
 - Not sure

10. How many times a day should I check my blood sugars?
 a. 2
 b. 4
 c. 6
 d. Less than 2
 e. More than 6
 f. Not sure
11. If my blood sugar levels are not controlled during my pregnancy, which of the following could happen?
 a. My baby could be born with a low birth weight
 b. My baby could be born with diabetes
 c. My baby would weigh more than nine (9) pounds
 d. Not sure
12. To reduce my chances of having diabetes later in life, I should ...
 a. Maintain a healthy weight
 b. Maintain healthy eating habits
 c. Have my blood sugar tested regularly
 d. All of the above
 e. Not sure
13. Gestational diabetes usually goes away after delivery.
 a. Yes
 b. No
 c. Not sure
14. When is the best time to exercise?
 a. Before checking blood sugars
 b. Right after you eat
 c. Only in the morning
 d. Only in the evening
 e. Not sure
15. What should you do if your blood sugars are less than 60?
 a. Walk for fifteen (15) minutes
 b. Drink 4 ounces of milk or juice, wait 15 minutes, and check your blood sugars again
 c. Nothing
 d. Not sure
16. Why is breastfeeding important?
 a. Breast milk is full of antibodies that help your baby fight infections.
 b. It is easy, convenient, and free.
 c. It burns calories and helps a woman lose weight.
 d. All of the above.
 e. Not sure
17. Your plate should be half filled with non-starchy vegetables.
 a. Yes
 b. No
 c. Not sure
18. The food groups that contain sugar are:
 a. Vegetables, milk, and meats
 b. Fruit, starch/grains, and milk
 c. Fat, fruit, and starch/grains
 d. Vegetables, starch/grains, and meat
 e. Not sure
19. Which of the following vegetables contain the most carbohydrate?
 a. Cabbage
 b. Potato
 c. Tomato
 d. Broccoli
 e. Not sure
20. A good choice for a snack is:
 a. 1-6 inch tortilla with cheese
 b. Peanut butter and crackers (6)
 c. Half sandwich with ham, chicken, or turkey
 d. All of the above
 e. Not sure

--Thank you for your participation

HOSPITAL VALLEY PRESBYTERIAN CLÍNICA PERINATOLÓGICA
PROGRAMA EDUCACIONAL PARA DIABETES GESTACIONAL

NO PONGA SU NOMBRE EN ESTE PAPEL

Está usted invitado a participar en este estudio de investigación acerca de la efectiva accesoria del Programa Educacional Éxito Dulce impartidos por dietistas registrados (DR) que les darán un conocimiento de nutrición. Soy un estudiante graduado de la Universidad del Estado de Utah, y estoy conduciendo este estudio como parte de mi curso de trabajo. Estoy interesado en averiguar si la educación que se les proporciona es efectiva y mejora su conocimiento acerca de la diabetes gestacional y como controlarla.

Su participación en este estudio requerirá el completar el siguiente cuestionario al principio de la clase de diabetes gestacional y de nuevo en su última cita a esta clínica. El cuestionario toma aproximadamente de diez a quince minutos y será tratado en forma confidencial. Su participación será anónima y no se le pagará por ser parte de este estudio. Este cuestionario tiene un mínimo riesgo para usted. Sin embargo, los beneficios de su participación demostrará que tan bien yo y el otro dietista registrado hemos logrado en educarlos sobre la diabetes gestacional y si otros cambios se necesitan hacer con el curriculum educacional.

Apreciaría su respuesta a las preguntas indicadas a continuación; sin embargo, esto no es parte del Hospital Valley Presbyterian Clínica Perinatólogica. Usted no tiene que participar en este estudio si no lo desea. Nosotros estaremos complacidos en contestar cualquier pregunta que tenga acerca de este estudio. Si tiene otras preguntas acerca de este proyecto ó si tiene un problema relacionado con investigación, se puede comunicar con Debbie Waldron al (818) 902-2976. Si tiene preguntas acerca de sus derechos como un participante de investigación puede comunicarse con el Administrador de IRB; Universidad del Estado de Utah, 9530 Old Main Hill; Logan, Utah 84322; true.fox@usu.edu ó llamar al (435) 797-1821. El IRB es un grupo de personas que revisan estudios de investigación para proteger los derechos y bienestar de los participantes de investigación.

Gracias por su participación.

Al completar este grupo de preguntas, usted estará dando su consentimiento informativo para participar en este estudio.

DEMOGRAFICOS

Por favor circule ó complete la mejor respuesta.

1. Cuál es su edad?

2. Cuántas semanas de embarazo tiene usted?

3. Cuando es la fecha del parto?

4. Cuánto mide de altura?

5. Cuál era su peso antes de su embarazo?

6. Cuál es su peso actual?

7. Dónde usted nació?
 - a. Estados Unidos
 - b. América Central
 - c. Sudamérica
 - d. Otro
8. En que ciudad vive?

9. Cuál es el nivel de educación más alta que completó?
 - a. Menos del grado 8th
 - b. Del 8th al 12th grados
 - c. Graduado de Preparatoria
 - d. Graduado del Colegio
 - e. Grado Avanzado
10. Cuál es su actual estado civil?
 - a. Soltera, nunca casada
 - b. Casada
 - c. Separada
 - d. Divorciada
 - e. Viuda
11. Cuál es su primer idioma?
 - a. Inglés
 - b. Español
 - c. Otro (por favor especifique)

12. Cuántos hijos vivos tiene usted?
 - a. 0
 - b. 1
 - c. 2
 - d. 3
 - e. 4
 - f. 5
 - g. 6+
13. Cuál es su principal medio de transporte para llegar a esta clínica?
 - a. Carro personal
 - b. Taxi
 - c. Camión
 - d. Bicicleta
 - e. Caminando
 - f. A través de un amigo
14. Está usted actualmente empleado?
 - a. Si
 - b. No
15. Cuál es su ingreso total para la casa, incluyendo otros que también compartan ingresos en la casa?
 - a. Menos de \$10,000
 - b. \$10,000 a \$20,000
 - c. \$20,000 a \$30,000
 - d. \$30,000 a \$40,000
 - e. \$40,000 a \$50,000
 - f. \$50,000 a \$60,000
 - g. \$60,000 a \$70,000
 - h. \$70,000 a \$80,000

16. Qué clase de aseguranza tiene?
- Medical
 - Medicaid
 - Privada (HMO, PPO)
 - Usted la paga
17. Recibe usted algún ingreso suplemental (tal como Women, Infants, and Children (WIC), estampillas para comida, etc.?)
- Si
 - No

Continuar bajo----

EDUCACIÓN DE DIABETES GESTACIONAL

Por favor circule ó complete la mejor respuesta.

- Me es importante comer tres comidas y tres aperitivos con un horario regular.
 - Si
 - No
 - No estoy segura
- Cuál de los siguientes tiene una porción de carbohidrato?
 - ¼ de taza con lechuga
 - 3 onzas carne de hamburguesa
 - 1/3 taza de arroz cocido
 - 2 tortillas
 - No estoy segura
- Cuál de lo siguiente tiene una porción de fruta?
 - 3 duraznos enteros
 - 1 mango entero
 - 1 manzana grande
 - 1 plátano chico
 - No estoy segura
- Circule la comida que pertenece al grupo de "comida libre".
 - Café decafeinado
 - Uvas
 - Yogurt
 - Chicharos
 - No estoy segura
- Cómo podría substituir proteína si usted no quiere pollo?
 - 2 rebanadas de tocino
 - 1 rebanada de pan
 - 2 cucharadas grandes de mantequilla de cacahuete
 - 1 plátano
 - No estoy segura
- Cuál pertenece al grupo de grasa?
 - Leche
 - Chuletas de Puerco
 - Tortillas
 - Aderezo para ensalada
 - No estoy segura
- Cuál desayuno sería la mejor selección si usted tiene diabetes gestacional?
 - 1 taza de leche, ½ taza de jugo de naranja, 1 taza de cereal
 - 1 huevo, 1 taza de avena, ½ taza jugo de manzana
 - 2 cucharadas grandes de Mantequilla de cacahuete, 1 rebanada de pan tostado
 - 3 panqueques, ¼ taza de miel de Maple, 1 cucharada grande de mantequilla, ½ taza de jugo de uva
 - No estoy segura
- Mi nivel de azúcar en la sangre dos horas después de una comida deben de ser entre?
 - 60 a 120
 - 80 a 120
 - 150 a 200
 - 200 a 300
 - No estoy segura
- Es importante llevar a cada cita el record donde monitorea diariamente.
 - Sí
 - No
 - No estoy segura

10. Cuántas veces al día debo de revisar mi azúcar en la sangre?
- 2
 - 4
 - 6
 - Menos de 2
 - Más de 6
 - No estoy segura
11. Si mis niveles de azúcar en la sangre no se controlan durante el embarazo, cuál de las siguientes puede pasar?
- Mi bebé podría nacer con bajo peso al nacer
 - Mi bebe podría nacer con la diabetes
 - Mi bebe podría pesar más de nueve (9) libras
 - No estoy segura
12. Para reducir mis posibilidades de tener diabetes más adelante en la vida, debo...
- Mantener un peso saludable
 - Mantener hábitos alimenticios saludables
 - Debo revisar el nivel de la azúcar regularmente.
 - Todas las anteriores
 - No estoy segura
13. La diabetes gestacional generalmente desaparece después del parto.
- Sí
 - No
 - No estoy segura
14. ¿Cuándo es el mejor momento para hacer ejercicio?
- Antes de comprobar el nivel de azúcar en la sangre.
 - Inmediatamente después de comer
 - Sólo en la mañana
 - Sólo por la noche
 - No estoy segura
15. ¿Qué debo hacer si azúcar en la sangre es menos de 60?
- Caminar por quince (15) minutos
 - Tomar 4 onzas de leche o jugo, espere
 - 15 minutos, y revisar el nivel de azúcar en la sangre
 - Nada
 - No estoy segura
16. ¿Por qué es importante la lactancia materna?
- La leche materna está llena de anticuerpos que ayudan a su bebé a combatir las infecciones.
 - Es fácil, conveniente y gratis.
 - Quema calorías y ayuda a una mujer a perder peso.
 - Todas las anteriores.
 - No estoy segura
17. Su plato debe ser la mitad de verduras sin almidón.
- Sí
 - No
 - No estoy segura
18. Los grupos de alimentos que contienen azúcar son los siguientes:
- Verduras, leche y carnes
 - Frutas, almidón/granos, y leche
 - Grasa, frutas, y el almidón/granos
 - Hortalizas, almidón/granos, y carne
 - No estoy segura
- 19.Cuál de estas verduras contiene azúcar?
- Repollo
 - Papas
 - Tomate
 - Brócoli
 - No estoy segura
20. Una buena selección de aperitivos es:
- 1-6 pulgadas de tortilla con queso
 - Mantequilla de cacahuate con galletas (6)
 - Mitad de un sándwich con jamón, pollo, o pavo
 - Todo lo de arriba

APPENDIX B
(Post-Test in English and Spanish)

DO NOT PUT YOUR NAME ON THIS PAPER

Thank you for your continued participation in this study. Now that you have been educated several times by a registered dietitian, we would like to evaluate if the education given to you has increased your knowledge about gestational diabetes. We would appreciate you answering the questions below; however, this is not part of Valley Presbyterian Hospital's Perinatology Clinic and you are not required to complete this questionnaire. However, the benefits of your participation will show how well I and the other RD's have done in educating you about gestational diabetes and if any changes need to be made with the education curriculum. All materials will be kept confidential. **By completing this set of questions, you are giving your informed consent to participate in this study.**

GESTATIONAL DIABETES EDUCATION

Please circle or fill in the best answer.

1. It is important for me to eat three meals and three snacks at regularly scheduled times.
 - d. Yes
 - e. No
 - f. Not sure
2. Which of the following is **one** serving of carbohydrate?
 - a. ¼ cup lettuce
 - b. 3 ounce hamburger patty
 - c. 1/3 cup of cooked rice
 - d. 2 tortillas
 - e. Not sure
3. Which of the following is one serving of fruit?
 - a. 3 whole peaches
 - b. 1 whole mango
 - c. 1 large apple
 - d. 1 small banana
 - e. Not sure
4. Circle the food that is in the "free food" group.
 - a. Decaf coffee
 - b. Grapes
 - c. Yogurt
 - d. Peas
 - e. Not sure
5. What could you substitute for protein if you did not want chicken?
 - a. 2 slices of bacon
 - b. 1 slice of bread
 - c. 2 Tablespoons of peanut butter
 - d. 1 banana
 - e. Not sure
6. Which of the following is in the fat group?
 - a. Milk
 - b. Pork Chops
 - c. Tortillas
 - d. Salad dressing
 - e. Not sure
7. Which breakfast would be the best choice if you have gestational diabetes?
 - a. 1 cup milk, ½ cup orange juice, 1 cup cereal
 - b. 1 egg, 1 cup oatmeal, ½ cup apple juice
 - c. 2 tablespoons peanut butter, 2 slices of toast
 - d. 3 pancakes, ¼ cup maple syrup, 1 Tablespoon butter, ½ cup grape juice.
 - e. Not sure
8. My blood sugar levels two hours after a meal should be between?
 - a. 80 to 120

- b. 150-200
c. 200-300
d. 60-120
e. Not sure
9. It is important to bring your blood glucose monitoring sheet to every appointment at this clinic.
a. Yes
b. No
c. Not sure
10. How many times a day should I check my blood sugars?
a. 2
b. 4
c. 6
d. Less than 2
e. More than 6
f. Not sure
11. If my blood sugar levels are not controlled during my pregnancy, which of the following could happen?
a. My baby could be born with a low birth weight
b. My baby could be born with diabetes
c. My baby would weigh more than nine (9) pounds
d. Not sure
12. To reduce my chances of having diabetes later in life, I should ...
a. Maintain a healthy weight
b. Maintain healthy eating habits
c. Have my blood sugar tested regularly
d. All of the above
e. Not sure
13. Gestational diabetes usually goes away after delivery.
a. Yes
b. No
c. Not sure
14. When is the best time to exercise?
a. Before checking blood sugars
b. Right after you eat
c. Only in the morning
d. Only in the evening
e. Not sure
15. What should you do if your blood sugars are less than 60?
a. Walk for fifteen (15) minutes
b. Drink 4 ounces of milk or juice, wait 15 minutes, & check again
c. Nothing
d. Not sure
16. Why is breastfeeding important?
a. Breast milk is full of antibodies and helps fight infections.
b. It is easy, convenient, and free.
c. It burns calories and helps a woman lose weight.
d. All of the above.
e. Not sure
17. Your plate should be half filled with non-starchy vegetables.
a. Yes
b. No
c. Not sure
18. The food groups that contain sugar are:
a. Vegetables, milk, and meats
b. Fruit, starch/grains, and milk
c. Fat, fruit, and starch/grains
d. Vegetables, starch/grains, & meat
e. Not sure
19. Which of the following vegetables contain the most carbohydrate?
a. Cabbage
b. Potato
c. Tomato
d. Broccoli
e. Not sure
20. A good choice for a snack is:
a. 1-6 inch tortilla with cheese
b. Peanut butter and crackers (6)
c. Half sandwich
d. All of the above
e. Not sure

--Thank you for your participation--

NO PONGA SU NOMBRE EN ESTE PAPEL

Gracias por su continua participación en este estudio. Ahora que usted varias veces ha recibido educación de parte de un dietista registrado, quisiéramos evaluar si la educación que se le ha impartido ha aumentado su conocimiento acerca de la diabetes gestacional. Le agradeceríamos si usted contesta las preguntas indicadas abajo; sin embargo esto no es parte del Hospital Valley Presbyterian Clínica Perinatólogica y no se requiere completar este cuestionario. Sin embargo, los beneficios de su participación demostrarán que tan bien yó y el otro dietista registrado lo hemos educado acerca del diabetes gestacional y si hay algunos cambios que hacerse al currículum educacional. Todos los materiales serán tratados en forma confidencial.

Al completar este grupo de preguntas, usted estará dando su consentimiento informativo para participar en este estudio.

EDUCACIÓN DE DIABETES GESTACIONAL

Por favor circule ó complete la mejor respuesta.

1. Me es importante comer tres comidas y tres aperitivos con un horario regular.
 - a. Si
 - b. No
 - c. No estoy segura
- 2.Cuál de los siguientes tiene una porción de carbohidrato?
 - a. ¼ de taza con lechuga
 - b. 3 onzas carne de hamburguesa
 - c. 1/3 taza de arroz cocido
 - d. 2 tortillas
 - e. No estoy segura
- 3.Cuál de lo siguiente tiene una porción de fruta?
 - a. 3 duraznos enteros
 - b. 1 mango entero
 - c. 1 manzana grande
 - d. 1 plátano chico
 - e. No estoy segura
4. Circule la comida que pertenece al grupo de "comida libre".
 - a. Café decafeinado
 - b. Uvas
 - c. Yogurt
 - d. Chicharos
 - e. No estoy segura
5. Cómo podría substituir proteína si usted no quiere pollo?
 - a. 2 rebanadas de tocino
 - b. 1 rebanada de pan
- 6.Cuál pertenece al grupo de grasa?
 - a. Leche
 - b. Chuletas de Puerco
 - c. Tortillas
 - d. Aderezo para ensalada
 - e. No estoy segura
- 7.Cuál desayuno sería la mejor selección si usted tiene diabetes gestacional?
 - a. 1 taza de leche, ½ taza de jugo de naranja, 1 taza de cereal
 - b. 1 huevo, 1 taza de avena, ½ taza jugo de manzana
 - c. 2 cucharadas grandes de Mantequilla de cacahuete, 1 rebanada de pan tostado
 - d. 3 panqueques, ¼ taza de miel de Maple, 1 cucharada grande de mantequilla, ½ taza de jugo de uva
 - e. No estoy segura
8. Mi nivel de azúcar en la sangre dos horas después de una comida deben de ser entre?
 - a. 60 a 120
 - b. 80 a 120
 - c. 150 a 200
 - d. 200 a 300
 - e. No estoy segura
9. 2 cucharadas grandes de mantequilla de cacahuete
10. 1 plátano
11. No estoy segura

9. Es importante llevar a cada cita el record donde monitorea diariamente.
- Sí
 - No
 - No estoy segura
10. Cuántas veces al día debo de revisar mi azúcar en la sangre?
- 2
 - 4
 - 6
 - Menos de 2
 - No estoy segura
11. Si mis niveles de azúcar en la sangre no se controlan durante el embarazo, cuál de las siguientes puede pasar?
- Mi bebé podría nacer con bajo peso al nacer
 - Mi bebe podría nacer con la diabetes
 - Mi bebe podría pesar más de 9 libras
 - No estoy segura
12. Para reducir mis posibilidades de tener diabetes más adelante en la vida, debo...
- Mantener un peso saludable
 - Mantener hábitos alimenticios saludables
 - Debo revisar el nivel de la azúcar regularmente.
 - Todas las anteriores
 - No estoy segura
13. La diabetes gestacional generalmente desaparece después del parto.
- Sí
 - No
 - No estoy segura
14. ¿Cuándo es el mejor momento para hacer ejercicio?
- Antes de comprobar el nivel de azúcar en la sangre.
 - Inmediatamente después de comer
 - Sólo en la mañana
 - Sólo por la noche
 - No estoy segura
15. ¿Qué debo hacer si azúcar en la sangre es menos 60?
- Caminar por quince (15) minutos
 - Tomar 4 onzas de leche o jugo, espere 15 minutos, y revisar el
 - Nada
 - No estoy segura
16. ¿Por qué es importante la lactancia materna?
- La leche materna está llena de anticuerpos que ayudan a su bebé a combatir las infecciones.
 - Es fácil, conveniente y gratis.
 - Quema calorías y ayuda a una mujer a perder peso.
 - Todas las anteriores.
 - No estoy segura
17. ¿Su plato debe ser la mitad de verduras sin almidón.
- Sí
 - No
 - No estoy segura
18. Los grupos de alimentos que contienen azúcar son los siguientes:
- Verduras, leche y carnes
 - Frutas, almidón/granos, y leche
 - Grasa, frutas, y el almidón/granos
 - Hortalizas, almidón/granos, y carne
 - No estoy segura
- 19.Cuál de estas verduras contiene azúcar?
- Repollo
 - Papas
 - Tomate
 - Brócoli
 - No estoy segura
20. Una buena selección de aperitivos es:
- 1-6 pulgadas de tortilla con queso
 - Mantequilla de cacahuate con galletas (6)
 - Mitad de un sándwich con carne
 - Todo lo de arriba
 - No estoy segura

APPENDIX C
(Institutional Review Board Letter from Valley Presbyterian Hospital)



November 9, 2010

Debbie Waldron, RD
 Valley Presbyterian Hospital
 15107 Vanowen Street
 Van Nuys, CA 91405

Re: Sweet Success Education Program

Dear Ms. Waldron:

I have reviewed your proposed study to determine the effectiveness of the Sweet Success Education program on improving nutrition knowledge and retention about gestational diabetes among Hispanic pregnant women. I understand there will be a total of 100 women invited to participate in the study at their initial visit to the VPH Perinatology Clinic and that the study is for data gathering only. I am approving the study to begin on December 1, 2010 and to conclude on May 31, 2011. The study will be forwarded to the January 6, 2011 IRB meeting for review and formal approval.

You will be responsible to inform the Institutional Review Board upon occurrence of any of the following:

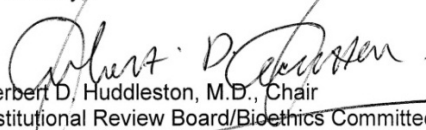
1. Terminations, discontinuations or completions of study.
2. Any revisions/amendments to the study.
3. Adverse reactions and unexpected events.

You or your representative will be required to present an Annual Report to the IRB before December 31, 2011. This report should include the following items:

1. A written annual report including the total number of patients enrolled in the study including benefits, adverse reactions, and withdrawals from the study and reason for withdrawal.
2. Any revisions/amendments to the protocol not previously submitted.
3. A current risk-benefit assessment based on study results from sponsoring agency.
4. Research results obtained thus far.

If you have any questions, please do not hesitate to contact me at 818/708-9090.

Yours truly,


 Herbert D. Huddleston, M.D., Chair
 Institutional Review Board/Bioethics Committee

lp

APPENDIX D
(Additional Demographic Data)

Weeks Pregnant	N=90	Percentage Total
6 -12	20	21%
13-20	16	18%
21-27	15	17%
28-34	35	39%
35-40	5	5%
Due Date		
January	2	2%
February	7	8%
March	8	9%
April	8	9%
May	6	7%
June	15	15%
July	13	13%
August	11	11%
September	12	11%
October	0	0%
November	3	3%
December	3	3%
January 2012	2	2%
Height		
<59	9	11%
60-64	59	72%
65-70	14	17%
Pre-Pregnancy Weight		
<100	3	4%
101-120	13	16%
121-150	21	25%
151-180	30	36%
181-200	9	11%
201-230	5	6%
231+ or >	3	4%
Current Weight		
<18.5	2	2%
18.5-24.9	21	23%
25-29.9	30	33%
30-34.9	23	26%
35-39.9	6	7%
>40	2	2%
Living Children		
0	17	20%
1	25	29%
2	26	30%

...Appendix D Continued

3	9	10%
4	4	5%
5	4	5%
6+	1	1%
Mode of Transportation		
Personal Car	44	54%
Taxi	5	6%
Bus	24	30%
Bike	0	0%
Walk	9	5%
Through a Friend	4	5%
Employed		
Yes	77	86%
No	13	14%
Marital Status		
Single	39	23%
Married	41	47%
Separated	6	7%
Divorced	1	1%
Widowed	1	1%
Primary Language		
Yes	77	86%
No	13	15%
Place of Birth		
United States	8	9%
Central America	44	50%
South America	2	2%
Other	34	39%