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The Effect of an Educational Intervention in Women with Gestational Diabetes: A Pilot Study

Janeen S. Amason

ACCEPTANCE

This dissertation, THE EFFECT OF AN EDUCATIONAL INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES: A PILOT STUDY by Janeen S. Amason was prepared under the direction of the candidate's dissertation committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing in the Byrdine F. Lewis School of Nursing and Health Professions, Georgia State University.

Shih-Yu (Sylvia) Lee, RNC, PhD
Committee Chairperson

Sandra Hewell, PhD, MN, WHNP-BC
Committee Member

Kathie Aduddell, EdD, RN
Committee Member

Date

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Ptlene Minick, PhD, RN
Doctoral Program Coordinator
Byrdine F. Lewis School of Nursing and Health Professions

Joan Cranford, EdD, RN
Assistant Dean for Nursing
Byrdine F. Lewis School of Nursing and Health Professions

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Janeen S. Amason
3337 English Oaks Drive
Kennesaw, GA 30144

The director of this dissertation is:

Dr. Shih-Yu (Sylvia) Lee, RNC, PhD
Associate Professor
Byrdine F. Lewis School of Nursing and Health Professions
Georgia State University
P.O. Box 4019
Atlanta, GA 30302-4019

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VITA

Janeen S. Amason

ADDRESS: 3337 English Oaks Drive
Kennesaw, GA 30144

EDUCATION:

Ph.D.	2013	Georgia State University Atlanta, Georgia
M.S.N.	1996	Troy State University Montgomery, Alabama
B.S.N.	1991	Auburn University Auburn, Alabama
A.S.	1988	Southern Union State Junior College Wadley, Alabama

PROFESSIONAL EXPERIENCE:

2004-Present	Faculty, Sr. Lecturer, WellStar School of Nursing, Kennesaw State University
2002-2005	Staff Nurse-Mother/Baby and Women's Health Services, Kennestone Hospital
2000-2001	Adjunct Faculty Patient Care Tech Program, Tulsa Community College
1993-1999	Faculty, LPN and ADN Nursing Programs, Southern Union State Community College
1991-1993	Staff Nurse-Postpartum, West Georgia Medical Center

PROFESSIONAL ORGANIZATIONS:

1991-present	Sigma Theta Tau International Honor Society
2007 -present	Georgia Association of Nursing Education
2009-present	Southern Nursing Research Society
2010-present	Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN)

HONORS:

2010-2013	Clendenin Graduate Fellow (Kennesaw State University)
2011	Dissertation Award (Georgia State University STEPS)
2011	Sigma Theta Tau Mu Phi Chapter Research Award
2009	Georgia State University Epsilon Alpha Chapter Golden Key International Honor Society
2008	STEPS Scholar, Georgia State University
2008	KSU Certificate of Excellence Outstanding Organization Advisor

PUBLICATIONS:

Bremner, M., Aduddel, K., and Amason, J. (2008). Evidenced-Based Practices Related to the Human Patient Simulator and First-Year Baccalaureate Nursing Students Anxiety. *Online Journal of Nursing Informatics*. February 2008.

PRESENTATIONS:

Southern Nursing Research Society 24th annual conference in Austin Texas February 3-6, 2010. Poster Presentation "The Effect of Perceived Stress and Sleep Disturbances on Well-Being of Postpartum Women with an Infant in NICU."

Georgia State University Sigma Theta Tau Research Day (2009). Poster Presentation "The Effect of Perceived Stress, Sleep Disturbances and Family Support on Well-Being of Postpartum Women with an Infant in NICU."

October 5-7, 2008. Poster Presentation "A New Student Success Program: A Creative Strategy for the Retention of Nursing Students" at the SREB conference Atlanta, Georgia.

February 21-23, 2007. Poster Presentation "Baby Bingo" at the Georgia Association of Nurse Educators (GANE) Education Conference St. Simons, Georgia.

Learning Style Models presented with Dr. Kathie Aduddell at the Mentor-Protégé Retreat April 16, 2005.

ABSTRACT

THE EFFECT OF AN EDUCATIONAL INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES: A PILOT STUDY

by

JANEEN S. AMASON

Women with gestational diabetes (GD) are at higher risk of developing type 2 diabetes (DM) after delivery compared to those without GD. Numerous studies in the general population have identified that adoption of healthy lifestyles can prevent DM; however limited research has focused on women with GD. The purpose of this randomized pilot study was to determine the effectiveness of an educational intervention of SUGAR (Start Understanding Gestational Diabetes and Risk of Type 2 Diabetes), on women's perceived risk of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors and adoption of healthy lifestyle behaviors after childbirth among women with GD.

A total of 23 women (mean age of 29.7 ±3.9), 18 in SUGAR group and 5 in control group (CG) completed self-reported standardized questionnaires (Risk Perception Survey for Developing Diabetes adapted for women with GD; Self-Rated Abilities for Health Practices; Health Promotion Lifestyle Profile II; General Sleep Disturbance Scale; and Demographic Questionnaire) at baseline (third trimester) and post-test (postpartum 6-8 weeks). Intervention was given post the baseline data collection with a booster session at 2-4 weeks postpartum. The women in CG received attention control treatment.

Study participants were obese (BMI M=33.1, SD=7.7) and a majority had a family history of DM. Findings showed that self-efficacy was the single significant

predictor and accounted for 22% of the variance of healthy lifestyle behaviors. Participants had a clinical significant sleep disturbance during both pregnancy and postpartum. At baseline, poor sleepers reported a lower self-efficacy. The intervention significantly increased DM knowledge for women in the SUGAR group; however, not for perceived risk, self-efficacy nor healthy lifestyle behaviors. There was no difference between groups for postpartum glucose screening rates with only 39% receiving recommended testing.

Future research needs to focus on prevention programs and center on self-efficacy, postpartum glucose screening, improve sleep, and adoption of healthy lifestyle behaviors. To ensure a better preventive care for GD women, education provided for both patients and health care provider is needed.

THE EFFECT OF AN EDUCATIONAL INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES: A PILOT STUDY

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A DISSERTATION

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Georgia State University

Atlanta, Georgia

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LIST OF ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists
ADA	American Diabetes Association
AHRQ	Agency for Healthcare Research and Quality
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
DM	Type 2 Diabetes
DPP	Diabetes Prevention Program
GD	Gestational Diabetes
GSDS	General Sleep Disturbance Scale
HAPO	Hyperglycemia and Adverse Pregnancy Outcome
HBM	Health Belief Model
HIPPA	Health Insurance Portability and Accountability Act
HPLPII	Health Promotion Lifestyle Profile II
IRB	Institutional Review Board
NICU	Neonatal Intensive Care Unit
NIH	National Institutes of Health
OB/GYN	Obstetrics/Gynecology
OGTT	Oral Glucose Tolerance Test
PI	Principal Investigator
RPS-DD	Risk Perception Survey for Developing Diabetes adapted Women with Gestational Diabetes
SPSS	Statistical Package for the Social Sciences
SRHAP	Self-Rated Abilities for Health Practices
SUGAR	Start Understanding Gestational Diabetes and Risk of Type 2 Diabetes
WHO	World Health Organization

CHAPTER I

INTRODUCTION

Gestational Diabetes (GD) has been recognized as a complication of pregnancy that will resolve after childbirth, but recent research has identified that this diagnosis may signify a lifetime of health issues (Baptiste-Roberts et al., 2009; Bellamy, Casas, Hingorani, & Williams, 2009; Feig, Zinman, Wang, & Hux, 2008; Lee, Hiscock, Wein, Walker, & Permezel, 2007; Lee, Jang, Park, Metzger, & Cho, 2008; Reece, Leguizamon, & Wiznitzer, 2009). Women with GD are at risk of developing type 2 diabetes (DM) after delivery, but many women have the misconception that the health threat ends with delivery of the neonate. Numerous research studies in the general population have identified that adoption of healthy lifestyles (e.g. healthy diet, exercise, weight loss) can prevent DM; however there is limited research which focuses on healthy lifestyle behaviors in women with GD. Comprehensive educational interventions would have significant clinical relevance in assisting women with GD to improve their healthy lifestyle behaviors during the postpartum period, thus impacting their own long term health and the health of their future children. The purpose of this pilot study was to evaluate the effectiveness of an educational intervention in women with GD to increase their perceived risk of DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors, and adoption of healthy lifestyle behaviors after childbirth. This chapter will

describe the background and significance of this study, an overview of the Health Belief Model (Rosenstock, 1974; Rosenstock, Stretcher, & Becker, 1988), the purpose of the study, and research questions for the study.

Background and Significance

GD is the most common medical disorder of pregnancy and affects approximately 4%-10% of pregnant women in the United States each year (ADA, 2010; AHRQ, 2009; Pridjian & Benjamin, 2010). Women with a history of GD have a 35-60% chance of developing type 2 diabetes (DM) (CDC, 2011) and are 3.5 times more likely to develop DM than individuals in the general population (Lee et al., 2008) with most of these women developing the disease within ten years of the diagnosis of GD (Feig et al., 2008; Lee et al., 2008; Kapustin, 2008). According to the CDC (2011), five to ten percent of women with GD are diagnosed with DM immediately after pregnancy during the postpartum period. However, less than 25% of women with GD are screened for DM postpartum (Almario et al., 2008; Kim et al., 2006), thus missing an opportunity to prevent or delay the development of DM. Baker, Brody, Salisbury, Schectman, & Hartmann (2009) found that a failure to screen patients was primarily associated with inconsistent screening guidelines and failure of patient's adherence to follow-up visits to obtain blood glucose screening. Women with GD need to be informed of risk and preventative strategies, so they can be actively engaged in their own health decisions to prevent DM.

GD is defined as a form of diabetes which begins or is first recognized during pregnancy, occurring due to pancreatic beta cells inability to produce sufficient insulin for increased demands during the third trimester of pregnancy (ADA, 2008; AHRQ,

2009; Pridjian & Benjamin, 2010). In the second and third trimesters, an increase in pregnancy hormones including progesterone, estrogen, cortisol, and human placental lactogen cause a resistance to insulin allowing more free glucose to be available for the growth and development of the fetus (Schneiderman, 2010). In a healthy pregnant woman, the insulin resistance is increased by 40%-70% and the excess glucose is usually tolerated, but if a woman has an underlying impaired pancreatic beta-cell function, an insufficient secretion of insulin will lead to hyperglycemia (Ben-Haroush, Yogev, & Hod, 2003; Ciani, Ghio, Resi & Volpe, 2010; Pridjian & Benjamin, 2010). The prevalence of GD has more than doubled since 1990 (Gethun, Nath, Ananth, Chavez, & Smulian, 2008) and may be associated with high maternal age at pregnancy, obesity, sedentary lifestyle, multiple pregnancies, and polycystic ovarian syndrome (Kim et al., 2010; Soheilykkah et al., 2010). Recent research has also identified that insufficient sleep is associated with glucose intolerance, thus increasing risk for GD (Qiu, Enquobahrie, Frederick, Abetew, & Williams, 2010).

In the United States, approximately 10.8% (12.6 million) of women who are aged 20 years or older have been diagnosed with DM, with higher rates identified in minority groups including Hispanics, non-Hispanic Blacks, and Asian Americans (CDC, 2011). Similarly, GD is more frequent in women who are African American, Asian, Hispanic, or Native American (Ferrara, 2007; Reece et al., 2009; Schneiderman, 2010). The World Health Organization (WHO, 2010) predicts that if no action is taken, the deaths associated with DM will double by the year 2030, shortening an individual's life expectancy by one-third (CDC, 2008). The most common complications of DM include cardiovascular disease, kidney failure, neuropathy, and retinopathy (CDC, 2008; NIH,

2008; WHO, 2010) and is the seventh leading cause of death in the United States (CDC, 2011). Obesity, sedentary lifestyles, sleep disturbance, and stress have been associated with the development of DM (Chaput, Despres, Bouchard, & Tremblay, 2007; Gunderson et al., 2008; Knutson & Cauter, 2008). Early prevention strategies, such as weight loss, increase of physical activity, and healthy diet, will decrease the incidence of DM and the associated complications in populations at risk for developing DM (CDC, 2011; Knowler et al., 2002; NIH, 2008), therefore specific populations, such as women with a history of GD, should institute health behavior strategies to prevent or delay DM.

Standard Care for GD

Universal screening using a two-step screening and diagnosis approach of GD is the common practice among obstetricians (Pridjian & Benjamin, 2010). Early screening performed at the first prenatal visit is recommended if women are at high risk for GD (e.g. history of GD, advanced maternal age, obese, history of polycystic ovarian syndrome (PCOS), at-risk ethnic group, and insulin therapy in previous pregnancy). If not diagnosed at this screening, she will be rescreened during traditional testing at 24-28 weeks gestation (Bottalico, 2007; Serlin & Lash, 2009). All pregnant women (unless previously diagnosed with type 1 or type 2 diabetes) are screened for GD between 24-28 weeks gestation using a one hour 50g glucose challenge test (GCT) for initial screening. If results are abnormal ($\geq$140mg/dl), then step two of the process is performed using a three-hour 100g glucose tolerance test (OGTT). A diagnosis of GD is made if two or more values meet or exceed the standard criteria (fasting=105mg/dl, one hour 190mg/dl, two hours 165mg/dl, three hour 145mg/dl) (Pridjian & Benjamin, 2010; Reece et al., 2009; Serlin & Lash, 2009; Theodoraki & Baldeweg, 2008).

Once GD is diagnosed, management of the disorder is focused on glycemic control (glucose levels between 60-90mg/dl) with initiation of medical nutritional therapy, exercise, and glucose monitoring (Pridjian & Benjamin, 2010). Diet management is individualized according to weight, height and caloric needs for pregnancy and counseled by a registered dietician when possible. A common diet therapy of 1900-2400kcal/day with prescribed restrictions of carbohydrates (35-40% of calories) is recommended. In addition, if there are no contraindications for exercise, women with GD should engage in moderate exercise at least three times a week (e.g. walk 1-2 miles per day) to achieve glycemic control (Metzger et al., 2007; Pridjian & Benjamin, 2010; Theodoraki & Baldeweg, 2008).

If pharmacological management is warranted, the use of oral hypoglycemic agents (such as Metformin or Glyburide) or insulin therapy will be instituted if initial diet and exercise fail to achieve glycemic control (Deshpande, 2010; Pridjian & Benjamin, 2010; Theodoraki & Baldeweg, 2008). To determine fetal well-being, weekly non-stress testing (NST) will begin at 32 weeks gestation for women using insulin therapy and at 36 weeks for other therapies such as medical nutritional management (Schneiderman, 2010). If no complications occur, delivery by 40 weeks is recommended due to greater incidence of shoulder dystocia associated with macrosomia in delivery after 40 weeks gestation (Pridjian & Benjamin, 2010). During the immediate postpartum period, GD women should have fasting or random glucose testing to identify persistent impaired glucose tolerance (Pridjian & Benjamin, 2010).

Preventative Care of DM in Women with GD

In the identification of women with GD as an at risk group for developing DM, the American Diabetes Association (ADA) and the American College of Obstetricians and Gynecologists (ACOG) have instituted guidelines for women with previous GD for postpartum blood glucose screening and counseling for adoption of healthy lifestyle behaviors (ACOG, 2009; ADA, 2010). Blood glucose screening is recommended 6-12 weeks postpartum with a fasting blood glucose or two hour oral glucose tolerance test (OGTT). If the results are normal, the professional societies recommend that screening is performed every three years, but if results are abnormal, the blood glucose screening should be performed annually. The position statement on postpartum glucose screening from the ADA and ACOG also suggests the women maintain a healthy diet of reduced fat and adequate fiber as well as a modest weight loss if BMI is > 25. Recommendations of moderate physical activity (150 minutes per week) and resistance training are also important in prevention of DM (ACOG, 2009; ADA, 2010; Jones, Roche, & Appel, 2009). The recommendation of implementation of healthy lifestyle behaviors is supported through research identifying engagement of the behaviors significantly reduces the risk of developing DM (Knowler et al., 2002; Tuomilehto et al., 2001). The National Diabetes Education Program (2010) has also developed a Gestational Diabetes Prevention Initiative which focuses on information for the patient and health care provider. The recommendations include educating that GD is a lifelong risk of DM, prevention strategies of DM including weight loss, nutrition, and physical activity, and glucose screening 6-12 weeks postpartum and every 1-2 years, therefore the health care

provider (including registered nurses) has an important role of preventative care for DM in women with GD.

Impact of GD to Maternal and Infant Health

Many women have the misconception that GD only affects them during pregnancy, and that once the baby is delivered the complication is no longer a health threat (Kapustin, 2008; Kim, McEwen, Kerr et al., 2007); in fact long term consequences of obesity and risk of DM are significant (Reece, 2010). There are strong evidences demonstrating that health promotion behavior such as weight loss, exercise, and healthy diet will decrease the risk of developing DM (England et al., 2009; Knowler et al., 2002; Tuomilehto et al., 2001). In addition, lifestyle modification (e.g. weight loss, healthy diet, and exercise), follow up physician appointments, and postpartum glucose screening are essential for early diagnosis and prevention of DM in women with GD (ACOG, 2009; Baker et al., 2009).

Women with GD and their offspring are at risk for short term and long term consequences of the disease (Reece, 2010). Complications associated with GD for the mother include an increased risk of prolonged labor, postpartum hemorrhage, polyhydraminos, and infection (Schneiderman, 2010). Cesarean section rates are high in women with GD due to cephlopelvic disproportion and macrosomia (Desphande, 2010; Holmes, Lo, McIntire, & Casey, 2010; Schneiderman, 2010), leading to potential postpartum complications associated with a surgical procedure. The fetus is exposed to high levels of glucose; forcing the production of large amounts of insulin leading to a macrosomic newborn with a birth weight greater then 4000gm (Deshpande, 2010; Metzger et al., 2008; Reece et al., 2009). The newborn has an increased risk of shoulder

dystocia, birth injury, or death during a vaginal delivery (Metzger et al., 2008; Reece, 2010). Other associated complications to the newborn include hypoglycemia, respiratory distress syndrome, hyperbilirubinemia, and an increased need for advanced medical care in the neonatal intensive care unit (Metzger et al., 2008; Reece et al., 2009; Schneiderman, 2010). The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study identified that four primary outcomes of intrauterine hyperglycemia (macrosomia, cesarean delivery, neonatal hypoglycemia, and neonatal hyperinsulinemia) were significantly higher in women with higher maternal glucose levels (e.g. fasting $\geq$ 100mg/dl) (Metzger et al., 2008). This epidemiology study in nine countries gives strong support to debate the importance of glucose control during pregnancy and possible redefining thresholds for diagnosis of GD (Yogev, Metzger, & Hod, 2009). The HAPO study has led to recent diagnostic criteria change for diagnosis of GD (ADA, 2011; CDC, 2011).

Long-term health consequences of intrauterine hyperglycemia have been well established identifying that children of women with GD have a predisposition of obesity, metabolic syndrome and DM (Clausen et al., 2008; Damm, 2009; Deshpande, 2010; Reece et al., 2009; Reece, 2010). In a follow-up study (Clausen et al., 2008) to determine glucose tolerance in 597 adults (primarily Caucasian) aged 18-27 years who were offspring of women with GD or type 1 diabetes, determined that approximately 20% of the children with a mother who had GD had DM/pre-diabetes. In comparison to the general population, the GD offspring had an eight fold increase risk of diabetes and/or pre-diabetes (Clausen et al., 2008); therefore identifying that glucose control during pregnancy is essential for the health of children born by a mother with GD.

Significance of the Research

Although healthy lifestyle behaviors (e.g. healthy diet, exercise, and weight loss) are strongly associated with prevention of DM, the incidence rate of DM continues to increase due to unhealthy eating habits, obesity, and sedentary lifestyles. Over three million people diagnosed in 2010 (CDC, 2011), resulting in a major health concern in the United States. Similarly, the rate of GD continues to escalate and is comparable to the current national trends of obesity and DM, thus leading to poor maternal and fetal outcomes of pregnancy and lifelong health complications associated with impairment of glucose tolerance. Research of prevention strategies focusing on weight loss, adoption of healthy diet, and exercise has been well established in the general population to prevent DM (Knowler et al., 2002; Tuomilehto et al., 2001). However, limited studies have focused on women with GD and whether interventions to promote healthy lifestyle behaviors are appropriate for women of childbearing age. Therefore, women with GD are identified as an at-risk group of developing DM and would benefit from established DM prevention strategies to avoid long-term health complications.

Current treatment practices have focused on management of glucose intolerance throughout the pregnancy for positive maternal and fetal outcomes, but management has been lacking after childbirth to prevent or delay the development of DM in childbearing women. Many women with a diagnosis of GD are unaware of future risk of DM, while others simply do not engage in healthy lifestyle behaviors after delivery. If women with GD convert to DM, they may have lifelong health consequences including cardiovascular disease, kidney failure, neuropathy, and retinopathy (CDC, 2008; NIH, 2008; WHO, 2010). A recurrence rate of GD of up to 70% (Bottalico, 2007) identifies that women

with a history of GD are at risk in subsequent pregnancies for insulin intolerance, therefore, prevention of DM is not only important for their own health, but also for the health of children in future pregnancies. High rates of congenital anomalies are associated with uncontrolled hyperglycemia during pregnancy (Kitzmiller, Dang-Kilduff, & Taslimi, 2007; Ross, 2006; Zeck & McIntyre, 2008), thus control of glucose levels prior to conception is essential to prevent the anomalies. Offspring are also at higher risk of developing obesity and DM in their lifetime after intrauterine exposure to high levels of glucose (Clausen et al., 2008; Damm, 2009; Deshpande, 2010; Reece et al., 2009; Reece, 2010).

Healthy People 2020 (U.S. Department of Health and Human Services, 2010) have included objectives for Americans centering on promotion of health and avoidance of preventable chronic diseases such as DM. The agenda encourages prevention activities, the guidance of individuals to make informed health decisions, and collaborative efforts for health. In conjunction with these objectives, focusing on an at risk population for DM and implementing innovative strategies to prevent this chronic disease incorporates the goals of Healthy People 2020 for health and healthy behaviors in women with GD.

The diagnosis of GD is an opportunity to engage women in performing healthy lifestyle behaviors after childbirth to prevent DM, but little is known of appropriate strategies to encourage healthy lifestyle behaviors for women with multiple roles/responsibilities. After childbirth, women have additional responsibilities with caring for a newborn which often leads to fatigue and time constraints interfering with health promoting activities. Therefore, research is needed to determine appropriate

strategies to meet the unique needs of a woman with GD to influence her decisions to adopt healthy lifestyle behaviors to prevent DM after childbirth. The research testing an intervention that educates and motivates women will validate an effective strategy to assist women with GD adopt healthy lifestyle behaviors after childbirth by addressing specific influences of her decision making process to engage in health promotion. In clinical practice these strategies, adapted specifically for the needs of women with GD, can assist health care providers incorporate DM preventative care into standard care practices for this at risk population postpartum. This adaptation to standard care practices would follow recommended DM guidelines from the ADA and ACOG which encourages counseling of healthy lifestyle behaviors and glucose screening for women diagnosed with GD (ACOG, 2009; ADA, 2010).

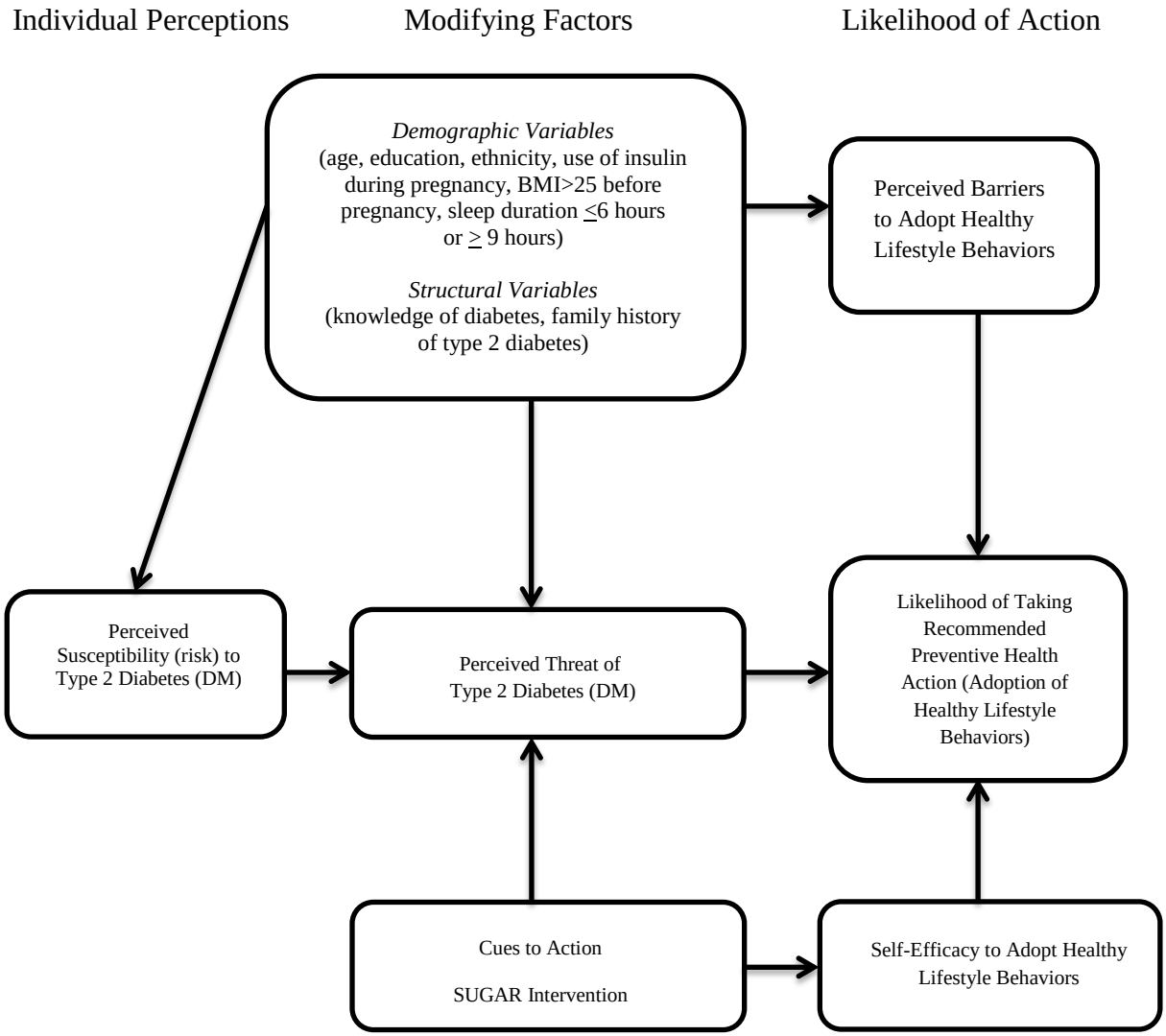
Theoretical Framework of the Health Belief Model

The Health Belief Model (HBM) is one of the most widely used theories in the field to examine the barriers and foundation of a person's participation in programs which focus on prevention of disease and promotion of healthy lifestyle (NCI, 2005). In studies of women's health issues, this framework has been used primarily to address breast cancer screening (Janz & Becker, 1984; Lee-Lin et al., 2007; Wu, West, Chen, & Hergert, 2006). The HBM has been used to explain and predict participation in long term and short term health behaviors including smoking cessation (Schofield, Kerr, & Tolson, 2007), condom use (Macintyre, Rutenberg, Brown, & Karim, 2004; Sayles et al., 2006; Zak-Place & Stern, 2004), exercise (Fallon, Wilcox, & Ainsworth, 2005; Schwarzer et al., 2007) and breast cancer screening (Janz & Becker, 1984; Lee-Lin et al., 2007; Wu et al., 2006), but has limited use in women with GD (Jones et al., 2009). The application of

the HBM is a useful tool to examine commonalities that influence people to adhere to health promotion activities.

The HBM (see Figure 1) is organized into three categories which include individual perceptions, modifying behaviors, and likelihood of action to show relationships of the concepts to an individual's motivation to participate in a health action or behavior. All of the concepts of the model influence a person's decision making about whether or not she will engage in prevention, screening, and measures to control for an illness (Family Health International, 2002; NCI, 2005; Rosenstock, Strecher, & Becker, 1988). To meet the investigator's goals, original concepts of the HBM of perceived seriousness and perceived benefits are omitted from this study due to limited literature support of these variables as strong predictors of health behavior.

Figure 1. Adapted Health Belief Model for Study in Self-Care of Women with Gestational Diabetes to Prevent Type 2 Diabetes (Rosenstock, 1974)



Theoretical Assumptions

The premise of the model is that an individual's health behavior is based on their beliefs or perceptions about a disease and prevention of the illness by available strategies. The core assumptions of the HBM is based on the thought that a person will adopt a health behavior to avoid disease if the individual believes that he/she is susceptible to a disease, believes the consequence of the disease would be serious, believes that the

disease occurrence can be avoided, believes the benefit of taking action to reduce a health threat exceeds any associated cost, and believes that he/she can effectively implement the recommended health behavior (Janz & Becker, 1984; Rosenstock, 1974; Rosenstock et al., 1988). The behavior depends also on the value of the goal and the probability that an action will be successful in achieving the goal (Janz & Becker, 1984).

Conceptual Definition of Terms

Perceived Susceptibility (Risk) is a person's belief (perception) of her chance of developing DM which influences the adoption of health behaviors to prevent DM. The assumption is the greater the sense of susceptibility, the greater the possibility that a person will engage in behaviors which will decrease their risk for a disease (Rosenstock, 1974).

Perceived Barriers are the person's perception of the "cost" of implementing the healthy lifestyle behaviors. The woman will determine the possible negative consequences of adopting healthy lifestyle changes and any obstacles (physical, psychological, and financial demands) that may interfere with instituting the lifestyle behavior change (Maiman & Becker, 1974; NCI, 2005; Rosenstock, 1974). The assumption for this study is that a woman with GD with less perceived barriers will more likely engage in healthy lifestyle behaviors to prevent DM.

Cues to Action addresses the influences of an individuals' environment on the adoption of healthy lifestyle behaviors to prevent the development of DM. Rosenstock (1974) believed that some type of "trigger" was essential in the decision-making process. The cues make the individual aware of his/her own feelings about a problem, thus assisting in the readiness to make a change or adopt a health action (Janz & Becker,

1984; Rosenstock, 1974). Education from health care providers influence the adoption of healthy lifestyle behaviors, therefore the individual is more likely to engage in the behavior if she receives counseling of behavior.

Self-Efficacy is a person's belief or confidence in their own ability to adopt healthy lifestyle behaviors to prevent the development of DM (Rosenstock et al., 1988). The woman with GD will initiate and maintain behavioral change if she feels competent and confident that she can institute those changes.

Modifying factors which include demographic variables (use of insulin during pregnancy, BMI>25 before pregnancy, sleep duration) and structural variables (knowledge of diabetes, family history of type 2 diabetes) affect a person's perceptions about the health threat and perceived barriers of health actions that prevent disease (Roden, 2004; Rosenstock, 1974). A GD woman's individual characteristics have an influence on her perceptions, thus influence her adoption of healthy lifestyle behaviors to prevent the development of DM after childbirth. For example, a woman with a greater knowledge of DM will have a higher perceived risk of developing DM, thus impacting behavioral change.

Use of Health Belief Model to Guide Study

Although, the HBM framework has been used in numerous studies associated with adoption of healthy behaviors, limited studies have focused on the adoption of health behaviors in women with GD (Jones et al., 2009). To meet the investigator's goals, the Health Belief Model was selected as an appropriate model and adapted by this author to guide the study in self-care for women with GD to prevent DM after childbirth.

The Health Belief Model was selected to guide the design of this pilot study because of its focus on the health beliefs and attitudes of individuals and the effect on health behaviors. This model has been viewed as one of the most influential in relation to health promotion, has strong empirical support, and has been evaluated thoroughly for use in a variety of health behavior studies (Roden, 2004). In relation to this model, women with a history of GD who perceive themselves at risk for developing DM will more likely advocate to be screened for the disease and implement healthy behaviors to decrease their risk for developing DM. Studies have demonstrated that women with a history of GD often do not perceive themselves at risk for developing DM (Jones et al., 2009; Kim, McEwen, Piette et al., 2007; Malcolm, Lawson, Gaboury, & Keely, 2009).

This framework was useful to guide the development of interventions designed to increase knowledge about GD and long term risks of DM, recommended follow up glucose screening postpartum, and healthy lifestyle strategies to prevent or delay the development of DM. According to the Health Belief Model, the women with a higher perceived threat and higher self-efficacy to adopt healthy behaviors are more likely to engage in positive health behavior. Interventions can also be implemented to increase women's perceived susceptibility of DM and self-efficacy to adopt healthy lifestyle behaviors. Specific barriers can be identified which hinder adoption of behaviors and lead to development of essential resources which assist the woman with GD to adopt healthy lifestyle behaviors. Also, demographic and structural variables have an influence on perceived risk of the woman. Research has indicated that women with a family history of diabetes, who are obese, have impaired sleep, and who use insulin during pregnancy are more likely to develop DM after GD. According to the HBM, these types

of variables will influence the perception of risk of developing DM in a woman with a history of GD. The goal is for women with GD to adopt healthy lifestyle behaviors (e.g. weight loss, healthy diet, and exercise) to prevent the development of DM and obtain blood glucose screening as indicated, therefore identification of these influences is important to develop effective intervention strategies. The development of an educational intervention based on known influences of behavior will be beneficial in helping women with GD adopt healthy behaviors to prevent DM.

Statement of Purpose

Current treatment practices have focused on management of glucose intolerance throughout the pregnancy for positive maternal and fetal outcomes, but little attention has been given to management after childbirth to prevent or delay the development of DM in childbearing women. Although general population studies have demonstrated the benefits of healthy lifestyle behaviors (weight loss, healthy diet, exercise) for prevention of DM, there is insufficient evidence that interventions have been used to assist women with GD adopt healthy lifestyle behaviors after childbirth. The development of a comprehensive educational intervention would have significant clinical relevance in assisting women with GD improve their healthy lifestyle behaviors postpartum, thus impacting their long term health and the health of future children. Therefore, the purpose of this pre-test, post-test, two group study was to determine the effectiveness of SUGAR (Start Understanding Gestational Diabetes and Risk of Type 2 Diabetes), an educational intervention designed to enhance women's perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors (e.g. weight loss, healthy diet, and exercise) and adoption of healthy lifestyle behaviors after

childbirth among women with GD. The HBM was selected as a guide for the pilot study because this framework assist health care providers to understand perception of susceptibility of a health problem (e.g. GD and DM), how knowledge of a disease influences that perceived risk, and how barriers and self-efficacy to adopt healthy lifestyle behaviors influence the likelihood that an individual will take action to promote their own health.

Research Questions

Based on the purpose of this study, literature support, and the theoretical framework of the Health Belief Model, the following research questions were used. In a sample of women with a history of GD:

1. To what degree is the likelihood of adopting healthy lifestyle behaviors explained by pregnant woman's selected demographics (age, education, ethnicity, use of insulin during pregnancy, BMI>25 before pregnancy, sleep duration), structural variable (knowledge of diabetes, family history of type 2 diabetes), perceived risk, and self-efficacy?
2. What effect sizes are expected for perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors, and adoption of healthy lifestyle behaviors after childbirth when comparing the two experimental groups (control group: standard care with attention control and treatment group: educational intervention) at 6-8 weeks postpartum?
3. What are the barriers to obtaining postpartum glucose screening and adopting healthy lifestyle behaviors after childbirth among women with a diagnosis of GD?

4. What type of cues of action encourages postpartum glucose screening and adoption of healthy lifestyle behaviors among women with a diagnosis of GD?

CHAPTER II

REVIEW OF THE LITERATURE

This chapter provides a review of significant literature related to the incidence of DM in women with GD and risk factors (e.g. obesity, sedentary lifestyles, use of insulin during pregnancy, early diagnosis of GD, sleep impairment) associated with DM. The Health Belief Model has been selected to guide this study therefore concepts identified with this model are explored in the literature in relation to women with GD and DM prevention. These concepts include perceived susceptibility (risk) for developing DM, self-efficacy to adopt healthy lifestyle behaviors, healthy lifestyle behaviors to prevent DM, screening for DM postpartum, barriers to adopting healthy lifestyle behaviors and glucose screening, and strategies (cues to action) to increase adoption of healthy lifestyle behaviors for prevention of DM. Directions for the future study are also addressed.

Incidence of DM in Women with GD

Gestational Diabetes (GD) is the most common medical disorder of pregnancy and is defined as a form of diabetes which begins or is first recognized during pregnancy, occurring due to pancreatic beta cells inability to produce sufficient insulin for increased demands during the third trimester of pregnancy (ADA, 2008; AHRQ, 2009; Pridjian & Benjamin, 2010). Each year, this disorder affects approximately 4%-10% of pregnant

women in the United States (ADA, 2010; AHRQ, 2009; Pridjian & Benjamin, 2010). Research has identified that women diagnosed with GD are at risk of developing DM after childbirth (Feig et al., 2008; Knowler et al., 2002; Lee, Hiscock, Wein, Walker, & Permezel, 2007; Lee et al., 2008; Ratner et al., 2008). A Canadian population-based study found that within nine years of the index pregnancy, the probability of the development of DM in women with a history of GD was 18.9% (Feig et al., 2008). Major findings from this study included that DM incidence increased with age of the woman at the time of delivery (highest rate in women who aged 46-50 years) and in women who lived in rural areas. Women who lived in higher income neighborhoods were less likely to develop DM after delivery. Personal characteristics that increase the risk of DM, such as lifestyle behaviors and body mass index (BMI), were not included in this study therefore it is ambiguous if GD is the sole factor for DM. However, other studies also identified the risk to develop DM in women with a history of GD. For example, a retrospective study that used survival analysis found that one fourth of the 5470 women (90% Caucasian) with a history of GD developed DM within 15 years of the index pregnancy (Lee et al., 2007), while a case-control study identified Korean women with a GD history had a 3.5 times greater incidence of DM than women in the general population (Lee et al., 2008). In a recent study (Kerimoglu, Yalvac, Karcaalt, & Kandemir, 2010), investigators performed glucose screening using a 75 gram OGTT at six and twelve months after delivery to evaluate glucose tolerance in women diagnosed with GD. Of the 78 patients, over 70% of the women either had impaired glucose tolerance (IGT) or were diagnosed with DM (Kerimoglu et al., 2010).

A landmark epidemiological study, the Diabetes Prevention Program (Knowler et al., 2002), which evaluated men and women's risk of developing DM, found that the women with a history of GD had a 71% higher incidence rate of developing DM than those without a history of GD (Ratner et al., 2008). Maternal BMI was positively correlated with the risk of DM. Women with GD who engaged in healthy lifestyle behaviors decreased the risk of DM by 50%; however, compared to women with no diagnosis of GD, women with GD were less able to sustain the weight loss and physical activity as compared to women with no diagnosis of GD, thus increasing risk of DM.

Risk Factors Contributing to Development of DM

There are additional risk factors that contribute to the development of DM such as overweight/obesity (BMI>25), sedentary lifestyles, use of insulin during pregnancy, an early diagnosis of GD (<24 weeks gestation), and sleep duration (Baptiste-Roberts et al., 2009; Chaput, Despres, Bouchard, Astrup, & Tremblay, 2009; Jarvela et al., 2006; Krishnaveni et al., 2007; Ogonowski & Miazgowski, 2009). In a five year follow up of 526 women (Krishnaveni et al., 2007); over one-third of the women who were diagnosed with GD developed DM (37%), while only 2% of the non-GD women developed DM in the same time frame. These women with GD who developed DM had higher BMI's (M=26.7) and large hip ratios (0.93) five years after the index pregnancy compared to women who did not develop DM (Krishnaveni et al., 2007). In addition, a relative (first degree) with DM was significantly associated with a higher incidence of diabetes ($p<0.001$). The incidence rates of DM are higher in women with GD who had increased severity of gestational diabetes (defined by insulin use, neonatal hypoglycemia, and recurrent GD), requirement of insulin therapy during pregnancy, and early diagnosis (<24

weeks gestation) of GD during the pregnancy (Jarvela et al., 2006; Ogonowski & Miazgowski, 2009; Russell, Dodds, Armson, Kephart & Joseph, 2008). A case control study matched 435 pairs of women (case group with women diagnosed with GD and control subjects without GD) based on age, parity, and date of delivery. Over one third of the GD women were treated with insulin during the pregnancy and of those who were treated with insulin, 78% developed DM (Jarvela et al., 2006). The retrospective cohort study (Lee et al., 2007) which followed a large number of women (n=5470[GD] and n=783[non-GD]) found the largest predictive factors for the development of DM in women with GD was use of insulin during pregnancy, larger BMI, and those women who were of Asian origin indicating that identified associated risk factors for DM (insulin use, obesity, and ethnicity) were evident in women who developed DM after childbirth. Lobner et al. (2006) reported similar findings for GD women at risk of developing DM. The German study identified a DM risk within eight years of the index pregnancy of 52.7% and significant predictors of risk included women who required insulin, had a BMI>30, and had more than two pregnancies. A recent study (Schaefer-Graf et al., 2009) found that 86% of postpartum DM was found in women with two or more of risk factors such as use of insulin therapy in pregnancy, early diagnosis of GD, and severity of hyperglycemia. These findings are supported in a systematic review (Baptiste-Roberts et al., 2009) examining risk factors of developing DM in women with GD in which researchers concluded that DM was higher in women who had increased anthropometric characteristics and women who used insulin during pregnancy.

Another modifiable risk factor identified for DM is the relationship between sleep duration ($\leq$6 hours per night or $\geq$9 hours per night) and impaired glucose tolerance

(Chaput et al., 2009; Knutson & Cauter, 2008; Knutson, Spiegel, Penev, & Cauter, 2007; Tasali, Leproult, & Spiegel, 2009). Insulin sensitivity and pancreatic beta cell function is influenced by sleep with glucose levels remaining stable through the sleep cycle and glucose metabolism and insulin production is increased during the waking hours. The quantity and quality of sleep affects glucose tolerance by affecting the normal homeostasis of the mechanisms that maintain and stabilize glucose levels (Ip & Mokhlesi, 2007), leading to impaired glucose tolerance if sleep patterns are altered. Shorter sleep ($\leq$ 6 hours) and longer sleep duration ($\geq$ 9 hours) decreases insulin sensitivity and glucose tolerance, thus increasing risk of DM. Numerous studies have identified the association of sleep duration and risk for DM. A longitudinal study (N=256) evaluating the relationship of sleep duration (short and long sleep period) with DM or impaired glucose tolerance (Chaput et al., 2009) identified sleep duration as a risk factor for developing DM with a significant relationship of DM and impaired glucose tolerance in participants with short and long duration of sleep. Gangwisch et al. (2007) identified similar results in their longitudinal study (N=8992) over a period of ten years. Participants with fewer than five hours sleep or longer than nine hours were significantly more likely to have DM than participants with normal sleep duration. Similar results were found in a prospective study of women (N=70,026) who were followed for a ten year period to determine if consistent sleep restriction resulted in a diagnosis of diabetes; a positive association between sleep duration ($\leq$ 5 hours and $\geq$ 9 hours) and diabetes was identified (Ayas et al., 2003).

Limited research has focused on the impact of sleep duration as a risk factor for GD. A pilot study (Qiu et al., 2010) of pregnant women (N=1290), identified that

women with short duration of sleep (≤ 4 hours) during the first trimester of pregnancy had an increased risk of GD than women who slept for nine hours per night. Women who snored and were overweight had an increased risk of GD by 6.9 fold. A major concern for this group of women is the continuance of impaired sleep after childbirth that is normally associated with the required care for their newborn, thus could compromise further the glucose tolerance increasing the risk of developing DM. Similar results were found in a convenience sample of pregnant women (N=189) which identified a higher incidence of GD was associated with short sleep duration and snoring (Facco et al., 2010).

As we recognize that GD is a risk factor for DM, additional factors such as use of insulin during pregnancy and early diagnosis of GD assist health care providers in identifying the women at higher risk of DM. As evidenced by the literature, the early diagnosis of GD (< 24 gestational weeks) and insulin management of GD is strongly associated with development of DM; therefore continuance of glucose management after delivery is imperative to reduce the risk. Sleep duration has an effect on glucose, thus knowledge of the relationship of sleep quality and quantity and glucose intolerance can be used to encourage women to obtain appropriate amounts of sleep, since sleep disturbances are prevalent when caring for a newborn.

In summary, there are additional factors which increase the risk of developing DM, such as BMI >25, sedentary lifestyles and sleep duration. Furthermore, factors such as use of insulin during pregnancy, early diagnosis of GD and family history are strong predictors of DM, therefore providing valuable information to health care providers to monitor these women more closely for DM.

Perceived Risk of Developing DM

Health beliefs have a major influence on lifestyle behaviors (Jones et al., 2009). Perceived risk is a subjective judgment of a person and is an important factor in a person's decision to adopt and sustain preventive behaviors (Pinnelli, Berlie, Slaughter, & Jaber, 2009; Walker, Schechter, Caban, & Basch, 2008). A cross sectional study (Adriaanse et al., 2008) in a large general population found individuals, both men and women, believed DM was a serious condition, but did not believe they were at risk. Another study showed individuals who had family members with DM and had metabolic syndrome perceived a higher risk of DM. Those who reported a higher perceived risk of developing DM also reported a greater intention to implement healthy lifestyles (Hivert, Warner, Shrader, Grant, & Meigs, 2009). These findings indicate that a family history of DM increase the perceived risk of DM, however, the study participants were primarily Caucasian, middle-aged and well educated. The perceptions of different ethnic groups with varied socioeconomic backgrounds warrant further exploration.

Findings of risk perception from the general population are also evidenced among women with GD, indicating that women have limited knowledge about their risk of developing the DM (Malcolm et al., 2009). Kim, McEwen, Piette, et al. (2007) conducted telephone interviews and found that 90% of 217 women with a history of GD understood GD was a risk factor for developing DM, but only 16% of the GD women believed that they would develop the disease. Women, who perceived themselves at risk for developing DM, indicated that they planned to change lifestyle behaviors to prevent the disease. The women with greater perceived risk of developing DM also had associated factors of DM such as greater BMI, use of insulin during pregnancy, and a

family history of GD. Kim, McEwen, Piette et al. (2007) believed that identifying the connection between risk perception and health behavior would assist health care providers in developing interventions focusing on risk perception first and then engage women to modify unhealthy lifestyle behaviors that lead to DM. Women with higher perceived risk of DM are more likely to engage in a healthy diet and exercise, but in contrast women with low perception of risk will less likely engage in those behaviors.

In a nine year follow-up project (Malcolm et al., 2009) of predominantly Caucasian (92%) GD women, almost one-third of the women believed their risk for DM was no different from other women in the general population. Of these women, 60% had a family history of DM. When a two hour glucose tolerance test was performed, almost half of the 77 women had abnormal results (Malcolm et al., 2009). A recent study (Morrison, Lowe, & Collins, 2010) of women diagnosed with GD (N=1372), over one- third considered themselves at low risk of developing DM. Those who perceived themselves at higher risk of developing DM had a BMI >25, a family history of DM, and used insulin during pregnancy, thus identifying that personal history does affect perception of DM risk.

Self-Efficacy to Adopt Health Behaviors

Self-efficacy is an individual's belief that he/she is capable of performing specific tasks to obtain certain goals and is a strong predictor of health behaviors (Bandura, 1994; Bandura, 1998). Individuals with high self-efficacy are more likely to set goals, stay committed to those goals, and work harder to achieve the goals, therefore they are more likely to make a behavior change and adhere to those behaviors over a long period of time, thus leading to better health outcomes (Rosenstock et al., 1988). In contrast, people

with low self-efficacy will expect poor outcomes, have low aspirations, little commitment to achieve goals, and give up if tasks become difficult (Anderson, Anderson, & Hurst, 2010; Bandura, 2004). Health promoting behaviors are influenced by a belief of being able to appropriately perform the activity, thus the engagement and maintenance of health behaviors will more likely occur in individuals with stronger self-efficacy (Bandura, 2004; Luszczynska, Scholz, & Schwarzer, 2005).

Self-efficacy can be enhanced by enactive attainments (success increases self-efficacy, failure lowers self-efficacy), vicarious experiences (observations), and verbal persuasion (encourage to succeed, promote development of skills) (Bandura, 1982). An experimental study (Podder et al., 2010) to improve self-efficacy and behaviors related to dairy intake was conducted in male and female college students (n=294). Students randomized into the intervention group, participated in a five week study using the internet for a web-based nutrition education through email messages, posted information, and checklists of intake of dairy product behaviors. Post-test measurement indicated an improvement in self-efficacy for total dairy intake and self-regulation. In another experimental study, an increase in self-efficacy of physical activity was identified in sedentary, obese women (N=29) (Dallow & Anderson, 2003). Women randomized into the intervention group participated in a 24 week physical activity program which focused on changing the way women thought about exercise and the behavior of exercise, while the control group participants were involved in a traditional exercise program. A significant increase in self-efficacy to increase physical activity was found in the intervention group women, while those in the control group had no change in self-efficacy. The encouragement from counselors during the physical activity program may

have been a major factor in increasing the participant's self-confidence to engage in exercise.

Self-efficacy is an important concept in adoption of health behaviors. A study of college aged men and women (N=162) reported a significant relationship between self-efficacy and health-promoting lifestyles (r=.61, p< 0.01), demonstrating that individuals with higher self-efficacy were more involved in healthy lifestyle behaviors (Jackson, Tucker, & Herman, 2007). Neupert, Lachman & Whitbourne (2009) described that older adults with higher self-efficacy continued to engage in exercise behaviors nine to twelve months after engaging in an instructional intervention encouraging resistance training. Self-efficacy of oral self-care was found to be a significant predictor of adults engaging in performing oral care using brushing and flossing (Buglar, White, & Robinson, 2009). In contrast, individuals with low self-efficacy in performing self-management activities do not engage in health behaviors. For example, a pilot study (Jennings-Sanders, 2009) measured the self-efficacy for mammography screening in African American women (mean age of 75) who lived in a senior high rise apartment building in an urban area. This study identified that the women were not confident in their ability to obtain a mammogram. In these women, 80% had not had a previous mammogram, thus demonstrating low engagement in a health behavior when self-efficacy is low.

There are limited studies which focus on the self-efficacy and adoption of health behaviors in women with GD. Kim, McEwen, Kieffer, Herman, & Piette (2008) identified that women, a dominate group of well-educated White women, with GD (N=228) who had low self-efficacy scores also had low physical activity, unhealthy diets, and higher BMI. In comparison, Koh, Miller, Marshall, Brown, & McIntyre (2010)

performed a cross-sectional telephone survey of women with a recent history (≤3 years) of GD to determine physical activity and psychosocial factors associated in engagement of the health activity. Women with higher social support (support from significant other or other family members) and self-efficacy were more likely engaged in physical activity, although the study determined a low prevalence of physical activity in general (Koh et al., 2010).

Prevention of DM: Healthy Lifestyle Behaviors

Prevention of DM through adoption of healthy behaviors has been well established in the literature (Knowler et al, 2002; Tuomilehto et al., 2001). The International Diabetes Federation has developed a three step plan for prevention of DM through 1) identification of those at higher risk for developing type 2 diabetes, 2) use of a measurement of that risk and 3) interventions to prevent the disease (Alberti, Zimmet, & Shaw, 2007). In relation to this study, women with GD are identified as a population at risk. Postpartum blood glucose screening is recommended and healthy behaviors for prevention of type 2 diabetes include weight loss, engagement in physical activity (a minimum of 30 minutes of moderate exercise five times a week), and eating a healthy diet low in fat and calories (Alberti et al., 2007; Blue, 2007; Quinn, 2003).

There are modifiable risk factors associated with the development of DM which include obesity, unhealthy diet, and physical inactivity. Studies have shown that obesity, which is a body mass index (BMI) > 25, leads to poor insulin secretion and sensitivity, thus increasing the risk of DM. A simple weight loss (through use of a healthy diet) of 10% of body weight can improve glycemic control (Case, Willoughby, Haley-Ziltin, & Maybee, 2006; Costacou & Mayer-Davis, 2003). In a study that targeted participants

who were obese, lacked physical activity, and had impaired glucose tolerance; simple interventions of weight loss and exercise reduced the risk of DM by 58% (Tuomilehto et al., 2001). This study, known as the Finnish Diabetes Prevention Study Group, grouped men and women (N= 522) either in an intervention group (received individual counseling about weight reduction, healthy diet, and physical exercise) or a control group. The participants in the control group were only given general information about diet and exercise at the beginning of the study and at annual visits, while the intervention group participants received seven sessions of detailed information from a nutritionist during the first year of the study and then a session every three months in the following years of the study. In addition, these men and women received supervised and individual structured exercise and resistance training. In a mean duration of 3.2 years, the intervention group had the most significant reduction of DM risk. A follow-up with participants of the Finnish study identified sustained lifestyle changes and a reduction in incidence of diabetes, even after counseling had stopped (Lindstrom et al., 2006).

The prevention strategies seem simple, but changing behaviors takes time and can only be achieved when the individuals are engaged in the process (Saunders & Pastors, 2008; Yun, Kabeer, Zhu, & Brownson, 2007). Modifiable life behaviors and prevention strategies are important concepts to prevent or delay the development of DM (Yun et al., 2007). The Diabetes Prevention Program (DPP) identified a 58% reduction of risk of DM when weight loss, exercise, and healthy diet were implemented (Knowler et al., 2002). This clinical trial used individualized training of nutrition, weight loss and management as well as physical activity to assist with the participant's health behavior modifications. Participants (3,234) were randomly assigned into three groups: lifestyle

intervention group, metformin intervention group, and placebo group. Diabetes was diagnosed with an oral glucose tolerance test (200mg/dl or higher) or fasting plasma glucose test (126mg/dl or higher). Confirmation was made with a second test within six weeks of initial testing using the same criteria. In a cumulative incidence of diabetes review, individuals assigned to the lifestyle intervention group (crude incidence 4.8/100 person) had less incidence of DM with greater weight loss and physical activity than the other groups (7.8/100 person-metformin group; 11.0/100 person- placebo group). In a subsequent review of the DPP (Ratner et al., 2008), the researchers focused on women (n=350) with a history of GD specifically and found that lifestyle modifications (healthy diet and exercise) decreased their DM risk by half. Women in the placebo group with a history of GD had a greater incidence of DM (15.2 cases/100 persons).

A similar study to the DPP (Knowler et al., 2002) and the Finnish Diabetes Prevention Study Group (Tuomilehto et al., 2001) was conducted in China with 577 adults with impaired glucose tolerance (Li et al., 2008). Participants were randomly assigned to either the control group or one of three intervention groups (diet only, exercise only, or a combination of diet and exercise interventions). The combined intervention group had a 51% lower incidence of DM during the actual intervention active phase of the study, but also had a 43% lower incidence rate over the duration of 20 years of the follow-up study of participants, therefore demonstrating the long-term effects of lifestyle modification on the risk of developing DM (Li et al., 2008).

It has been suggested that once individuals are identified as at risk for diabetes, they should be counseled by health care providers, therefore women with GD should be provided with information on the long term effects of GD and DM preventative care

including diet, exercise and weight reduction (Ratner, 2007). Although the DPP did include women with GD, studies implementing lifestyle modification in the prevention of DM in women with GD are limited. A majority of the reviewed studies in women with GD focused on low engagement of healthy lifestyle behaviors. A cross sectional study of women diagnosed with GD (N=331) identified that physical activity behavior was performed in only 37% of the women (Koh et al., 2010). In another cross-sectional study, almost three-fourths of women with a history of GD who currently had DM did not meet the recommended physical activity of thirty minutes a day, five days a week, and over 80% of the women were overweight (Yun et al., 2007). The findings suggest that modifiable risk factors have a potential to prevent DM, thus leading to a recommendation from the researchers that health care providers should educate and motivate women with GD to implement preventive lifestyle health strategies. A survey of GD women (N=121) identified that although women were instructed about postpartum adoption of healthy lifestyle behaviors, they were not implementing the strategies. More than one-third of the participants gained weight after the pregnancy (Stage, Ronneby, & Damm, 2004).

In the management of GD, nutrition therapy is the primary intervention for glycemic control. An education intervention study (Fehler, Kennedy, McCargar, Bell, & Ryan, 2007) of women with GD (n=19), which focused on nutrition and exercise, identified that the women made significant behavior changes in nutrition during pregnancy, but did not sustain those changes postpartum. The researchers did not elaborate on the reason the women did not sustain the changes postpartum, but the significant increases of nutrition behavior were measured two weeks post intervention (group nutrition education session). In addition, 45% of these women tested positive for

glucose intolerance postpartum, while 60% did not lose weight to return to pre-pregnancy weight at the six week and six month assessments. Therefore, this study indicates that interventions should focus not only on the education of the behavior, but researchers need to target other factors which encourage or hinder sustaining the behavior after childbirth.

Available data from intervention studies have identified that general strategies of healthy diet, exercise, and modest weight loss lowers the risk of DM. According to the ADA (2010) and ACOG (2009), women with GD should be counseled to lose weight, eat a healthy diet and engage in moderate exercise (150 minutes) after delivery and continue these behaviors for a lifetime. These recommendations are consistent with the information provided for the general public who are at risk for developing DM. Studies such as the DPP identify that women with GD had similar reduction of DM risk as women with no GD diagnosis when diet and exercise interventions were followed (Ratner, 2007), thus demonstrating that these behaviors are appropriate for women with GD. However, research is limited in addressing the best approach to engage women with GD to adopt those healthy lifestyle behaviors. Furthermore, women who are caring for a newborn have unique needs and are more likely to have a difficult time participating in multiple counseling sessions, therefore modification of known lifestyle intervention strategies to fit the busy lifestyle of a new mother is necessary (England et al., 2009).

Barriers in Adoption of Health Behaviors

With prevention strategies of DM identified, health care providers need to be aware of barriers that impede women with GD from implementing healthy behaviors after delivery. In an assessment of readiness to make postpartum health behavior changes, Swan, Kilmartin, & Liaw (2007), found a low prevalence of physical activity

and weight loss in GD women (N=53) living in rural Australia. The participants were aware of the risk of developing DM and were aware of preventive strategies, but were not engaged in the activity, thus a need of promotion for weight loss and physical activity for this population was indicated.

There is a gap between knowledge and the behavior which may be associated with time commitments, especially mothers of multiple children. Numerous responsibilities compete with diet, exercise, sleep habits, and work schedules, thus making it difficult for the mother to implement healthy lifestyle strategies. In addition, women do not have an immediate concern of DM, primarily because there are no symptoms in the early development of the disease (Swan et al., 2007). An individual's health beliefs are also essential components for engaging in healthy lifestyle behaviors. Downs and Ulbrecht (2006) assessed exercise beliefs and behaviors of postpartum GD women (N=28) and identified that only 7% believed that physical exercise during postpartum would decrease their risk of developing DM. Exercise activities were predominantly for weight management and not for prevention of a disease. The women identified that lack of time was the major barrier that limited their engagement of physical exercise. Some limitations of this study included a small sample size, participants were predominantly white, married women and the study participants were from only one clinic, thus limiting generalizability due to lack of diversity of the population. Although the study had some limitations, a notable characteristic of this sample was that 75% of participants had a family history of DM, but the belief of physical exercise in the prevention of DM was low (Downs & Ulbrecht, 2006). Family history of DM is an associated factor of developing DM, thus knowledge deficit of the

relationship for developing DM and preventive self-care should be emphasized to increase knowledge and motivate women to engage in a healthy lifestyle.

Physical activity of postpartum women is determined by time constraints, child care, and social support (Doran, 2008; Evenson, Aytur, & Borodulin, 2009; Graco, Garrard, & Jasper, 2009; Smith, Cheung, Bauman, Zehle, & Mclean, 2005). A mixed method study (Doran, 2008) of GD women 6-12 month post-delivery (N=38), identified that postpartum is a difficult time to engage in physical activity due to recovery from labor and delivery and taking care of a newborn. Lack of time, feeling tired, and lack of child care were major barriers. Similar results were reported in semi-structured interviews with women (N=10) with a previous GD diagnosis (Graco et al., 2009). Common barriers to participation in physical activity was due to lack of time to engage in an activity, placing family needs before their own, and lack of appropriate childcare. The women of this study perceived that diet was important in prevention of DM, but did not understand the important role of physical activity in prevention of the disease.

Barriers for adoption of a healthy diet were noted in a random sample of GD women (N=226) who were surveyed by telephone to evaluate psychosocial factors related to diet (Zehle et al., 2008). Half of the women reported that major barriers to eating a healthy diet was a busy lifestyle and lack of knowledge, with one-third of the participants reporting that they did not know which foods should be included in their diet to prevent DM. This same group of investigators (Smith et al., 2005), also assessed psychosocial factors for physical activity in women with GD reporting that only one-third of the women engaged in regular activity. The most common barriers to engaging in physical activity were lack of time and lack of assistance with child care. In addition, the

women reported other barriers including feeling tired, they did not enjoy physical activity, and that their neighborhood was not suitable for physical activity. These studies also identified a knowledge deficit of appropriate lifestyle modifications to prevent DM.

Early Diagnosis: Postpartum Glucose Screening for DM

Early diagnosis of DM is essential for positive health outcomes. In general, evidence supports diagnostic screening practices are useful tools for early diagnosis of disease such as cervical and breast cancer, retinopathy, and DM (Engelgau, Narayan, & Herman, 2000; Nguyern, Larocque, Paquette, & Irace-Cima, 2009; Rue et al., 2009; Zhang et al., 2007). Screening has reduced mortality rates in breast cancer (Rue et al., 2009) as well as cervical cancer (Fisher & Brundage, 2009). Early detection can decrease the co-morbidities that are associated with DM including cardiovascular disease, blindness, and amputations (Ambady & Chamukuttan, 2008; Marshall & Flyvbjerg, 2006). Smirnakis et al. (2005) found that only 37% of women with GD were screened for DM postpartum, but in comparison 94% of women obtained cervical cancer screening, demonstrating that other screening rates are higher and are being performed by health care providers.

Although there are specific recommendations from the ADA and ACOG (ADA, 2003; ACOG, 2009) for follow-up testing of women with GD, there is evidence that many women are not screened for DM postpartum according to guidelines (Almario et al., 2008; Kim et al., 2006). There is a problem with continuity of screening after the index pregnancy (pregnancy with diagnosis of GD) due to lack of knowledge of the risk of DM, as well as, affected women being primarily healthy and asymptomatic and do not seek routine health care appointments (Kapustin, 2008). This population is a young, busy

population therefore follow-up care is not a priority. In addition, healthcare providers are knowledgeable of practice recommendations for follow-up with women with GD, but incorporation of the recommended guidelines into practice is not well established (Kapustin, 2008). With this in mind, health care providers have an essential role in increasing awareness and implementing screening practices that can help delay or prevent this disease. Early diagnosis and early intervention can prevent DM complications (Case et al., 2006) therefore, women with GD need to be educated about their risk for developing DM and become their own advocates for postpartum glucose screening.

Kapustin (2008) highlighted that the lack of postpartum glucose screening for DM in women with GD misses the opportunity to diagnose DM and manage the disease to prevent long term complications. Kim et al. (2006) found that less than one quarter of the 570 women with a history of GD were screened postpartum using either a fasting blood glucose screening or OGTT. This study was primarily White married women and the majority (90%) of those screened visited an endocrinologist during the pregnancy. Similar results were reported in a cross sectional study in which researchers performed a retrospective chart review (Alamario et al., 2008). Their results indicated that two-thirds of postpartum women with GD (N= 90) did not have postpartum glucose screening, with only 20% of health records having a documented physician's order for the postpartum DM screening. A slight increase in screening (33%) was noted in women who were referred back to their primary care physician for postpartum blood glucose screening (Alamario et al., 2008).

Russell et al. (2008) identified that only 45% of GD women (N=344) had postpartum glucose screening and of those women who were screened, 36% had an

increased glucose level. Moreover, this high incidence rate supports the need for women with GD to be screened and educated on DM prevention. In identification of postpartum screening rates, beliefs among the health care provider are also important. Case et al. (2006) stated that DM educators, nurses, and physicians have an essential role in increasing awareness and implementing screening practices which can help prevent this disease. In a survey (Case et al., 2006) of 399 health care professionals, almost all providers (98%) performed a 50g Oral Glucose Tolerance Test (OGTT) for screening of GD during pregnancy, but only 21% of those providers stated that they performed glucose screening postpartum for DM. This finding may indicate that health care providers may not see the benefit of the postpartum screening or there is a knowledge deficit of recommended guidelines.

Barriers to Screening

Lack of consistency of postpartum glucose screening recommendations from professional societies in the past may have contributed to low screening practices and may have been a major barrier for women obtaining glucose screenings postpartum (Bennett, Bolen, Wilson, Bass, & Nicholson, 2009; Bentley-Lewis, Levkoff, Stuebe, & Seely, 2008; England et al., 2009). In 2007, the Fifth International Workshop-Conference on GD supported the ADA postpartum glucose screening guidelines, but the committee's only recommendation was administering an OGTT at 6-12 weeks post-delivery (Metzger et al., 2007). The ADA guidelines suggest a blood glucose test or an OGTT performed at 6-12 weeks postpartum with annual follow-up screening if abnormal results are obtained and every three years if normal (ADA, 2003). Baker et al. (2009) found that a failure to screen patients was primarily associated with inconsistent

screening guidelines and failure of patient's adherence to follow-up visits to obtain blood glucose screening. Agarwal, Punnose, & Dhatt (2004) compared recommendations from the ADA and WHO and concluded that there is confusion and lack of universal recommendations in the clinical practice for screening in the postpartum period.

Bentley-Lewis et al. (2008) found there are many barriers to postpartum screening including lack of communication between obstetricians and primary care providers about blood glucose screening, unclear glucose postpartum screening recommendations, and missed postpartum appointments. The patient factors included risk awareness and adherence to screening appointments. Hunt & Conway (2008) identified in a large Mexican-American sample of 707 women that only 57% returned for the postpartum glucose screening. The women who failed to return for screening had higher glucose levels at diagnosis of GD, were overweight before pregnancy, and were more likely to have had a history of GD in previous pregnancies. These women are more likely to be at high risk for developing DM, but are not receiving screening for diagnosis of DM.

These studies demonstrate that the postpartum screening rates are low and that standard guidelines are not being followed. Health care provider's establishment of glucose screening during postpartum care is imperative to identify women with persistent glucose intolerance. In addition, women with GD need to be knowledgeable of not only their risk of developing DM, but also the screening guidelines, so they can become their own advocates to obtain essential testing.

Strategies to Increase Adoption of Healthy Lifestyle Behaviors

Knowledge

Health promotion begins with the knowledge of health risks and information to assist individual in making decisions about health and health behaviors. Bandura (2004) described that individuals change habits if they have the knowledge about how lifestyle behaviors affect their health. If the understanding is lacking, then change will not occur because the individual will have limited reason to change a behavior that is unhealthy and one they enjoy. The impact of information is more beneficial to address the positive aspects of behavior change rather than to use information that instigates fear of the disease. Bandura (2004) also describes that knowledge is only part of the process to change behavior and that there are additional factors (such as self-efficacy) that influences the adoption of healthy behaviors. Hjelm et al. (2008) discussed that health behaviors depended on an individual's knowledge about those behaviors, stressing that the knowledge is based on what is provided by the health care provider. Numerous awareness campaigns for prevention of disease such as breast cancer, cardiovascular disease, and diabetes (NIH, 2011; International Diabetes Federation, 2011; Susan G. Komen for the Cure, 2011) have been used over the years to provide knowledge to the public. The International Diabetes Federation (2011) has instituted World Diabetes Day to highlight education to the public and health care professionals about prevention and management of DM.

Although limited studies have addressed knowledge of healthy behavior and women with GD, a recent study in women with GD contradicts the basic premise that knowledge equals behavior. Swan and colleagues (2007) determined that although

women with GD had a high awareness of healthy behaviors to prevent DM, engagement in those activities were low, thus demonstrating incongruence between the knowledge and behavior. In contrast, some studies have demonstrated an association between knowledge and behavior. Smith et al. (2005) identified, in a study of women with a history of GD (N=226), that the participants did not know what type of physical activity would decrease their risk of developing DM and therefore only one-third of the participants reported engaging in exercise that met recommended moderate exercise requirements after childbirth. In a qualitative study (Rosal, Borg, Bodenlos, Tellez, & Ockene, 2011) of low income Latinos (N=41) with no diagnosis of diabetes, participants (85% women) had limited knowledge of DM risk factors or lifestyle changes that could prevent or delay DM. Although half of the participants recognized family history as a risk factor for DM, very few mentioned ethnicity or gestational diabetes as an associated risk. Chen and Lin (2010) identified a positive relationship between pre-diabetes knowledge and health promoting lifestyles. This cross sectional study (N=260) of adults discussed the importance of increasing awareness to assist with encouraging activities that were health promoting.

Cues to Action

Providing information about prevention strategies of DM may occur in a variety of ways. Advice from health care providers, media campaigns, and intensive counseling sessions have all been used to increase the likelihood that an individual will adopt health behaviors. Preventive counseling has shown to be effective in the adoption of health behaviors, such as the individualized counseling in the premiere DM prevention studies (Knowler et al., 2002; Tuomilehto et al., 2001) to promote healthy diet and exercise in

the prevention of DM. Motivation from health care providers to engage in a health behavior can increase the likelihood that an individual will adhere to the behavior long term. In a randomized clinical trial in overweight women (N=217), individuals who were involved in individual sessions in which motivational interviewing was used in conjunction with a weight control program, had more weight loss at six months and 18 months than the control group (Smith, DiLillo, Bursac, Gore, & Greene, 2007). Motivational interviewing, a client-centered approach to engage individuals to adopt health behaviors, was successful in engaging participants to be involved in weight loss, thus leading to an achievement of weight loss.

Internet based behavioral counseling has also been effective in adoption of health behaviors (Tate, Jackvony, & Wing, 2003; Tate, Jackvony, & Wing, 2006), allowing individuals to use health behavior interventions at their convenience and without one on one sessions with a health care provider. Bandura (2004) believes that with the accessibility, convenience, and anonymity that the internet provides, those individuals who ignore traditional preventative health services will more likely use this type of service. One hundred ninety-two adults were involved in a randomized trial comparing computer-automated counseling, email counseling, or no counseling. Weight loss was significantly greater in groups that received email counseling (Tate et al., 2006). Similarly, a randomized controlled trial in overweight adults (N=92) reported a greater weight loss in one year in participants of the internet counseling group who received diet and exercise information and weekly emails from a counselor (Tate et al., 2003). A limitation of these internet based interventions is that all information is a self-report, thus reporting bias may be an issue in the findings.

Research has also explored strategies (cues) that would enhance screening rates. The most effective strategies in increasing breast and cervical cancer screenings have been behavioral interventions that target the patients (Mandelblatt & Yabroff, 1999; Yabroff, Mangan, & Mandleblatt, 2003). Although overall screening rates for DM were suboptimal, a cross sectional survey of 228 non-Hispanic White women identified that women who were given advice regarding postpartum screening and received a laboratory slip for the screening had a higher rate of receiving glucose screening postpartum than those who did not (Kim, McEwen, Kerr, et al., 2007). The researchers also wanted to determine if there was an association of recall of health care provider advice with healthy diet and physical activity, but no significant association was found. A limitation of this study was that the sample included predominately White, college educated, and overweight women who had been diagnosed with GD in the last five years. The length of time between education and diagnosis could have led to recall bias.

Success has also been reflected in studies focusing on reminders to patients and physicians about screening needs. Telephone interventions have proven effective in increasing overall screening rates in a variety of preventive practices. A randomized clinical trial to promote diabetic retinopathy screening found that there was a 74% increase in the retinopathy screening in those who were reminded by telephone compared to those only given printed material (Walker et al., 2008). The short telephone interventions were significant in participants who had poor control of DM and had an influence on their perception of risk of complications from DM. Zhang et al. (2007) discussed that increasing awareness, improving health care provider performances, and improving healthcare systems processes had a significant effect on increasing screening

practices for diabetic retinopathy. In women with GD, a postal reminder that was sent to the women and their physicians increased postpartum OGTT screening rates to 60.5% in comparison to a no reminder group with a rate of 14.3% (Clark, Graham, Karovitch, & Keely, 2009). The randomized controlled trial assigned 223 GD women to one of four groups. One group had postal reminders sent to the physician and the patient while the second group reminders were only sent to the physician. The third group reminders were only sent to the patient and the fourth group received no postal reminders (Clark et al., 2009). In Australia, a new system has been developed to register women with GD into the South Australian Gestational Diabetes Mellitus Recall Register (Chittleborough et al., 2010). An annual reminder was sent to the women reminding them of their risk of type 2 diabetes and encouraging them to receive blood glucose screening. Of the 429 women who received the first reminder letter, over 56% obtained glucose screening.

Summary of the Relevant Literature

In summary, in comparison to the general population, women with GD are at high risk of developing DM after childbirth due to several factors such as overweight/obesity (BMI >25), sedentary lifestyles, use of insulin during pregnancy, an early diagnosis of GD (<24 weeks gestation), and sleep duration. Numerous intervention studies of the general public have demonstrated that adoption of healthy lifestyle behaviors (e.g. healthy diet, exercise, weight loss) decreases the risk of developing DM, but limited research has explored strategies to encourage women with a diagnosis of GD to implement those behaviors during the postpartum period and throughout their lifetime. Perception of risk of developing DM is low in women with GD. In addition, there are numerous barriers such as fatigue, time constraints, and lack of social support which

prohibit women from engaging in healthy behaviors postpartum and/or to obtain postpartum glucose screening for early diagnosis of DM. A variety of strategies (counseling, technology, advice from health care providers) have been used to motivate and encourage adoption of healthy lifestyle behaviors in general populations, yet limited research has been conducted to encourage adoption of healthy lifestyle behaviors in women with GD.

There is strong empirical support for the development of interventions to increase adoption of healthy lifestyles and postpartum glucose screening practices. In the past, nursing care has focused on management of GD during pregnancy to achieve positive pregnancy outcomes, but evidence demonstrates the importance of nursing care after childbirth as well. With an increased incidence of DM in women with GD and evidence that the disease can be prevented or delayed through adoption of healthy lifestyle behaviors (e.g. weight loss, healthy diet, exercise), it is important that preventive care be instituted throughout her lifetime. In women with a history of GD, screening practices for postpartum glucose screening are low and the incidence rate of DM is high. Established guidelines from the ADA and ACOG for postpartum glucose screening for DM in women with GD gives strong credence to the importance of women having blood glucose or OGTT screening performed postpartum. No studies have identified educational interventions to increase GD women's knowledge of DM risk and postpartum glucose screening practice. Several studies were reviewed for the modification of lifestyles to prevent or delay DM in adult men and women in the general population (Knowler et al., 2002; Quinn, 2003; Tuomilehto et al., 2001), however, there were limited studies which addressed healthy lifestyle modifications for women with a

history of GD (Ratner et al., 2008). The focus of the research in women with GD has been the risk of developing DM, but few studies have focused on risk perception and health behaviors of women with GD (Jones et al., 2009).

There are several methodological problems in studies associated with women with GD and the risk for developing DM. A majority of the studies used a retrospective design thus; prospective longitudinal studies that review the effect of educational interventions during prenatal or postpartum time frames and the effect on health choices of women with GD are needed. A diverse sample base is lacking, with studies predominantly comprised of Caucasian women. Hispanics, African Americans, and Native Americans have a disproportionate risk of developing DM (CDC, 2008), but few studies have a representative sample of these at risk groups. Few studies have identified a woman's risk perception of developing DM following GD and there is a gap in the literature on the effect of the perception of risk on glucose screening postpartum or adoption of health behaviors. Furthermore, a majority of studies reviewed did not have theoretical foundations.

To contribute to nursing's body of knowledge, future research for preventive care of women with GD needs to focus on prevention programs established for the needs and challenges of adoption of healthy lifestyles of postpartum women. Examination of influences that enhance or prevent engagement of healthy behaviors will assist health care providers in developing effective DM prevention programs that are tailored for childbearing age women with GD. Prevention of DM is plausible, but adherence to healthy behaviors for a lifetime is a challenge, especially for women who have responsibilities of motherhood that can be overwhelming (England et al., 2009).

Madden, Loeb, & Smith (2008) who conducted a review of literature of DM prevention programs pointed out that nurses have the greatest opportunity for health promotion, but in the prevention studies, very few nurses contributed to research, therefore nursing research for the prevention of DM is an essential area for nurses to contribute. With diet and exercise being effective for the prevention of DM, the focus of research should now be on different strategies for delivery of education and counseling for women with GD. Interventions may occur as one on one counseling sessions or development of other creative strategies, such as the use of technology, may be useful for many women who have difficulty adhering to appointment schedules. Another important area for research should be focused on compliance of postpartum glucose screening by the patient and health care provider and determine efficient ways to have continuity of care and linking of obstetrical history even when multiple health care providers are utilized (England et al., 2009).

This review of the scholarly literature on women with GD and their risk for developing DM demonstrates a need for further research with this vulnerable population. Throughout this review of the literature, variables have been identified for a quantitative study including perceived risk for developing DM, barriers to adopting health behaviors, self-efficacy to adopt health behaviors, and cues to action to implement behavior. The purpose of this pre-test, post-test, two group study is to determine the effectiveness of SUGAR (Start Understanding Gestational Diabetes and Risk of Type 2 Diabetes), an educational intervention designed to enhance women's perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors

(e.g. weight loss, healthy diet, and exercise) and adoption of healthy lifestyle behaviors after childbirth among women with GD. As demonstrated throughout the literature, DM can be prevented or delayed through adoption of healthy lifestyle behaviors, but women with GD do not perceive themselves at risk for developing DM and have barriers to implementing health actions. The creation of specific strategies for this at risk population is imperative to decrease the incidence of DM in women with GD and can be developed based on specific influences of adoption of health behavior. In pursuing studies that focus on women with GD, effective strategies could lower the incidence rate of overt DM, thus avoiding associated complications in young women that lead to physical, psychological, and financial consequences.

CHAPTER III

METHODOLOGY

This pre-test, post-test, two group study was to determine the effectiveness of SUGAR (Start Understanding Gestational Diabetes and Risk of Type 2 Diabetes), an educational intervention designed to enhance women's perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors (e.g. weight loss, healthy diet, and exercise), and adoption of healthy lifestyle behaviors after childbirth among women with GD. The purpose of this chapter is to describe the methodology for the pilot study. Detailed discussion includes research design, study setting, sampling, and protection of human subjects, instrumentations, study procedures, and data analysis.

Research Design

A pre-test, post-test, two group study design was used to pilot test an educational intervention SUGAR (Start Understanding Gestational Diabetes and Risk of Developing Type 2 Diabetes) in women with GD to determine if the structured intervention would result in an increased perceived susceptibility (risk) of developing DM, knowledge of DM, and adoption of healthy lifestyle after childbirth to prevent or delay the development of DM. This design has been developed to answer the following research questions for this study:

1. To what degree is the likelihood of adopting healthy lifestyle behaviors explained by pregnant women's selected demographic (age, education, ethnicity, use of insulin during pregnancy, BMI>25 before pregnancy, sleep duration), structural variable (knowledge of diabetes, family history of type 2 diabetes), perceived risk, and self-efficacy?
2. What effect sizes are expected for perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors, and adoption of healthy lifestyle behaviors after childbirth when comparing the two experimental groups (control group: standard care with attention control and treatment group: educational intervention) at 6-8 weeks postpartum?
3. What are the barriers to obtaining postpartum glucose screening and adopting healthy lifestyle behaviors after childbirth among women with a diagnosis of GD?
4. What type of cues of action encourages postpartum glucose screening and adoption of healthy lifestyle behaviors among women with a diagnosis of GD?

Study Setting

The setting for this pilot study was three OB/GYN offices in a not-for-profit health system located in the southeastern United States. The health system had over 12,000 births in 2010 and serves a diverse population. The prenatal care protocol for women with GD at the OB/GYN offices included scheduled prenatal visits, maternal-fetal medicine consultation, participation in a diabetes education class, glucose monitoring, and non-stress tests beginning at 32 or 36 weeks for fetal well-being evaluation. After delivery, a follow-up appointment was scheduled approximately six to eight weeks postpartum.

Sample

In order to recruit participants for this pilot study, a meeting with the managers and staff of the OB/GYN offices was conducted by the student Principal Investigator (PI) to review the purpose of the project and requirements of participation. The student PI posted flyers (Appendix A) in the OB/GYN offices and provided staff with additional flyers to seek potential participants. In addition, the student PI reviewed medical records for the diagnosis of gestational diabetes and to identify first time diagnosis of gestational diabetes.

A convenience sample of pregnant women 32-36 weeks gestation who were diagnosed with GD was used for this study. Study participants were enrolled during their third trimester of pregnancy and assigned into the intervention (SUGAR) group or the attention control group after baseline data had been obtained. Participants were randomized into the groups until the control group reached five participants, and then participants were placed in the intervention group only. Sample criteria included first diagnosis of GD, 18 years of age or older, able to read, write, and speak English. Exclusions for this study included women with a previous diagnosis of type 1 or type 2 diabetes, since the diagnosis is different than GD according to the ADA (2010). Women with cognitive impairment or mental illness were also excluded from the study due to limited ability to complete questionnaires and participate in educational sessions. Women experiencing pregnancy complications which limited activities (e.g. placed on bed rest) were considered for the study if it was determined that participation in the study did not cause additional stress to the woman. The determination was based on the health care provider's medical comment.

A sample size of 20 was selected for this pilot study since it is an adequate sample size for a normal shaped distribution (S. Koval, personal communication, April 8, 2011). Due to the nature of the pilot study, the small sample size does not have enough power to test for hypothesis; however we calculated the effect size for a future large-scale study. To ensure a final sample size of 20, the researcher over sampled by 25% resulting in a total of 25 mothers enrolled in the study.

Protection of Human Subjects

Institutional Review Board (IRB) approval was obtained from Georgia State University (Appendix B & C) and committee approval by the Nursing Research Committee (NRC) of the health care system (Appendix D). A partial Health Insurance Portability and Accountability Act (HIPPA) waiver allowed the student PI access to patient records to obtain additional baseline data. Once potential participants were identified, the student PI met with the pregnant woman to invite her to participate in the study and to provide details of the research project including information explaining the time points of contact, the randomization design, and the approximation time commitment of 20 minutes needed to complete the questionnaires. The women were allowed to ask questions and were given ample time to consider participation before they consented for this study.

Participation was voluntary and participants could withdraw from the study at any time. In this study, the participant did not have any more risks than she would have in normal everyday life and no immediate benefit occurred for the participant. Informed consent (Appendix E) was obtained by the student PI and a copy of the informed consent was provided for the participants' own records.

For this study, anonymity was protected by assigning code numbers to each participant and only the student PI had access to a master list. To ensure confidentiality, all information was locked and secured with the participants' name and code in a separate location from collected data. All collected data will be located in a locked cabinet for a minimum of seven years and then will be destroyed. Data input to the computer had limited access for research personnel only. For reporting purposes, only aggregated data is published thus, no individual data is reported.

Since DM is a severe health risk, the study participants in the control group also received educational information about GD and DM at the end of the study.

Instrumentation

For collection of data, four instruments were selected based on the purpose of the study and research questions. The study utilized instruments including the Risk Perception Survey for Developing Diabetes adapted for women with GD [RPS-DD] (Kim, McEwen, Piette et al., 2007), Self-Rated Abilities for Health Practices [SRAHP] (Becker, Stuifbergen, Oh, & Hall, 1993), Health Promotion Lifestyle Profile II (HPLP II) (Walker & Hill-Polerecky, 1996), and General Sleep Disturbance Scale [GSDS]-short version (Lee, 1992). All of the instruments are at or below the 8th grade reading level. The approval to use these instruments was obtained from the authors of the instruments. In addition, a demographic form, developed by the researcher, was used to collect baseline and postpartum patient characteristics. Open-ended questions pertaining to barriers and cues for action for adoption of healthy lifestyle behaviors and postpartum glucose screening were developed by the investigator.

Demographic Information

Baseline and Postpartum Demographic Questionnaire. An investigator developed demographic form was used to obtain baseline (pre-test) individual characteristics including age, ethnicity, marital status, education, income, gestational weeks at diagnosis of GD, pre-pregnancy weight, use of insulin or oral hypoglycemic medications during pregnancy, height, family history of DM, and sleep duration (see Appendix F). A post-test demographic form was used (6-8 weeks postpartum) to collect information about type of delivery, total gestation weeks, pregnancy weight gain and final pregnancy weight, attendance to follow-up postpartum appointment, and newborn characteristics including sex, birth weight, length, and NICU admittance (see Appendix G).

Perceived Susceptibility (Risk) of DM and Knowledge of Type 2 Diabetes

Risk Perception Survey for Developing Diabetes adapted for women with GD (RPS-DD). The RPS-DD (see Appendix H) was used to examine multiple areas of perceived risk for developing diabetes (Kim, McEwen, Piette et al., 2007). This tool is a 24 item questionnaire which was modified from the Risk Perception Survey for Developing Diabetes (Walker, Mertz, Katlen, & Flynn, 2003) to target women with GD (Kim, McEwen, Piette et al., 2007; Michigan Diabetes and Research Training Center, 2010). This tool has four subscales (optimistic bias, diabetes risk knowledge, personal control, barriers, and benefits) and four single item questions. The adapted instrument has an 8th grade reading level and is completed in ten minutes or less.

The *Optimistic Bias* subscale for not developing diabetes has two items (Section 1, items E & F) using a 1-4 Likert-type scale from 1(strongly agree) to 4 (strongly

disagree). The scores are averaged with higher scores indicating the participant is optimistic they will not develop diabetes. The *Diabetes Risk Knowledge* subscale has eleven items (Section 2 & 3, items A-K) that are a summation of correct responses, with higher scores indicating higher knowledge of risk factors of DM. A Likert score from 1 (increases or raises the risk) to 4 (don't know) is used. The P*ersonal Control* subscale of developing diabetes with four items (Section 1, items A-D) uses a 1-4 Likert type scale with 1 (strongly agree) to 4 (strongly disagree). Scores are averaged with higher scores indicating a greater personal control to prevent development of DM. Three items (Section 4, A-C) focus on women's perceptions on *Barriers and Benefits* of preventive behaviors and are measured on a 1 (strongly agree) to 6 (strongly disagree) Likert scale. The scores are averaged with higher scores indicating greater belief that health behaviors have benefits, while lower scores reflect greater barriers to preventive activity (Michigan Diabetes and Research Training Center, 2010).

Four individual questions of the RPS-DD relate to perceived risk of developing DM and change of behavior. The measurement of risk perception is a single item (item 5) asking, "What do you think your risk or chance is for getting diabetes over the next 10 years?" The participant chooses Likert-type scale of 1 (almost no chance) to 4 (high chance). In addition, the authors added a question (item 6) using the Likert scale of 1 (almost no chance) to 4 (high chance) pertaining to risk perception of developing diabetes to address the possibility that women who plan to make life changes may have lower risk perception. "If you don't change your lifestyle behaviors, such as diet or exercise, what is your risk or chance of getting diabetes over the next 10 years?" Two questions (items 7 & 8) focus on change of behavior and the intent to change behavior to lower chances of

developing DM using a yes/no response (Michigan Diabetes and Research Training Center, 2010).

The initial cross-sectional study using the RPS-DD adapted for women with GD (Kim, McEwen, Piette et al., 2007) surveyed 217 women with a history of GD and reported psychometric analysis of the subscales. The Optimistic Bias subscale (Cronbach's alpha of 0.65), Diabetes Knowledge subscale (Cronbach's alpha of 0.70) and Personal Control (Cronbach's alpha of 0.72) had acceptable internal consistency for a new instrument (Burns & Grove, 2005). For barriers and benefits subscale, the authors noted that the Cronbach's alpha was not calculated because the questions were not originally designed to measure the same construct, but were a summary of benefits and barriers. The four individual items have no reliability reported. There is also no validity reported for the adapted RPS-DD, but the original version of the RPS-DD did report content and face validity by a panel of clinical diabetes experts, risk perception experts, and health psychologists (Walker et al., 2003).

Barriers and Cues to Action of Healthy Behaviors and Screening

Five open ended questions were developed by the investigator to elicit descriptive data for barriers to adopt healthy lifestyle behaviors and postpartum glucose screening. These questions include: 1) How do you describe a healthy lifestyle? 2) Is a healthy lifestyle important to you? 3) Can you give me the top three reasons that prevent you from having a healthy lifestyle (e.g. eating healthy diet, exercising, losing weight)? 4) Did you receive blood glucose screening at your postpartum appointment? 5) If you did not receive blood glucose screening at your postpartum appointment, what was the reason you did not have this blood work done? Two open ended questions were developed by

the investigator to elicit descriptive data for cues to action to obtain postpartum glucose screening and adopt healthy lifestyle behaviors. These questions include: 1) Can you tell me what encourages or motivates you to adopt healthy lifestyle behaviors (e.g. lose weight, eat healthy diet, exercise? and 2) What motivated you to get a glucose test postpartum? (see Appendix I).

Self-Efficacy for Health Practices

Self-Rated Abilities for Health Practices (SRAHP). The SRAHP was used to measure the self-efficacy to adopt healthy lifestyle behaviors. This tool (see Appendix J) is a measurement of the self-perceived ability (self-efficacy) to implement behaviors that are health promoting, including diet as well as exercise (Becker et al., 1993; University of Texas at Austin School of Nursing, 2007). This 28 item scale includes four subscales: exercise (items 4, 15-18), nutrition (items 1-3 and 5-7), responsible health practices (items 22-28), and psychological wellbeing (items 8-14). The subscales of the Self-Rated Abilities for Health Practices focus on health practices that were determined important from the health promotion literature for implementing health promoting behaviors. The *Nutrition* subscale (seven items) measures one's belief that he/she is able to perform activities for healthy nutrition, such as eating a balanced diet and drinking water. The *exercise* subscale (seven items) measures beliefs about ability to perform physical activity/exercise. The *Responsible Health Practices* subscale (seven items) is the individual's confidence to interact with the health care provider, while the *Psychological Well Being* subscale (seven items) is related to stress management skills (University of Texas at Austin School of Nursing, 2007).

The SRAHP is a five point Likert-type scale rated from 0 (not at all) to 4 (completely) to represent an individuals' confidence to perform health practices. A total score was calculated from a summation of all subscales, with a range from 0-112, with higher scores indicating greater self-efficacy for health practices (Becker et al., 1993). Evaluation for reliability was determined in three separate samples including adults attending a health fair (N=188), undergraduate students (N=111) and adults with disabilities (N=117) with Cronbach's alpha for total score ranging from 0.91-0.94 and subscales ranging from 0.76 to 0.92. Content validity was established through review of experts while convergent validity determined significant moderate correlations with the General Self-Efficacy Scale (r= 0.43, p<.01) and Health Promoting Lifestyle Profile (r=.69, p<.01).

Healthy Lifestyle Behaviors

Health Promotion Lifestyle Profile II (HPLPII). The HPLPII (Appendix K) measures the frequency of self-reported healthy behaviors focusing on six main areas including physical activity, spiritual growth, health responsibility, interpersonal relations, nutrition, and stress management (Walker & Hill-Polerecky, 1996). The 52 item questionnaire has six subscales which focus on different areas of lifestyle behaviors (Frank-Stromberg & Olsen, 2004; University of Nebraska College of Nursing, 2010). *Nutrition* (items 2, 8, 14, 20, 26, 32, 38, 44, 52) includes the selection and consumption of a healthy diet according to guidelines of the Food Guide Pyramid which are important for health and well-being while *physical activity* (items 4, 10, 16, 22, 28, 34, 40, 46) questions determine participation in regular activity. Another area of this tool is *health responsibility* (items 3, 9, 15, 21, 27, 33, 39, 45, 51) which is a belief of one's

accountability for their own health and well-being through education, attention to own health, and being informed when seeking professional assistance. A subscale which focuses on the development of inner resources is *Spiritual Growth* (items 6, 12, 18, 24, 30, 36, 42, 48, 52) with achievement through transcending, connecting, and developing thus, giving a feeling of harmony, provision of inner peace, and finding a sense of purpose. *Stress management* (items 5, 11, 17, 23, 29, 35, 41, 47) is the identification and implementation to control or reduce tension while the final subscale of this tool is the *interpersonal relations* (items 1, 7, 13, 19, 25, 31, 37, 43, 49) which is communication and developing close relationships with others (University of Nebraska College of Nursing, 2010).

The HPLPII has a four point Likert-type scale ranging from 1 (never) to 4 (routinely) to indicate the frequency a respondent engages in a certain type of health behavior. An overall score of the health promoting lifestyle is a calculation of the mean of responses from all items. In addition, subscale scores are calculated using the mean for each set of questions of the subscale. The authors recommend a use of means for scoring to have more meaningful comparisons of each of the subscales (Frank-Stromberg & Olsen, 2004; University of Nebraska College of Nursing, 2010; Walker & Hill-Polerecky, 1996).

The psychometric evaluation of the HPLPII was established through data from a test population of (n=712) adults ranging from 18-92 years of age. The total scale alpha coefficient of internal consistency was 0.943 and the subscales Cronbach's alpha ranged from 0.793 to 0.872. Twenty-six undergraduate students were used to evaluate test-retest stability at a three week interval and resulted with r=0.892. Content validity was

determined through evaluation of content experts and literature review, while construct validity was supported through factor analysis for the six subscales and convergent validity with the Personal Lifestyle Questionnaire (*r*=.678) (University of Nebraska College of Nursing, 2010; Walker & Hill-Polerecky, 1996).

Sleep Disturbance

General Sleep Disturbance Scale (GSDS). The GSDS is a 21 item questionnaire (Appendix L) with seven subscales which measures the frequency, during the past week, a person experiences difficulty initiating sleep (one item), mid-sleep awakenings (one item), early awakenings (one item), sleep quality (three items), sleep quantity (two items), sleepiness (seven items), and use of substances to aid sleep (six items) (Lee, 1992). Due to the fact that the majority of pregnant women will not use sleep aids during pregnancy, the items associated with sleep aids were omitted, therefore only items 1-15 were used. The instrument uses an eight point Likert-type scale with 0 (never) to 7 (everyday) weekly scale and uses a mean score of $\geq$3 on the total scale or any subscale to indicate significant sleep disturbance. This is based on the DSM-IV criteria for symptoms of insomnia having a frequency of at least three times per week.

Psychometric evaluation for this tool was demonstrated in a sample of female registered nurses working varied shifts of day, evening, and rotating (N=760) with the Cronbach's alpha coefficient 0.88 for the overall scale and subscale of sleep quality (0.79) and daytime sleepiness (0.82) were reported. Other subscales have limited number of items, therefore alpha coefficients were not measured. In a study of sleep patterns in new mothers and fathers (N=72 couples), the Cronbach's alpha was 0.77 and 0.85

respectively (Gay, Lee, & Lee, 2004). Construct validity of the GSDS was also evaluated with the modified Stanford Sleep Questionnaire Assessment of Wakefulness (Lee, 1992).

Intervention

SUGAR Intervention Group

Women with GD in the SUGAR group received standard prenatal and postpartum care. During the third trimester of pregnancy, the participants had regular prenatal visits every two to four weeks and then weekly beginning at 36 weeks gestation. Participants also had monitoring of blood glucose as appropriate, a consultation appointment with a diabetes educator, and use of insulin or oral hypoglycemic agents as indicated to control blood glucose. In addition to the standard care, the SUGAR group received an educational intervention, led by the student PI. The focus of the 30 minute session was to provide education to the participant about the risk of DM after childbirth, associated risk factors of DM (such as family history, use of insulin during pregnancy, sleep duration, obesity, and sedentary lifestyles), glucose intolerance risk for future pregnancies, recommended postpartum glucose screenings, and healthy lifestyle behaviors to prevent or delay DM based on ACOG and ADA recommendations for women with GD. The educational session was conducted by the student PI in a private room located at the designated OB/GYN office in a comfortable environment. Two educational brochures entitled "What I Need to Know About Gestational Diabetes" (NIDDK, 2006) and "Small Steps Big Rewards: Your Game Plan to Prevent Type 2 Diabetes" (National Diabetes Education Program, 2006) were provided to the participant during the session (See Appendix M and N). A manual of content with full script and learning activities was

developed to maintain consistency in delivery of the intervention managed by the student PI.

Four components were reviewed during the session:

Component 1: Discussion of general information about GD which included the definition of GD, causes, diagnosis, and treatment. The PI elicited knowledge the participant had about GD and provided additional information and/or addressed misconceptions.

Component 2: The focus of this component was the risk for DM after pregnancy. Emphasis of information was placed on health risk for the child-bearing woman and health risks of children of future pregnancies. Risk of subsequent GD pregnancy was also discussed.

Component 3: This component focused on the recommended postpartum glucose screening guidelines instituted by the ADA and ACOG. A flow-chart was reviewed detailing postpartum glucose screenings 6-12 weeks postpartum (primarily performed at follow-up postpartum visit) and future blood glucose screenings for DM annually or every three years, depending on postpartum glucose screening results.

Component 4: Healthy lifestyle behaviors which include nutritious diet and active lifestyle through exercise were reviewed. The ADA nutrition guide was reviewed for understanding of healthy nutrition to prevent DM. Recommendations of moderate exercise of 150 minutes per week were reviewed and examples of moderate exercise were provided. The PI assisted the participant in determining

exercise that was beneficial and activities that were realistic for the busy lifestyle of a mother with a newborn.

Attention Control Group

Women with GD in the attention control group received standard prenatal and postpartum care. During the third trimester of pregnancy, the participants had regular prenatal visits every two to four weeks and then weekly beginning at 36 weeks gestation, monitoring of blood glucose as appropriate, a consultation appointment with a diabetes educator, and use of insulin or oral hypoglycemic agents as indicated to control blood glucose. In addition to the standard care, a 30 minute attention control session was conducted by the student PI at the next obstetrical appointment following enrollment into the study. A comfortable private room located at the designated health system OB/GYN office was used for the session. The component for this group focused on care of the newborn including nutrition and newborn safety. An educational brochure entitled "Caring for Your Newborn" (Appendix O) which is based on recommendations from the American Academy of Pediatrics (Media Partners, 2008) was used to guide the session and was provided to the participant during the session. The brochure is written on a 5th-6th grade reading level and provided additional resources for information on care of the newborn. A manual of content with full script and learning activities was developed to maintain consistency in delivery of the attention control intervention managed by the student PI.

Booster Session

A booster session to both groups was delivered via telephone at two to four weeks postpartum to reinforce information provided at the educational session and served as a reminder of study participation. No additional information was provided.

Study Procedures

After obtaining IRB and NRC approval from all sites, the student PI began the study procedure (see Figure 2) with recruitment of participants in their third trimester of pregnancy (32-36 weeks gestation) at the designated OB/GYN offices. For recruitment, the student PI posted flyers in the OB/GYN offices and provided staff with additional flyers to give to women diagnosed with gestational diabetes. The student PI reviewed the medical record for the diagnosis of gestational diabetes and to determine first time diagnosis of gestational diabetes. Once the potential participant was identified, the staff nurse was asked to approach the patient to determine if the participant was interested in meeting with the student PI. The information card was completed and the patient was screened for study eligibility by the student PI. The student PI met with the participant at her prenatal appointment and enrolled the participant in the study, obtained written informed consent, and administered (paper/pencil form) the baseline demographic questionnaire (pre-test).

Study participants were enrolled during their third trimester of pregnancy (32-36 weeks gestation) and randomly assigned to the intervention group or the attention control group after baseline data was obtained. In general, the diagnosis of GD is 24-28 weeks gestation, thus enrollment of the participant at approximately 32-36 weeks gestation provided the participant time to accept the medical condition and engage in

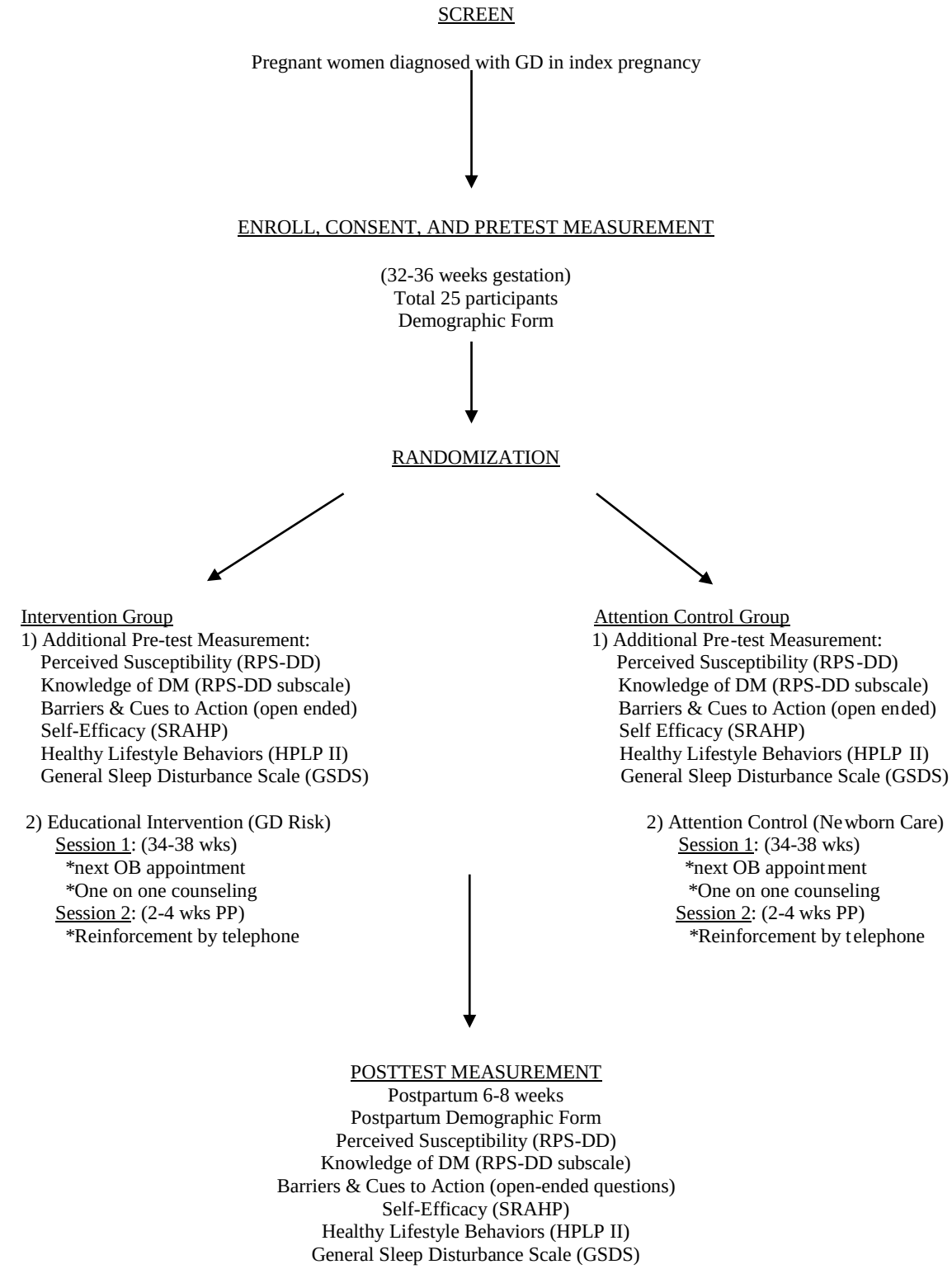
standard care practices of GD before participating in the educational intervention. In addition, this stage of the pregnancy allowed sufficient time for the PI to provide the information prior to delivery.

Women who were assigned to the intervention group (SUGAR) received the first educational intervention at the next obstetrical appointment (one to two weeks) after enrollment, while the attention control group received information on care of the newborn. Prior to the educational session, questionnaires including the Risk Perception Survey for Developing Diabetes adapted for women with GD [RPS-DD] (Kim, McEwen, Piette et al., 2007), Self-Rated Abilities for Health Practices [SRAHP] (Becker, Stuifbergen, Oh, & Hall, 1993), Health Promoting Lifestyle Profile II [HPLPII] (Walker & Hill-Polerecky, 1996), General Sleep Disturbance Scale [GSDS] (Lee, 1992), and Barriers and Cues to Healthy Behaviors and Screening were administered. Sessions for the intervention group and the attention control group were conducted by the student PI. For the educational intervention, a private room at the OB/GYN office was used for a 30 minute session using strategies to engage the adult learner in discussion and activities to encourage engagement in the learning process and provide pertinent information to help motivate the learner to implement healthy strategies for their lifelong health. Educational brochures were provided to the participant during the session. For attention control, the control group also had a session at the next obstetrical appointment after enrollment. A private room at the OB/GYN office was used for the session to discuss care of the newborn including nutrition and newborn safety. In addition, an educational brochure on newborn care was provided during the session.

Two to four weeks postpartum, the participants received a telephone call from the student PI to remind them of the ongoing study and to reinforce information that was provided during the educational session. The contact served as a booster session and encouraged completion of all phases of the project and required a time commitment of the participant of approximately five to ten minutes.

Follow-up assessment (post-test) for both groups occurred six to eight weeks postpartum at the postpartum follow-up appointment. Post-test data collection included postpartum demographics and repeat measures of the RPS-DD, SRAHP, HPLPII, GSDS, and Barriers and Cues to Healthy Behaviors and Screening. If the participant did not attend the appointment, data was collected by telephone interview. After completion of the study, all participants received a $10 gift card for compensation of time associated with participating in the study. In addition, women that were randomized in the attention control group received the same educational brochures provided to the intervention (SUGAR) participants focusing on the risk of DM after childbirth, associated risk factors, and glucose intolerance risk for future pregnancies, recommended postpartum glucose screenings, and healthy lifestyle behaviors to prevent or delay DM.

Figure 2: Research Design Pretest/Posttest



Methods of Data Analysis

Data was transferred from the questionnaires to the computer program Statistical Package for the Social Sciences (SPSS) version 18 for Windows using a double entry method to ensure accuracy of transcribed data. Prior to substantive analyses, the data was subjected to cleaning to check for impossible or improbable values. Internal consistency reliability measures for all instruments were calculated using Cronbach's alpha coefficients. Frequency distributions were also examined for reasonable approximations to normality for all continuous variables. Descriptive statistics were used to describe sample characteristics and major study variables. Mean scores and standard deviations were obtained for each scale and subscales. T-tests or chi-square as appropriate, were used to determine if there are any significant differences at baseline between the groups of participant characteristics which could impact the outcome variables (e.g. educational background).

Analysis Plan for Specific Research Questions

Research question 1: (To what degree is the likelihood of adopting healthy lifestyle behaviors explained by pregnant woman's selected demographic (age, education, ethnicity, use of insulin during pregnancy, BMI >25 before pregnancy, sleep duration), structural variable (knowledge of diabetes, family history of type 2 diabetes), perceived risk, and self-efficacy?) was analyzed using Hierarchical Multiple Linear Regression to determine whether demographic variables, structured variables, and self-efficacy can predict healthy lifestyle behaviors. To select the appropriate independent variables for the final regression model, a correlation matrix was used to determine the strength of relationships between the predictor variables and the outcome variable (healthy lifestyle

behaviors). Distribution results determined use of parametric (Pearson's Product Moment Correlation coefficient) or non-parametric (Spearman's Rho) correlation. The strength of the relationship will be described as weak (r<0.3), moderate (r=0.3 to 0.5), and strong (r>0.5) and direction is either positive or negative values of r (Field, 2009). Independent variables with a correlation coefficient equal to or greater than 0.3 were included in the hierarchical regression model. Independent variables that were highly correlated were not used because the predictors will account for similar outcome variance, thus making it difficult to distinguish importance of individual predictors (Field, 2009). Next, the variables were entered in two steps based on the Health Belief Model (Rosenstock, 1974) adopted in this pilot study. Demographic variables (age, education, ethnicity, use of insulin during pregnancy, BMI >25, or sleep duration), and structural variables (knowledge of diabetes or family history of type 2 diabetes) were entered as the first step and then entered self-efficacy as the second step. A significant change in R Square (use of F distribution with p<.05) (Munro, 2005) would indicate that the independent variable (demographic variables, structured variables, self-efficacy) was a predictor of healthy lifestyle behaviors. Due to the small sample size, the total independent variables entered into the model were limited to three. A post-hoc power analysis was conducted to examine the observed power based on the regression models.

Research question 2: (What effect sizes are expected for perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors and adoption of healthy lifestyle behaviors after childbirth when comparing the two experimental groups [control group: standard care with attention control and treatment group: educational intervention] at 6-8 weeks postpartum?) was tested to

determine the effect size by calculating the mean difference and standard deviation of the intervention group and control group (Cohen d). A small effect size was defined as about 0.2, a medium one was about 0.5, and a large one was about 0.8 (Cohen, 1988).

Research question 3: (What are the barriers to obtaining postpartum glucose screening and adopting healthy lifestyle behaviors after childbirth among women with a diagnosis of GD?) was analyzed as descriptive data with identification of common themes and placed in grouping data of like categories. Similar categories among participants are reported.

Research question 4: (What type of cues of action encourages postpartum glucose screening and adoption of healthy lifestyle behaviors?) was analyzed as descriptive data with identification of common themes and placed in grouping data of like categories. Similar categories among participants are reported.

CHAPTER IV

RESULTS

The findings of this pre-test, post-test, two group quasi- experimental pilot study is presented in this chapter. Data were double entered and prior to statistical analysis, outliers, missing data, and normal distribution were evaluated. Ordinal data were dummy coded. Interval/ratio level variables were assessed for normality by analyzing skewness. All variables were normally distributed. SPSS (Version 18) software was used for statistical analysis and a significance level of $p < .05$ was set for analysis. Description of sample characteristics, reliability of instruments, and data regarding research questions are reported.

Sample Characteristics

Between September 2011 and July 2012, women diagnosed with gestational diabetes (GD) were screened (N=59) for eligibility for this study. Twenty-six women were eligible for the study and were invited to participate. One potential participant declined to participate in this study and two women withdrew from the study. The women who withdrew from the study did so after baseline demographic data was collected and prior to the second session. The first participant was withdrawn due to a preterm delivery, and the second participant declined to participant further and withdrew

stating that she was not feeling well during her pregnancy. A total of twenty-three women completed the entire protocol.

At the beginning of the study, participants were randomly assigned to either the intervention (SUGAR) group or the control group. During the enrollment phase of participants, the decision was made to randomly assign only five women to the control group and the other participants in the intervention group to provide a better opportunity to pilot test the intervention. Table 1 summarizes the characteristics of the pregnant women (N=25) who completed the baseline data collection. Table 2 summarizes the characteristics of the postpartum women who completed the protocol (N=23). To determine if there were any differences between the control and intervention group, appropriate Chi-Square statistics or independent t-tests were used for analysis. This was a homogeneous group except for a significant difference between groups noted in gestational weeks at delivery (p=.005) category; however, a majority were term infants.

Participants ranged in age from 21-37 years with a mean age of 29.7 (SD=3.9). Less than half of the participants were Caucasian (40%), while 60% of the participants were from minority populations including African American (32%), Hispanic (8%) and Asian (12%). A majority of the participants (60%) had a family income of $\geq$$35,000, married (76%), and had previous pregnancies (72%). The majority of the women had at least some college education (76%) and had a family history of DM (56%). Pre-pregnancy weight for participants ranged from 126-327 pounds with an average BMI of 33.13(SD= 7.65). Only 8% of the participants used insulin during the pregnancy, while 28% used oral medications (100% used Glyburide) during the pregnancy to control

blood sugar. The majority of women (64%) controlled glucose levels through diet management.

Table 1

Sample Characteristics and Inter-group Characteristics Comparison

Characteristic	*Total Sample N=25* *M (SD) or N (%)*	*SUGAR Group n=20* *M (SD) or n (%)*	*Control Group n=5* *M (SD) or n (%)*	x^2 or *t*	*p value*
Age (years)	29.68(3.88)	30.25(3.54)	27.40(4.78)	-1.51	.15
Gravida				1.77	.41
1-3	20(80%)	17(85%)	3(60%)		
4-6	3(12%)	2(10%)	1(20%)		
8- 9	2(8%)	1(5%)	1(20%)		
Para				1.15	.56
0	12(48%)	9(45%)	3(60%)		
1-2	10(40%)	9(45%)	1(20%)		
3-4	3(12%)	2(10%)	1(20%)		
BMI	33.13(7.65)	34.23(7.71)	30.74(8.82)	-0.77	.45
Weeks Diagnosis of GD				2.43	.12
>24 weeks	19(76%)	14(70%)	0		
$\leq$ 24 weeks	6(24%)	6(30%)	5(100%)		
Health Care Provider				0.36	.55
OB/GYN	12(48%)	9(45%)	3(60%)		
Midwife	13(52%)	11(55%)	2(40%)		

(continued)

Sample Characteristics and Inter-group Characteristics Comparison Table (continued)

Characteristic	*Total Sample N=25*	*SUGAR Group n=20*	*Control Group n=5*		
Ethnicity				1.04	.31
Caucasian	10(40%)	9(45%)	1(20%)		
Black/African American	8(32%)	6(30%)	2(40%)		
Hispanic/Latino	2(8%)	1(5%)	1(20%)		
Asian	3(12%)	3(15%)	0		
Other					
Asian/Hispanic	1(4%)	0	1(20%)		
Caucasian/Hispanic	1(4%)	1(5%)	0		
Marital Status				0.88	.35
Married	19(76%)	16(80%)	3(60%)		
Divorced	0	0	0		
Separated	0	0	0		
Single	6(24%)	4(20%)	2(40%)		
# Family Members live in Home	3.20(1.12)	3.10(.968)	3.60(1.67)	0.89	.38
Education				1.97	.16
Some high school/HS Grad	6(24%)	6(30%)	0		
Some College/≥College Grad	19(76%)	14(70%)	5(100%)		
Family Income				0.07	.97
≤ $34,999	10(40%)	8(40%)	2(40%)		
$35,000-$74,999	9(36%)	7(35%)	2(40%)		
$75,000 and over	6(24%)	5(25%)	1(20%)		
Family Member History of DM				0.65	.42
Yes	14(56%)	12(60%)	2(40%)		
No	11(44%)	8(40%)	3(60%)		

(continued)

Sample Characteristics and Inter-group Characteristics Comparison Table (continued)

Characteristic	*Total Sample N=25*	*SUGAR Group n=20*	*Control Group n=5*		
Insulin Use During Preg.				0.54	.46
Yes	2(8%)	2(10%)	0		
No	23(92%)	18(90%)	5(100%)		
Glyburide Use During Preg.				0.45	.50
Yes	7(28%)	5(25%)	2(40%)		
No	18(72%)	15(75%)	3(60%)		
Sleep Duration (hours)	7.48(1.53)	7.45(1.54)	7.60(1.67)	0.19	.85

*$p<.05$

A majority of the women (70%) delivered at term with 52% of the participants delivering vaginally and 48% delivering by cesarean section. The women gained an average of 22.8 (SD=12.79) pounds during their pregnancy. Newborns had an average birth weight of 7.16 (SD=1.28) pounds. However, one newborn in the SUGAR group required admission to the Neonatal Intensive Care Unit (NICU) due to complications related to sepsis and low blood glucose.

Information was obtained to determine sleep issues for the pregnant and postpartum woman. Women reported to feel refreshed they needed, on average, 7.64 (SD=1.93) hours of sleep. They were asked the average nocturnal total sleep time (in the past week) during their pre-test and post-test data collection time period. During pre-test women, on average, slept 7.48 (SD=1.53) hours, but only slept 5.22 (SD=1.38) hours during post-test. During the postpartum period, women were awakened by the newborn an average of 2.96 (SD=1.40) times per night and they slept significantly less than what they needed (paired t [22] = 4.88, $p<.001$).

Table 2

Postpartum Sample Characteristics with Comparison of Groups

Characteristic	*Total Sample N=23 M (SD) or N (%)*	*SUGAR Group n=18 M (SD) or n (%)*	*Control Group n=5 M (SD) or n (%)*	x^2 *or t*	*p value*
Weeks Delivered	38.17(1.11)	38.5(.536)	37(1.23)	-3.16	.01*
<37	7(30%)	3(17%)	4(80%)		
≥38	16(70%)	15(83%)	1(20%)		
Type of Delivery				0.71	.70
Vaginal	12 (52%)	9(50%)	3(60%)		
C-Section	11(48%)	9(50%)	2(40%)		
Pregnancy Weight Gain (lbs.)	22.83(12.79)	21.78(13.22)	26.6(11.61)	0.74	.47
Sleep Duration	5.22(1.38)	5.17(1.51)	5.40(.89)	0.33	.75
Awakened by Newborn	2.96(1.40)	2.94(1.55)	3.0(.71)	0.08	.94
Baby Gender				2.07	.36
Boy	10(43%)	9(50%)	1(20%)		
Girl	13(57%)	9(50%)	4(80%)		
Average Weight (lbs.) of Newborn	7.16(1.28)	7.42(1.28)	6.21(.81)	-1.98	.06
Average Length (in.) of Newborn	18.84(.99)	19(.95)	18.25(1.00)	-1.55	.14
Baby to NICU				0.29	.59
Yes	1(5%)	1(6%)	0 (0%)		
No	22(95%)	17 (94%)	5(100%)		

*$p < .05$

Description of Research Instruments

Instruments used for this study were based on the Health Belief Model and included perceived risk, knowledge of diabetes, self-efficacy of healthy lifestyle behaviors, sleep disturbance, and healthy lifestyle behaviors. The internal consistency of the instruments (Table 3) used in this study was assessed and all had an acceptable Cronbach's alpha coefficient (> .70).

Table 3

Reliability of Instruments

Instrument	# of items	Cronbach's Alpha
Risk Perception Survey for Developing Diabetes adapted women with Gestational Diabetes (RPS-DD)*	24	0.58
Diabetes Risk Knowledge	11	0.78
Risk Perception	1	n/a
Risk Perception with no Lifestyle Change	1	n/a
Personal Control*	4	0.55
Optimistic Bias*	2	0.57
Benefits and Barriers*	3	0.57
Recent Lifestyle Change	1	n/a
Plans for Future Lifestyle Change	1	n/a
Self-Rated Abilities for Health Practices (SRAHP)	28	0.94
Nutrition	7	0.77
Psychological Well-Being	7	0.84
Exercise	7	0.93
Responsible Health Practices	7	0.84
Health Promotion Lifestyle Profile II (HPLP II)	52	0.96
Health Responsibility	9	0.87
Physical Activity	8	0.88
Nutrition	9	0.82
Spiritual Growth	9	0.88
Interpersonal Relations	9	0.87
Stress Management	8	0.88
General Sleep Disturbance Scale (GSDS)	15	0.93
Sleep Quantity	2	0.78
Sleep Quality	8	0.93
Daytime Function	5	0.92
Maintenance Insomnia*	2	0.67

*deleted for final data analysis

The Risk Perception Survey for Developing Diabetes adapted for women with GD (RPS-DD) (Kim, McEwen, Piette et al., 2007; Michigan Diabetes and Research Training Center, 2010) was used to measure risk perception and knowledge of diabetes. The Cronbach's alpha for the 24-item total scale for the RPS-DD was not acceptable and therefore the total scale was not used for analysis. In addition, the subscales of Personal Control, Optimistic Bias, and Benefits and Barriers were excluded from final analysis because of the Cronbach's alpha less than 0.70. For this study, a single item from the RPS-DD was used to determine risk perception. At baseline, the women perceived a slight to moderate chance of developing diabetes (M= 2.71, SD= .71), measured by the single item risk perception subscale of the RPS-DD.

The Diabetes Risk Knowledge subscale of the RPS-DD (see Table 4) is a summation of correct responses (0-11), with higher scores indicating higher knowledge of risk factors of DM (Kim, McEwen, Piette et al., 2007; Michigan Diabetes and Research Training Center, 2010). At baseline, women had an average knowledge of diabetes risk of 6.3 (SD= 1.87). A majority of the women (78%) recognized that a diagnosis of gestational diabetes and a family history of diabetes (91%) increased their risk of diabetes; conversely, the women had lower knowledge of ethnicity and age risk factors. In addition, the women understood that diet, exercise, and weight control prevented diabetes.

Self-Rated Abilities for Health Practices (SRAHP) was used to measure self-efficacy to adopt healthy lifestyle behaviors. SRAHP is a measurement of the self-perceived ability (self-efficacy) to implement behaviors that are health promoting, including diet and exercise (Becker et al., 1993; University of Texas at Austin School of

Nursing, 2007). The SRAHP is a 28 item scale using a five point Likert-type scale rated from 0 (not at all) to 4 (completely) to represent their confidence to perform health practices. A total score was calculated from a summation of all subscales, with a range from 0-112, with higher scores indicating greater self-efficacy for health practices (Becker et al., 1993). Subscales include nutrition, exercise, psychological well-being, and responsible health practices. Higher scores indicate higher total self-efficacy and self-efficacy subscale. Since no cut off point was available, we reported the median score to have a better interpretation of the finding of this population. At baseline, the control group indicated a higher overall self-efficacy (*mdn* = 105), than the SUGAR group (*mdn*= 95), although not significant in this small sample (t [21] = 1.3, p=.18).

Health Promotion Lifestyle Profile II (HPLPII) measured the frequency of self-reported healthy behaviors focusing on six main areas of healthy lifestyle behaviors (Frank-Stromberg & Olsen, 2004; University of Nebraska College of Nursing, 2010). The subscales focused on physical activity, spiritual growth, health responsibility, interpersonal relation, nutrition, and stress management (Walker & Hill-Polerecky, 1996). The 52 item questionnaire has a four point Likert–type scale ranging from 1 (never) to 4 (routinely) to indicate the frequency a respondent engages in a certain type of health behavior. At baseline, women had a mean score of 2.8 (SD= .50), indicating that the women engaged in healthy lifestyle behavior "sometimes."

The 15 item General Sleep Disturbance Scale (GSDS) questionnaire was used to determine sleep disturbance in the past week for the study participants; including sleep initiation, maintenance insomnia, sleep quantity, sleep quality, and daytime function (Lee, 1992). At baseline, study participants self-reported a mean score of 3.64 (SD=

1.58) which indicated a clinical significant sleep problem for they experienced approximately four days of sleep disturbances in the past week.

Inter-group comparison by using independent t- test indicated no significant differences among the variables at baseline in this small sample (see Table 4).

Table 4

Pre-test Inter-group Comparison of Theoretical Variable

		Total N=23	*SUGAR n=18*	*Control n=5*	
Study Variable	*Possible Range (cut-off point)*	*M (SD)*	*M (SD)*	*M (SD)*	*t*
Risk Perception	1-4	2.7(.71)	2.8(.65)	2.2(.84)	-1.66
Knowledge of Diabetes	0-11	6.3(1.87)	6.5(2.01)	5.6(1.14)	-0.95
Self-Efficacy	0-112	92.96(14.66)	90.78 (14.87)	100.8(12.0)	1.38
Nutrition	0-28	24.70(3.17)	24.22(3.37)	26.40(1.51)	1.39
Psychological Well-Being	0-28	22.96(4.04)	22.44(4.10)	24.80(3.56)	1.16
Exercise	0-28	20.65(6.85)	20.06(6.82)	22.80(7.29)	0.79
Responsible Health Practices	0-28	24.65(3.28)	24.06(3.47)	26.80(.84)	1.72
Healthy Lifestyle Behaviors	1-4	2.80(.50)	2.80(.54)	2.90(.35)	0.58
Nutrition		2.97(.55)	2.97(.57)	2.98(.55)	0.03
Physical Activity		2.01(.76)	2.01(.83)	2.00(.48)	-0.04
Health Responsibility		2.85(.63)	2.80(.69)	3.02(.32)	0.70
Spiritual Growth		3.20(.55)	3.17(.57)	3.38(.46)	0.76
Interpersonal Relations		3.26(.52)	3.19(.53)	3.51(.43)	1.26
Stress Management		2.57(.67)	2.55(.64)	2.65(.84)	0.29
Sleep Disturbance	0-7	3.64(1.58)	3.80(1.50)	3.00(1.86)	-1.02
Sleep Quantity	(≥3)	5.10(1.39)	5.31(1.38)	4.60(1.43)	-1.00
Sleep Quality		3.55(1.91)	3.85(1.72)	2.48(2.41)	-1.45
Daytime Function		3.05(1.29)	3.18(1.27)	2.60(1.44)	-0.88

Postpartum Glucose Screening

The study participants were asked if they received postpartum glucose screening. Less than half of the total participants (39%) obtained postpartum glucose screening; and the screening was similar between the two groups. Descriptive data was obtained for barriers to screening for those who did not receive screening and the motivation for those who did receive screening and results are reported later in this chapter.

Findings Related to Research Questions

Research questions and results are presented in this section. As indicated in Table 4, no significant differences are noted at baseline between groups indicating a homogenous sample.

Results of Research Question 1

Research Question 1: To what degree is the likelihood of adopting healthy lifestyle behaviors explained by pregnant woman's selected demographics (age, education, ethnicity, use of insulin during pregnancy, BMI>25 before pregnancy, sleep duration), structural variable (knowledge of diabetes, family history of type 2 diabetes), perceived risk, and self-efficacy? To examine research question 1, a hierarchical multiple linear regression was used. Correlation among the independent variables and dependent variable were assessed first to determine which predictors to be entered into the regression model (Table 5).

Table 5

Relationships Among Selected Pilot Study Variables

	Age	Education	Ethnicity	Insulin Use	BMI >25	Sleep Duration	GSDS	Diabetes Knowledge	Family Hx of DM	Perceived Risk	SRAHP
Age											
Education	-.23										
Ethnicity	.17	.31									
Insulin Use	.06	.17	-.06								
BMI>25	-.03	-.50*	-.09	-.02							
Sleep Duration	.14	-.13	.04	-.09	-.07						
GSDS	-.06	-.20	-.33	-.22	-.09	-.10					
DM Knowledge	.24	.48*	.15	.12	-.06	.13	-.10				
Family Hx of DM	-.01	.07	-.07	.26	.44*	-.15	.01	.33			
Perceived Risk	.02	-.15	-.44*	-.07	.32	-.02	.26	.29	.24		
SRAHP	.08	-.15	.19	.07	.32	-.02	-.55**	-.08	-.12	-.13	
HPLPII	.08	-.17	.14	.09	.09	.22	-.58**	.17	-.31	-.25	.74**

*$p < .05$, **$p<.01$. BMI = Body Mass Index; SRAHP= Self Rated Abilities for Health Practices; HPLPII= Health Promotion Lifestyle Profile II

Due to the smaller sample size, the total independent variables entered into the model were limited to three independent variables including sleep disturbance (r= -.58, p<.001), family history of DM (r= -.31, p=.15), and self-efficacy (r=.74, p<.001). Based on the Health Belief Model adopted in this pilot study, sleep disturbance and family history of type 2 diabetes were entered first, which accounted for 43% of variance adopting healthy lifestyle (R^2 = .43, R^2 adj. = .37, F(2,20)= 7.51, p<.001). However, sleep disturbance was the single significant predictor. Self-efficacy was entered as the second step, which added an extra 22% of the variance to adopting healthy lifestyle (R^2 = .65, R^2 adj. = .59, F (3, 19) =11.72, p< .001); however, self-efficacy was the only significant predictor (Table 6). A negative correlation was found between GSDS and SRAHP (r=-.55, p<.01) indicating that an individual who reported higher severity of sleep disturbance also perceived lower self-efficacy and sleep disturbance accounted for 30.3% of low self-efficacy.

Table 6

Summary of Hierarchical Regression Analysis for Variables Predicting Adoption of Healthy Lifestyle Behaviors (N=23)

	Step 1				Step 2			
Variable	B	SE	β	*t*	B	SE	β	*t*
GSDS	-.18	.05	-.58	-3.4*	-.08	.05	-.27	-1.63
Family History of DM	-.30	.17	-.30	-1.80	-.24	.14	-.24	-1.73
Self-Efficacy					.02	.01	.56	3.42*
R^2 Change		.43				.22		
R^2		.43				.65		
Adjusted R^2		.37				.59		
F		7.51*				11.59*		

*$p < .05$. GSDS = General Sleep Disturbance Scale Total Scale, Family History of DM = Demographic Questionnaire, and Self-Efficacy = Self Rated Abilities for Health Practice Total Scale

Results for Research Question 2

Research Question 2: What effect sizes are expected for perceived susceptibility (risk) of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors and adoption of healthy lifestyle behaviors after childbirth when comparing the two experimental groups (control group: standard care with attention control and treatment group: educational intervention) at 6-8 weeks postpartum? To examine research question 2, effect size was calculated by using the mean difference and standard deviation of study variables from pre-test to post-test in the SUGAR and control groups.

Values of 0.2, 0.5, and 0.8 were defined as small, medium, and large effect size (Cohen, 1988). Estimated effect size ranged from small to large; with knowledge of diabetes having the largest effect and some of the direction was unexpected (Table 7).

Table 7

Variables at Pre-test and Post-test for SUGAR Group and Control Group

	SUGAR Group (n=18)		*Control Group (n=5)*		
Study Variable (Possible Range)	*Pre-Test M (SD)*	*Post-Test M (SD)*	*Pre-Test M (SD)*	*Post-Test M (SD)*	*Cohen's d*
Risk Perception (1-4)	2.8(.65)	2.9(.80)	2.2(.84)	2.4(.55)	0.04
Knowledge of Diabetes (0-11)	6.5(2.01)	7.6(1.79)	5.6(1.14)	5.2(2.59)	1.04*
Self-Efficacy (0-112)	90.78(14.87)	91.94(19.0)	100.8(12.0)	103(9.27)	-0.07
Healthy Lifestyle Behaviors (1-4)	2.8(.54)	2.9(.53)	2.9(.35)	3.1(.22)	-0.31

* $p < .05$. Cohen's d was calculated using the mean difference between pre-test and post-test and standard deviation.

Results for Research Question 3

Research Question 3: What are the barriers to obtaining postpartum glucose screening and adopting healthy lifestyle behaviors after childbirth among women with a diagnosis of GD? To examine research question 3, descriptive data was obtained using two open ended questions to determine barriers for postpartum glucose screening and adoption of healthy lifestyle behaviors: "Can you give me the top three reasons that prevent you from having a healthy lifestyle (e.g. eating healthy diet, exercising, losing

weight)?" and "If you did not receive blood glucose screening at your postpartum appointment, what was the reason you did not have this blood work done?"

During the semi-structured interview, participants described a healthy lifestyle as including a healthy diet and exercise, but also reported there were numerous barriers (see Table 8) that prevented them from engaging in those behaviors postpartum. The top five barriers for adopting healthy lifestyle behaviors after childbirth included time, caring for baby/family, recovery, finances, and lack of sleep. The most common barrier that prevented the women from engaging in healthy lifestyle behaviors during pregnancy and after delivery was time. Time was a consistent barrier identified by the study participants, with work schedules and caring for their families as the most common time constraints. Women stated they, "need quick things" and they had a "lack of time to cook the right foods." Women also indicated that busy schedules affected cooking and engaging in exercise. For instance, after the delivery of the newborn, many women stated that caring for the newborn provided little or no time to exercise and made it difficult to grocery shop to purchase healthy food. Next, women indicated that recovery after the delivery was a barrier, especially for the women who had cesarean sections. The women stated that the recovery from surgery interfered primarily with their engagement in exercise activities. Finances were also noted as a common barrier to adopt healthy lifestyle behaviors. Some women stated that, "eating healthy cost more money" and that they could not afford a gym membership. In addition, some women stated that laziness, lack of will power, and procrastination were also factors.

Table 8

Barriers to Adopting Healthy Lifestyle Behaviors Postpartum (N=23)

Barrier	# of Women
Lack of Time	15
Recovery after Childbirth	5
Baby/Family	4
Expense of Food and Gym	4
Lack of Sleep	3
Convenience of Fast Food	2
Food Preferences	2
Lack of motivation/will power	2
Lack of Energy	2
Lazy	2
Work/Job	2
Difficult to get to grocery store	1
Procrastination	1
Lack of knowledge	1

The most common barrier to postpartum glucose screening was that the health care provider did not order the test. One participant stated, "the health care provider told her to randomly check blood sugar with her home monitor and make an appointment with her primary care physician to check glucose." Similarly, another participant stated that the health care provider, "told her to keep checking her glucose at home once a week." Two participants who did not receive testing did not attend her scheduled postpartum appointment.

Results for Research Question 4

Research Question 4: What type of cues of action encourages postpartum glucose screening and adoption of healthy lifestyle behaviors among women with a diagnosis of GD? To obtain descriptive data for research questions 4, two open ended questions were used in a semi-structured interview to determine motivation or encouragement for postpartum glucose screening and adoption of healthy lifestyle behaviors: "What motivated you to get a glucose test postpartum?" and "Can you tell me what encourages or motivates you to adopt healthy lifestyle behaviors (e.g. lose weight, eat healthy diet, exercise)?"

The participants reported that the motivation for postpartum glucose testing was due to health care provider recommendation and scheduling of test. The nine participants that obtained glucose screening stated that the health care provider scheduled the test either on the scheduled postpartum appointment or a different appointment time. One participant stated, "the midwife initiated (the test), but I knew to do the test and planned to ask about doing the test."

Common motivators for adopting healthy lifestyle behaviors included living longer, being there for baby/family, and prevention of health issues (see Table 9).

Table 9

Motivation for Adoption of Healthy Lifestyle Behaviors Postpartum (N=23)

Motivator	# of Women
Being there for Baby/Family	7
Live longer	6
Prevention of Health Issues	5
Health	3
To have More Energy	2
Be a Healthy example to children	2
Lose weight	2
Fit into clothes	2
Better quality of life	1
Feel good about myself	1
Keep up with Kids	1
Fear of being obese	1
Health of future pregnancies	1
Newborn complications after delivery	1

The women described that living longer for their families was the most common motivator for adopting healthy lifestyle behaviors. A participant stated that she wanted, "be around for her baby," while another stated her priority was to, "live a long life with family." Some women (7) stated that the encouragement for adopting healthy lifestyle behaviors was the baby and/or family. A woman wanted to be a good example to her children, while another participant wanted to be healthy to take care of her children and family. Another common theme for the women's motivation to adopt healthy lifestyle behaviors was to prevent health issues. Many women voiced concerns of family history

of health issues and indicated a desire to prevent disease which had occurred in her family. One participant stated that her grandfather's diabetes motivated her to be healthy because her "grandfather has diabetes and his leg was amputated." Another participant had a father with diabetes that led to renal failure and death, while another participant stated that her mother has diabetes and, "I know that I am 'thin line' to get diabetes too." In addition, after delivery of the newborn, some women were focused on losing weight and wanting to, "fit into clothes."

Summary

This chapter presented the results of the pilot educational intervention SUGAR. Twenty-three women completed all phases of the study, with two women withdrawing after collection of baseline demographic data due to preterm delivery and not feeling well with the pregnancy. Four research questions were evaluated. Self-efficacy was the only independent variable that was a significant predictor of healthy lifestyle behavior; however sleep disturbance was correlated to low self-efficacy. Estimated effect size was calculated using the mean difference and standard deviations, with knowledge of diabetes having the largest effect of all study variables and small effects with unexpected directions for self-efficacy and healthy lifestyle behaviors. Women identified barriers that prohibit them to engage in healthy lifestyle behaviors after childbirth including time, caring for baby/family, postpartum recovery, finances, and lack of sleep. In addition, the women reported common motivators for adopting healthy lifestyle behaviors which included living longer, being there for baby/family, and prevention of health issues. The postpartum glucose screening rate was low. Women who did not receive postpartum glucose screening reported the most common barrier to postpartum glucose screening

was that the health care provider did not order the test. Women who received the recommended postpartum glucose screening stated that the reason they obtained the screening was due to the health care provider's recommendation and scheduling of test.

CHAPTER V

DISCUSSION AND CONCLUSIONS

The purpose of this pre-test, post-test, two group study was pilot testing an educational intervention "SUGAR" (Start Understanding Gestational Diabetes and Risk of Developing Type 2 Diabetes) in women with GD to determine if the structured educational intervention would result in an increase perceived susceptibility of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors, and adoption of healthy lifestyle after childbirth among women with GD. This chapter presents a discussion of study findings and subsequent conclusions. The discussions will focus on study findings with respect to principal findings of research questions and additional findings. Furthermore, this chapter will address the strengths and limitations of this study and implications for future study and clinical practices.

Principal Findings

Predictors of Adopting Healthy Lifestyle Behaviors for Pregnant Women

In this study, self-efficacy was the only significant predictor ($R^2 = 0.65$, R^2 adj. = 0.59, $F(3, 19) = 11.59$, $p < .001$) for adopting healthy lifestyle behaviors for pregnant women with GD, which is consistent with previous studies in the general populations (Jackson et al., 2007; Nuepert et al., 2009; Podder et al., 2004). There is limited research exploring the relationship of self-efficacy and healthy behaviors specifically in women

with GD; however, Koh and colleagues (2010) described that GD women with higher self-efficacy were more likely engaged in physical activity. Moreover, Kim et al. (2008) identified that women who had low self-efficacy had low physical activity, unhealthy diets, and higher BMI. The significant predictor finding in this pilot study concurs with earlier studies and demonstrates that when a woman has the confidence that she can perform a behavior, she is more likely to engage in the healthy lifestyle behavior. Although factors affecting self-efficacy were not examined, in the current study women who had more sleep disturbance also perceived a lower self-efficacy. Since the review of current literature has not yielded studies that have explored the relationship between sleep disturbance and self-efficacy among pregnant women, future research would be beneficial to investigate if improved sleep could increase self-efficacy for the pregnant woman.

Factors that the HBM model (Janz & Becker, 1984; Rosenstock, 1974; Rosenstock et al., 1988) purported as influences to adopt healthy lifestyle behaviors such as perceived risk and knowledge of DM were not associated with the adoption of healthy lifestyle behaviors in this study. Despite the fact that the women in this study believed they had a slight-moderate risk of developing diabetes, perceived risk had a non-significant and inverse relationship with adoption of healthy lifestyle behaviors. This finding is inconsistent with other prior studies (Janz & Becker, 1984; Rosenstock, Strecher, & Becker, 1988), but is consistent with Morrison et al. (2010) study of GD women indicating no association between risk perception and lifestyle behaviors. Morrison and colleagues (2010) suggested that perceived risk may be an insufficient motivator for adoption of health behaviors for prevention of disease. The finding of this

pilot study suggest that risk perception may not consistently change behaviors and that other factors such as self-efficacy, sleep disturbance, and family DM history may have more of an influence on adoption of healthy lifestyle behaviors. In addition, this study had a small sample size, therefore further examination of perceived risk and the relationship of adoption of healthy lifestyle behaviors in a larger sample size warrants further investigation.

The HBM implies higher knowledge influences the adoption of healthy lifestyle behaviors. In this study, diabetes knowledge was positively correlated with healthy lifestyle behaviors, though it was not statistically significant. The finding is consistent with a previous study with GD women (Swan et al, 2007); however, the non-significant finding from the current study may be a result of the small sample size and suggests further research with a larger sample size to confirm the association between knowledge and healthy lifestyle behavior is needed.

The Effectiveness of the SUGAR Intervention

The effect sizes of the intervention on perceived risk of developing DM, knowledge of DM, self-efficacy to adopt healthy lifestyle behaviors, and adoption of healthy lifestyle behaviors after childbirth, ranged from small to large (d= -.07 to 1.04); with knowledge of diabetes having the largest effect (d=1.04).

The effect size for perceived risk was small. At baseline, the total sample of women in this study indicated they perceived a slight to moderate risk of developing DM. At post-test, the SUGAR group women still reported a similar perception with only 25% of this group indicating a belief that they had a high risk of developing DM. The SUGAR's group's belief, however did increase from 10% pre-test. No one in the control

group perceived a high risk of developing DM and the majority (60%) of them perceived a slight risk of developing DM. The findings are consistent with other studies which found that women with a history of GD did not perceive themselves at greater risk for developing DM (Kim, McEwen, Piette, et al., 2007; Malcolm et al., 2009; Morrison et al., 2010). There was no difference between groups post-test, indicating that the intervention did not increase risk perception. This unexpected finding may be a result of all participants' exposure to GD information from health care providers throughout the pregnancy. Educational material used for the SUGAR group provided knowledge based information, but may have been inadequate to influence a participant's perceived risk. Therefore, identification of strategies to increase risk perception needs to be explored before replication of the current study.

At baseline, women's knowledge of diabetes was comparable between the SUGAR and control groups. A majority of the women recognized that a diagnosis of GD and a family history of diabetes increased their risk of diabetes and that diet, exercise, and weight control prevented diabetes; conversely, the largest knowledge gap for the women was information that ethnicity and increase in age are risk factors for developing DM. The effect size for the DM knowledge was large. This finding suggests that the educational intervention given to the SUGAR group was beneficial in increasing the diabetes knowledge. Furthermore, it is important to note that post-test data was obtained approximately three months after the initial educational session, with a small booster session occurring 2-4 weeks postpartum which served as a quick reference to the education and reminder of study participation. This demonstrates that the participants were able to retain session information over an extended period of time. Although

knowledge increased in the SUGAR group, there was not a significant relationship between knowledge and healthy lifestyle behaviors, thus indicating a translation gap between knowing information and the actual engagement in the health behavior; however the small sample size may explain the non-significant relationship in this sample.

Self-efficacy is an individual's belief that he/she is capable of performing specific tasks to obtain certain goals and is a strong predictor of health behaviors (Bandura, 1994; Bandura, 1998). The participants in this study reported a high self- efficacy in both pre-test and post-test indicating they were confident that they could perform health behaviors, which might have been related to education and support received from the diabetes educators and health care providers during prenatal care. However; the effect size was small, suggesting that the educational material used in this study was not adequate to increase self-efficacy. Other researchers reported that multiple individual sessions using strategies such as goal setting, persuasive messaging, and motivation schemes have been effective in increasing self-efficacy (Gaston, Cramp, & Prapavessis, 2012; Moore et al., 2011; Prestin & Nabi, 2012; Smith et al., 2010), therefore exploration of alternative type of strategies to increase self- efficacy in women with GD is essential in future studies. An alternative explanation for the small effect size may be due to the study participants already having a high self -efficacy scores at pre-test, thus it was difficult to improve after the intervention.

Studies in the general population have supported that a healthy diet, exercise, and modest weight loss lowers the risk of DM (Knowler et al., 2002; Li et al., 2008; Lindstrom et al., 2006; Moore et al., 2011; Tuomilehto et al., 2001). The effect size for adopting health behaviors was moderate, however, it was an unexpected opposite

direction since the control group had a higher adoption of healthy lifestyle behavior than the SUGAR group. This finding should be interpreted cautiously, however, due to the small sample size. In addition, one must take into consideration the possibility of numerous influences during the postpartum period such as lack of time, recovery after childbirth, and caring for a newborn which may interfere with engagement in healthy lifestyle behaviors. All of these potential factors need to be considered in future research. In addition, a more accurate assessment of behavior change such as weight loss, BMI, and diary of physical activity may be evaluated after the woman has adjusted to the new role of mother of a newborn. There is limited literature of healthy lifestyle behaviors in women with GD, but an education intervention study (Fehler et al., 2007) of GD women which focused on nutrition and exercise, identified that the women made significant behavior changes in nutrition during pregnancy but did not sustain those changes postpartum.

Barriers to Obtain Postpartum Glucose Screening and Adoption of Healthy Lifestyle Behaviors

Early diagnosis of DM is essential for positive health outcomes; therefore, the ADA and ACOG have provided guidelines to perform glucose screening 6-12 weeks postpartum in women diagnosed with GD (ADA, 2003; ACOG, 2009). In this study, the most common barrier to postpartum glucose screening was that the testing was not scheduled by the health care provider. Only 39% of the women in this study received recommended glucose screening, which is slightly higher than other studies reported (Alamario et al., 2008; Case et al., 2006; Kim et al., 2006). The findings of this study were consistent with another study of GD women which reported that a high percentage

of health care providers initiated the prenatal glucose screening, but they were significantly lower in initiation of the postpartum glucose screening (Case et al., 2006). Women in the SUGAR group were taught the recommendations for postpartum glucose screening, but there was no difference between the control group and the SUGAR group in the number who were screened. This finding suggests that although information was provided to the participants on screening recommendations, the women relied on the health care provider' recommendations and did not request that screening be obtained. In addition, there were no differences in screening rates between the type of health care provider (midwife or OB/GYN); which suggests further investigation related to all health care providers' knowledge of glucose screening guidelines and rationale for not following recommendations.

Finally, one must consider the lack of adherence to follow-up appointments. In this study, three participants did not attend the separate screening appointments made by the health care provider though no further rationale was given. Similar results of lack of adherence to follow-up appointments have been identified as a factor for low postpartum glucose screening (Baker et al., 2009; Bentley-Lewis et al., 2008). Again, this finding suggests further exploration into health care provider's procedures related to follow-up appointments and postpartum glucose screening.

Women in this study identified certain barriers prevented their engagement in health behaviors during the postpartum period. Consistent with prior studies (Doran, 2008; Graco et al., 2009; Razee et al., 2010; Swan et al., 2007; Zehle et al., 2008), women in this pilot study reported the most common barriers were lack of time, caring for baby/family, recovery, finances, and lack of sleep. Similarly, Razee et al. (2010)

reported that although the women tried to maintain a healthy lifestyle, lack of time, energy, and family responsibilities interfered with healthy lifestyle after childbirth. In addition, engagement of physical activity was the lowest form of healthy behavior for women in this study at the pre-test and post-test period. This finding is similar to those of another study (Doran, 2008) which reported that women have a difficult time engaging in physical activity, especially after childbirth due to postpartum recovery and care of the newborn. Understanding barriers that prevent behaviors can assist health care providers in offering support and resources which encourage healthy behaviors that meets the unique needs of the new mother caring for a newborn.

Cues to Initiate Postpartum Glucose Screening and Adoption of Healthy Lifestyle Behaviors

In the current study, those who received postpartum glucose screening reported that their health care provider arranged the testing either at the six week postpartum appointment or a separate appointment thus demonstrating the important role of the health care providers to ensure the postpartum blood sugar check- up. Similarly, Kim et al. (2007) found that women who were counseled by the physician about postpartum screening were more likely to receive the test. Furthermore, Almario et al. (2008) reported that low screening rates were related to failure of health care providers to order the screening.

The participants in this study stated living longer, being there for her baby/family, and prevention of health issues motivated them to adopt healthy lifestyle behaviors. These pilot study findings are consistent with the conclusions from previous studies (Hansen, Landstad, Hellzen, & Svebak, 2010; Razee et al., 2010). One study found

common motivators for healthy lifestyle among women with a history of GD included prevention of type 2 diabetes, health, a beautiful body, and being a role model for their children (Razee et al., 2010). Another study of participants diagnosed with impaired glucose reported that health concerns and support from family and friends were important motivators for healthy lifestyle behaviors (Hansen et al., 2010). In this pilot study, a majority of the postpartum women (91%) stated they were planning to make lifestyle changes to lower the chance of developing diabetes, leading us to consider the relationship of intent and engagement of health behaviors in future studies.

Additional Findings

Personal Characteristics

Previous DM prevention studies have focused on the general population (Knowler et al., 2002; Li et al., 2008; Tumilehto et al., 2001); however the focus of GD women in this study provides useful information for DM preventative care for this specific at-risk population. Consistent with prior studies, this study found the women diagnosed with GD were obese (Lee et al., 2007; Lobner et al, 2006; Krishnaveni et al., 2007; Ratner et al., 2008) and had a family history of diabetes (Krishnaveni et al., 2007). Research has identified that obesity and family history of diabetes are risk factors for the development of DM (Alberti et al., 2007; Case et al., 2006; Knowler et al., 2002); therefore, the women of this study had numerous factors that placed them at greater risk for developing DM. In addition, in this current study, women with a family history of diabetes also had a higher BMI, warranting continued research to investigate whether family genetics or unhealthy behavior patterns lead to overweight/obesity and DM.

Ethnicity was also found to have an association with perceived risk of developing DM, with white women's perception of risk higher than non-white women ($t[21]=2.23$, $p=.04$). It is important to note that in this study, women of minority populations who are at greater risk of developing DM also have a lower risk perception of developing DM. This finding suggests that DM preventative education may need to focus on minority groups.

A final note related to the personal characteristics of this study involved the education level of the participants. All of the study participants were involved in a clinical GD education session after diagnosis. The more educated (some college or higher educated level) individual demonstrated higher knowledge of diabetes, indicating that comprehension of information may be associated with educational level.

Benefits from Clinical DM Education Class

An important component of prenatal care of the woman with GD is to control glucose levels through diet and exercise with the addition of medications as warranted. Once a diagnosis of GD was established, the women attended a one-time diabetes education class to learn about diet, exercise, and glucose monitoring. In this study, the participants were asked to describe the GD information they received from the clinical health care provider. The women described information that they received from the diabetes education class such as diet and glucose monitoring, thus demonstrating the importance of the individual sessions given by the diabetes educators. The women retained knowledge from this educator specifically; therefore exploring the benefits of the diabetes educators for additional teaching prenatal and postpartum would support use of this specialized education to influence healthy behaviors in women with GD. This does

not imply that the health care providers failed to give patients information, but does highlight that a specific DM education was beneficial to the participant.

Findings from this study identified that a majority of the women controlled glucose levels through diet and exercise with only 8% of the women requiring insulin during the pregnancy and 28% were prescribed Glyburide to control glucose levels. Research has identified that fetuses exposed to high levels of glucose in utero are at risk of macrosomia (Metzger et al., 2008; Reece, 2010; Voldner et al., 2010). A majority (87%) of the newborns in this study weighed less than 4,000 grams which may suggest that the participants had good glucose control during the pregnancy, which might be part of the benefits from the clinical educational program.

Sleep Deprivation

The participants in this study experienced a clinical significant sleep disturbance during both pregnancy and postpartum periods indicated by a GSDS score of >3 which is comparable to the DSM-IV criteria for insomnia three or more times a week for sleep disturbance. During pregnancy women self- reported an average of seven hours of nocturnal sleep, however they reported only five hours during the 6-8 weeks postpartum. The sleep deprivation during the postpartum period may have resulted from caring for their newborn as they reported an average of three awakenings by the newborn per sleep period. In addition, an inverse relationship was noted between healthy lifestyle behaviors and sleep disturbances suggesting that women with sleep disturbance had lower healthy lifestyle behaviors. Sleep deprivation may interfere with the woman's engagement in healthy lifestyle behaviors during the postpartum period and may need to be more accurately assessed after sleep patterns of the newborn are more established.

Furthermore, self-efficacy had a negative relationship with sleep disturbance, indicating that the women with more sleep disturbance had lower self-efficacy.

Strong evidences show that poor sleep quality in postpartum women with term or pre-term infants is associated with fatigue and health outcomes (Goyal, Gay, & Lee, 2009; Hunter, Rychnovsky, & Yount, 2009; Insana, Stacom, Hawley, & Montgomery-Downs, 2011; Lee & Hsu, 2012; Lee & Kimble, 2009; Rychnovsky & Hunter, 2009; Tsai & Thomas, 2012). Furthermore, research in the general population has reported that poor sleep impacts insulin resistance and increases risk of type 2 diabetes (Ayas et al., 2003; Chaput et al., 2009; Gangwisch et al., 2007) and that sleep duration is a risk factor for GD (Qiu et al., 2010; Facco et al., 2010). Future research is needed to evaluate how sleep disturbances impact glucose control in pregnant women and postpartum women with GD.

Strengths of the Study

Participants of previous studies related to women with GD were primarily Caucasian women. Therefore, a strength of this pilot study was the diverse sample including African Americans, Asians, and Hispanics who represent ethnic groups who are at higher risk of developing DM. The low attrition rate is also a strength of this study. This may be a result of : 1) the session timing in conjunction with obstetrical appointments to prevent extra travel for the study participants and 2) the phone call booster session at 2-4 weeks postpartum to remind the woman of the participation in the study and meeting at the postpartum appointment.

Limitations of the Study and Recommendations for Future Research

Since few studies have been conducted in women with GD, the pilot study findings add to the limited literature and gives insight into areas of future research needed for this population. Although, useful information has been obtained from this study, there are some limitations that should be considered. This pilot study had a small sample size making it difficult to ascertain significant changes between the groups. A replicated study with a larger sample and equal number of participants in each group will give greater statistical power to prevent Type II error.

This study was guided by the HBM; however, findings from this study only have limited support for the model. Despite the use of targeted preventative care content in this intervention pilot study, the estimated effect size of healthy lifestyle behaviors was opposite of the predicted direction indicating that the control group had a higher adoption of healthy lifestyle behaviors than the SUGAR group. Therefore, the intervention did not increase health behaviors in the SUGAR group. Meeting the recommendations for healthy behavior may be more difficult to obtain for these participants during the postpartum period therefore, a longitudinal study extending to six months or one year after delivery may be beneficial to ascertain effective postpartum follow- up strategies have on promoting healthy lifestyle behaviors. This time frame would allow for an adjustment period to the new role of mother, the numerous family responsibilities, and the additional time to overcome barriers (such as time, recovery from delivery etc.) which prevent engaging in healthy lifestyle behaviors when caring for a newborn.

Self-efficacy decreased during postpartum for the SUGAR group, which indicates the educational intervention was more knowledge focused and had no effect on self-

efficacy. The informational booklets ("What I Need to Know about Gestational Diabetes" [NIDDK, 2006] and "Small Steps Big Rewards: Your Game Plan to Prevent Type 2 Diabetes" [National Diabetes Education Program, 2006]) used for the educational intervention provided information on diet, exercise, and prevention of DM and offered key points to change health behaviors by presenting suggestions of eating healthy, losing weight, and incorporating exercise into daily activity. However, no specific information was provided that addressed self-efficacy to adopt healthy behaviors. Given that self-efficacy was a significant predictor of healthy lifestyle behaviors, future studies should explore strategies such as setting achievable goals and use of motivational interviewing to increase self-efficacy in women with GD. These strategies to increase self- efficacy in women with GD should then be added to the developed intervention when this pilot study is replicated. In addition, women with sleep deprivation had lower self-efficacy. This pilot study revealed a significant clinical sleep disturbance in postpartum women therefore intervention research is needed to promote sleep in women caring for a newborn.

Finally, postpartum glucose screening rates remained low in this sample, therefore research should focus on compliance of postpartum glucose screening by the patient and health care provider and determine efficient ways to ensure blood testing even when multiple health care providers are utilized.

Implications for Clinical Practice

The growing epidemic of DM in women underscores the need to educate and assist patients to adopt and sustain healthy lifestyle behaviors that prevent the disease (Feig et al., 2008; Knowler et al., 2002; Lee et al., 2007; Lee et al., 2008; Ratner et al.,

2008). The results of this pilot study have implications for health care providers and diabetes educators. The participants stated that a healthy lifestyle was important and they understood the components of a healthy lifestyle (diet, exercise, and weight loss), however there is a gap between knowledge and actual implementation of the healthy lifestyle behaviors. Counseling of nurses and other health care providers of important influences (such as self-efficacy) and the effects of sleep disturbance on the health behaviors is warranted. Nurses at different stages of care including prenatal care, hospital postpartum care, and after childbirth can incorporate this type of information in various health education given to these women. Collaboration between all caregivers in the OB/GYN offices and hospital settings would assist in consistent interventions and education provided to the patients. In addition, providing women with GD a preventive checklist guide that includes information on diet, exercise, and screening guidelines may be useful to help patients self-advocate during postpartum follow-up appointments.

The diabetes education class was an important tool for the women in obtaining information for glucose control through diet and exercise during the pregnancy. Exploration of extended diabetes education into the postpartum period could also be beneficial in sustaining healthy behaviors adopted during pregnancy. The continued education and support could focus on reducing barriers, increasing self-efficacy, and promoting sleep that is tailored for the unique needs of women of childbearing age. Diabetes prevention requires major lifestyle changes that are not easily sustained, therefore interventions over an extended period of time would provide needed support to implement and attain the behaviors.

A few suggestions are warranted to assist the health care providers in assisting these women in their adoption of healthy behaviors. For example, to improve adherence to ACOG and ADA recommendations on postpartum glucose screening, strategies to enhance education to health care providers is necessary. In addition, the development and incorporation of screening reminders attached to electronic medical records to assist health care providers in scheduling the recommended glucose screening and send email/text reminders to women diagnosed with GD may increase postpartum screening rates.

Conclusion

Although the effect of the SUGAR intervention with a small sample was not expected to have statistically significant changes, this pilot study adds to the limited research of DM preventative care of women with GD and provides preliminary findings to develop meaningful education and support of women diagnosed with GD. Findings from this small pilot study revealed that the educational intervention significantly increased DM knowledge for women in the SUGAR group; however, not for perceived risk, self-efficacy or healthy lifestyle behaviors. Overall women had high self-efficacy during pregnancy and the postpartum period and self-efficacy was the single significant predictor of healthy lifestyle behaviors. Estimated effect size ranged from small to large, with knowledge of diabetes having the largest effect of all study variables. Moreover, women had a clinical significant sleep disturbance during pregnancy and postpartum. Low postpartum screening rates in this sample were due to no screening recommendation from the health care provider. In addition, women identified barriers and motivators which influenced the adoption of healthy lifestyle behaviors and postpartum glucose

screening. To increase healthy lifestyle behavior in women with GD, interventions are warranted that focus on self-efficacy, enhance sleep promotion, and decrease barriers which interfere with healthy lifestyle behaviors. To ensure a better preventive care of GD women, education focusing on DM risk in GD women, increasing self-efficacy to adopt healthy behaviors, the influence of sleep disturbance on DM risk, self-efficacy and adoption of health behaviors, common barriers to healthy lifestyle behaviors and postpartum glucose screening recommendations should be provided to both patients and health care providers.

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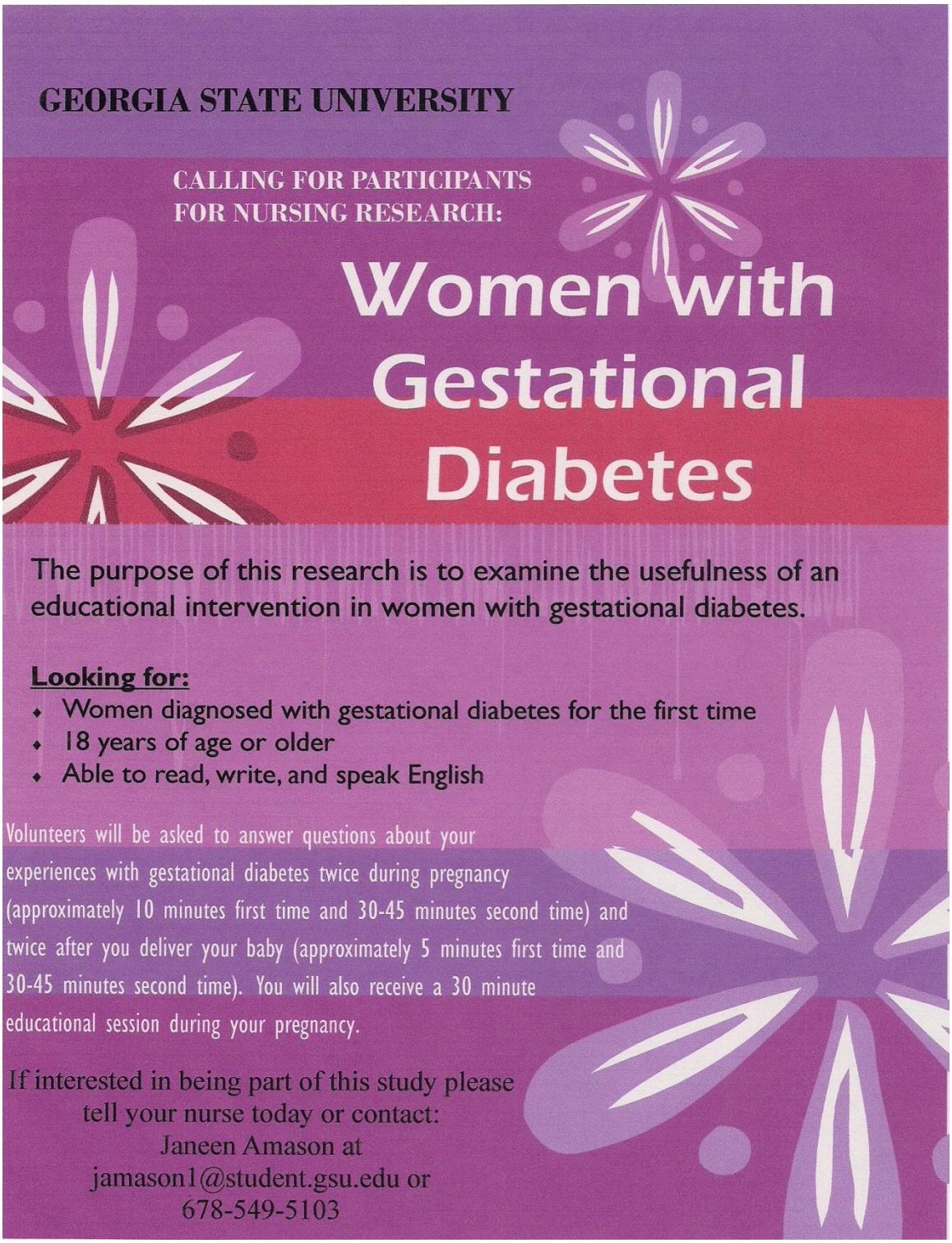
APPENDICES

Appendix A

Recruitment Flyer



Appendix B

IRB Approval

INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999 In Person: Alumni Hall
Atlanta, Georgia 30302-3999 30 Courtland St, Suite 217
Phone: 404/413-3500
Fax: 404/413-3504

June 29, 2011

Principal Investigator: Lee, Shih-Yu (Sylvia)

Student PI: Janeen Amason

Protocol Department: B.F. Lewis School of Nursing

Protocol Title: The Effect of an Educational Intervention in Women with Gestational Diabetes: A Pilot Study

Submission Type: Protocol H11536

Review Type: Expedited Review

Approval Date: June 29, 2011

Expiration Date: June 28, 2012

The Georgia State University Institutional Review Board (IRB) reviewed and approved the above referenced study and enclosed Informed Consent Document(s) in accordance with the Department of Health and Human Services. The approval period is listed above.

Federal regulations require researchers to follow specific procedures in a timely manner. For the protection of all concerned, the IRB calls your attention to the following obligations that you have as Principal Investigator of this study.

1. When the study is completed, a Study Closure Report must be submitted to the IRB.
2. For any research that is conducted beyond the one-year approval period, you must submit a Renewal Application 30 days prior to the approval period expiration. As a courtesy, an email reminder is sent to the Principal Investigator approximately two months prior to the expiration of the study. However, failure to receive an email reminder does not negate your responsibility to submit a Renewal Application. In addition, failure to return the Renewal Application by its due date must result in an automatic termination of this study. Reinstatement can only be granted following resubmission of the study to the IRB.
3. Any adverse event or problem occurring as a result of participation in this study must be reported immediately to the IRB using the Adverse Event Form.
4. Principal investigators are responsible for ensuring that informed consent is obtained and that no human subject will be involved in the research prior to obtaining informed consent. Ensure that each person giving consent is provided with a copy of the Informed Consent Form (ICF). The ICF used must be the one reviewed and approved by the IRB; the approval dates of the IRB review are stamped on each page of the ICF. Copy and use the stamped ICF for the coming year. Maintain a single copy of the approved ICF in your files for this study. However, a waiver to obtain informed consent may be granted by the IRB as outlined in 45CFR46.116(d).

All of the above referenced forms are available online at https://irbwise.gsu.edu. Please do not hesitate to contact Susan Vogtner in the Office of Research Integrity (404-413-3500) if you have any questions or concerns.

Sincerely,

Cynthia A. Hoffner, IRB Vice-Chair

Federal Wide Assurance Number: 00000129

Appendix C

IRB Approval Continuing Review

INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999 In Person: Alumni Hall

Atlanta, Georgia 30302-3999 30 Courtland St, Suite 217

Phone: 404/413-3500

Fax: 404/413-3504

June 19, 2012

Principal Investigator: Lee, Shih-Yu (Sylvia)

Student Principal Investigator: Amason, Janeen

Protocol Department: B.F. Lewis School of Nursing

Protocol Title: The Effect of an Educational Intervention in Women with Gestational Diabetes: A Pilot Study

Funding Agency:

Submission Type: Continuing Review #1 for H11536

Review Type: Expedited Review, Category 7

Approval Date: June 28, 2012

Expiration Date: June 27, 2013

The Georgia State University Institutional Review Board (IRB) reviewed and approved the above referenced study in accordance with 45 CFR 46.111. The IRB has reviewed and approved the research protocol and any informed consent forms, recruitment materials, and other research materials that are marked as approved in the application. The approval period is listed above.

Federal regulations require researchers to follow specific procedures in a timely manner. For the protection of all concerned, the IRB calls your attention to the following obligations that you have as Principal Investigator of this study.

1. For any changes to the study (except to protect the safety of participants), an Amendment Application must be submitted to the IRB. The Amendment Application must be reviewed and approved before any changes can take place

2. Any unanticipated/adverse events or problems occurring as a result of participation in this study must be reported immediately to the IRB using the Unanticipated/Adverse Event Form.

3. Principal investigators are responsible for ensuring that informed consent is properly documented in accordance with 45 CFR 46.116.

    a. The Informed Consent Form (ICF) used must be the one reviewed and approved by the IRB with the approval dates stamped on each page.

4. For any research that is conducted beyond the approval period, a Renewal Application must be submitted at least 30 days prior to the expiration date. The Renewal Application must be approved by the IRB before the expiration date else automatic termination of this study will occur. If the study expires, all research activities associated with the study must cease and a new application must be approved before any work can continue.

5. When the study is completed, a Study Closure Report must be submitted to the IRB.

All of the above referenced forms are available online at https://irbwise.gsu.edu. Please do not hesitate to contact the Office of Research Integrity (404-413-3500) if you have any questions or concerns.

Sincerely,

Susan K. Laury

Susan K. Laury, IRB Chair

Federal Wide Assurance Number: 00000129

Appendix D

Nursing Research Committee Approval

From: Nancy Ballard

To: Janeen Amason, MSN, RN

Date: 5-31-2011

Subject: NRC Approval for Study

Dear Ms Amason

Study Number: 11-09

Study Title: The Effect of an Educational Intervention in Women with Gestational Diabetes: A Pilot Study

Your research proposal has been approved by the WellStar Nursing Research Committee, and you may begin your study as described effective immediately. Any changes to the study must be reported promptly to the Nursing Research Committee for approval.

A 6 month Progress Report (form is available on the Center for Nursing Excellence Website) is due in November of 2011 unless the study is closed before that date. At the completion of the study, please contact me to schedule a date to report the results of your study to the Nursing Research Committee.

Please contact me if you have any questions or need additional information.

Sincerely,

Nancy Ballard

Nancy Ballard, MSN, RN,
Chair, Nursing Research Committee
WellStar Health System
Center For Nursing Excellence
Atlanta, GA 30339
Phone 770 956-6441
FAX 770 937-4044
Nancy.ballard@wellstar.org

Appendix E

Georgia State University
Byrdine F. Lewis School of Nursing
Informed Consent and HIPPA Authorization

Title: The Effect of an Educational Intervention in Women with Gestational Diabetes

Principal Investigator: Shih-Yu (Sylvia) Lee RNC, PhD (PI)
Janeen Amason MSN, RN (Student PI)

I. Purpose:

The purpose of the study is to examine which educational material is most helpful for women with gestational diabetes. You are invited to this study because you have gestational diabetes. About 40 women will help with this study. You will have an equal chance to receive one of the educational materials: something about you or caring for your newborn. A "flip of a coin" will be used to decide it.

II. Procedures:

If you sign the informed consent, the following will happen:

1. Your medical records will be reviewed by the research team member.
2. You will be interviewed today for some information about you (10 minutes)
3. During your next routine office visit you will:
   a. Answer 5 questionnaires (30-45 minutes)
   b. Attend an educational session (30 minutes)
4. A research team member will call you 2-4 weeks after you deliver your baby to:
   a. Collect information about the birth of your baby (5 minutes)
   b. Review the education information (5 minutes)
5. During your routine postpartum checkup, you will answer 5 questionnaires (30-45 minutes)
6. Once you have finished the study, you will receive a $10 gift card.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life. However, you may feel distress when answering questions. If this happens, you may refuse to answer the question, or you can stop the participation completely.

IV. Benefits:

There will be no direct benefit as a result of your participation. The findings from this study will help to provided better care for women with gestational diabetes.

V. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality and Protected Health Information (PHI):

- PHI is a term used to protect your health information. Any health information given to us will be used for the purpose of this study. We will keep your records private to the extent allowed by law.
- Only the PI and student PI will have access to the information you provide.
- Information may be shared with those who make sure the study is done correctly; such as the Institutional Review Board at Georgia State University, the Office for Human Research Protection and the WellStar Nursing Research Committee.
- We will use a code number rather than your name on collected data.
- To ensure confidentiality, all information will be locked and secured with your name and code kept in a separate location from collected data.
- The information you provide will be stored in a locked cabinet in the student PI's office. Only the student PI will have access to it.
- Information stored on a computer will have limited access for research personnel only.
- The findings will be summarized and reported in group form. You will not be identified personally.

VII. Contact Persons:

For questions about this study:
Shih-Yu (Sylvia) Lee at 404-413-1176 or nusyl@langate.gsu.edu
Janeen Amason at 678-797-2162 or jamason1@student.gsu.edu
For questions about your rights as a participant:
Susan Vogtner in the Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu.

VIII. Copy of Consent Form to Subject:

We will give you a copy of this consent form to keep.

If you are willing to volunteer for this research, please sign below.

_____ _____

Participant Date

_____ _____

Principal Investigator or Researcher Obtaining Consent Date

Appendix F

Demographic Form (Pre-Test)

1. Age:_____
2. Ethnic group:

   _____White (Caucasian)

   _____Black/African American

   _____Hispanic/Latino

   _____Asian

   _____Other, please specify_____
3. Marital Status:

   _____Married

   _____Divorced

   _____Separated

   _____Single
4. How many family members live in your home?_____

5. Education: (please mark highest degree earned)

   _____Some high school

   _____High school graduate

   _____Some College

   _____College Graduate (Undergraduate)

   _____Graduate Degree

6. Family Income:

_____Under $15, 000

_____$15,000-$24,999

_____$25,000-$34,999

_____$35,000-$49,999

_____$50,000-$74,999

_____$75,000-$99,999

_____$100,000 and over

7. Do you have a family member who has been diagnosed with Type 2 Diabetes?

_____yes

_____no

If yes, who?_____

8. What type of information has your health care provider given you about Gestational Diabetes status? _____

9. What type of impact do you believe Gestational Diabetes has on your health?_____

10. Are you using insulin to manage your blood sugar?

_____yes

_____no

11. Are you using oral medications (pills) (e.g. Metformin) to manage your blood sugar?

_____yes

_____no

12. On average in the past week, how many total hours do you sleep each night?

_____

13. Before pregnancy, on average how many total hours did you sleep each night?_____

14. How many hours of sleep do you need to feel refreshed? _____

Additional Demographic Data

1. Gravida _____
2. Para_____
3. Due Date_____
4. Height_____
5. Pre-pregnancy weight _____
6. Weeks gestation diagnosis of GD _____
7. Health care provider for this pregnancy:

_____OB/GYN

_____Midwife (CNM)

_____Nurse Practitioner

Appendix G

Postpartum Demographic Form

1. Delivery
    a. How many weeks gestation at delivery?_____
    b. Did you deliver vaginally or by c-section?_____

2. Weight gain during pregnancy
    a. How many pounds did you gain during the pregnancy?_____
    b. What was your final weight at the end of your pregnancy?_____

3. Newborn Characteristics
    a. Baby

        _____boy

        _____girl

    b. What was the birth weight and length of your baby?_____
    c. Did your baby go to the NICU?

        _____yes

        _____no

4. On average, how many total hours do you sleep each night? _____

5. How many times are you awaken during the night by your newborn? _____

Appendix H

RPS-DD Adapted for Women with Gestational Diabetes

The next set of questions ask about what you think of your risk or chance for getting diabetes.

1. What statement best reflects your opinion for each?	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
A. I feel that I have little control over risks to my health.	1☐	2☐	3☐	4☐
B. If I am going to get diabetes, there is not much I can do about it.	1☐	2☐	3☐	4☐
C. I think that my personal efforts will help control my risks of getting diabetes.	1☐	2☐	3☐	4☐
D. People who make a good effort to control the risks of getting diabetes are much less likely to get diabetes.	1☐	2☐	3☐	4☐
E. Compared to other women of my same age, I am less likely than they are to get diabetes.	1☐	2☐	3☐	4☐
F. Compared to other women of my same age, I am less likely than they are to get a serious disease.	1☐	2☐	3☐	4☐

2. We would like you to **think about people in the general public** and NOT about your own personal risk of getting diabetes. Which statement most closely reflects your view of how each item affects **their risk** for diabetes? *Check the box for each statement that best describes your opinion.*	**Increases or raises the risk**	**Has NO effect on risk**	**Decreases or lowers the risk**	**Don't know**
A. Being Asian American	1☐	2☐	3☐	4☐
B. Being Caucasian (White)	1☐	2☐	3☐	4☐
C. Eating a healthy diet	1☐	2☐	3☐	4☐
D. Being Black or African-American	1☐	2☐	3☐	4☐
E. Being Hispanic	1☐	2☐	3☐	4☐
F. Having had diabetes during pregnancy	1☐	2☐	3☐	4☐

3. We would like you to **think about people in the general public** and NOT about your own personal risk of getting diabetes. Which statement most closely reflects your view of how each item affects **their risk** for diabetes? *Check the box for each statement that best describes your opinion.*	**Increases or raises the risk**	**Has NO effect on risk**	**Decreases or lowers the risk**	**Don't know**
G. Having a blood relative with diabetes	1☐	2☐	3☐	4☐
H. Being 65 years of age or older	1☐	2☐	3☐	4☐
I. Exercising regularly	1☐	2☐	3☐	4☐
J. Being American Indian	1☐	2☐	3☐	4☐
K. Controlling weight gain	1☐	2☐	3☐	4☐

4. For each item below, let us know the response that BEST DESCRIBES YOUR OPINION about possible ways to prevent diabetes.	**Strongly**	**Agree**	**Neither Agree or Disagree**	**Disagree**	**Strongly Disagree**
A. Doing regular exercise and following a diet take a lot of effort.	1☐	2☐	3☐	4☐	6☐
B. Regular exercise and diet may prevent diabetes from developing.	1☐	2☐	3☐	4☐	6☐
C. Benefits of following a diet and exercise program outweigh the effort to do it.	1☐	2☐	3☐	4☐	6☐

5. What do you think your risk or chance is for getting diabetes over the next 10 years?

1☐ Almost no chance

2☐ Slight chance

3☐ Moderate chance

4☐ High chance

6. If you don't change your lifestyle behaviors, such as diet or exercise, what is your risk or chance of getting diabetes over the next 10 years?

1☐ Almost no chance

2☐ Slight chance

3☐ Moderate chance

4☐ High chance

7. Have you recently made changes in any lifestyle behaviors that you believe will lower your chances of getting diabetes?

0☐ No

1☐ Yes

8. Are you planning to make changes in any lifestyle behaviors in the near future that you believe will lower your chances of getting diabetes?

0☐ No

1☐ Yes

Appendix I

Barrier and Cues to Action Questions for Adoption of Healthy Lifestyle Behaviors and Postpartum Glucose Screening

1. How do you describe a healthy lifestyle?

2. Is a healthy lifestyle important to you?

3. Can you give me the top three reasons that prevent you from having a healthy lifestyle (eating healthy diet, exercising, losing weight)?

4. Can you tell me what encourages or motivates you adopt healthy lifestyle behaviors (e.g. lose weight, eat healthy diet, exercise?

Postpartum questions only:

5. Did you receive blood glucose screening at your postpartum appointment?

6. If you did not receive blood glucose screening at your postpartum appointment, what was the reason you did not have this blood work done?

7. What motivated you to get a glucose test postpartum?”

Appendix J

Self Rated Abilities for Health Practices Scale (SRAHP)

(University of Texas at Austin School of Nursing, 2007)

Adapted Version for Women with Gestational Diabetes

Read each statement and use the following scale to indicate how confident you are to do each of the health practices, not how often you actually do it.

0 = Not at all
1 = A little
2 = Somewhat
3 = Mostly
4 = Completely

I am confident that I can:

1.	Find healthy foods that are within my budget	0 1 2 3 4
2.	Eat a balanced diet	0 1 2 3 4
3.	Figure out how much I should weight to be healthy	0 1 2 3 4
4.	Brush my teeth regularly	0 1 2 3 4
5.	Tell which foods are high in fiber content	0 1 2 3 4
6.	Figure out from labels what foods are good for me	0 1 2 3 4
7.	Drink as much water as I need to drink every day	0 1 2 3 4
8.	Figure out things I can do to help me relax	0 1 2 3 4
9.	Keep myself from feeling lonely	0 1 2 3 4
10.	Do things that make me feel good about myself	0 1 2 3 4
11.	Avoid being bored	0 1 2 3 4
12.	Talk to friend and family about the things that are bothering me	0 1 2 3 4
13.	Figure out how I respond to stress	0 1 2 3 4

14.	Change things in my life to reduce my stress	0 1 2 3 4
15.	Do exercises that are good for me	0 1 2 3 4
16.	Fit exercise into my regular routine	0 1 2 3 4
17.	Find ways to exercise that I enjoy	0 1 2 3 4
18.	Find accessible places for me to exercise in the community	0 1 2 3 4
19.	Know when to quit exercising	0 1 2 3 4
20.	Do stretching exercises	0 1 2 3 4
21.	Keep from getting hurt when I exercise	0 1 2 3 4
22.	Figure out where to get information on how to take care of my health	0 1 2 3 4
23.	Watch for negative changes in my body's condition	0 1 2 3 4
24.	Recognize what symptoms should be reported to a doctor or nurse	0 1 2 3 4
25.	Use medication correctly.	0 1 2 3 4
26.	Find a doctor or nurse who gives me good advice about how to stay healthy	0 1 2 3 4
27.	Know my rights and stand up for myself effectively	0 1 2 3 4
28.	Get help from others when I need it	0 1 2 3 4

Appendix K

LIFESTYLE PROFILE II

DIRECTIONS: This questionnaire contains statements about your *present* way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate the frequency with which you engage in each behavior by circling:

N for never, **S** for sometimes, **O** for often, or **R** for routinely

		NEVER	SOMETIMES	OFTEN	ROUTINELY
1.	Discuss my problems and concerns with people close to me.	N	S	O	R
2.	Choose a diet low in fat, saturated fat, and cholesterol.	N	S	O	R
3.	Report any unusual signs or symptoms to a physician or other health professional.	N	S	O	R
4.	Follow a planned exercise program.	N	S	O	R
5.	Get enough sleep.	N	S	O	R
6.	Feel I am growing and changing in positive ways.	N	S	O	R
7.	Praise other people easily for their achievements.	N	S	O	R
8.	Limit use of sugars and food containing sugar (sweets).	N	S	O	R
9.	Read or watch TV programs about improving health.	N	S	O	R
10.	Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).	N	S	O	R
11.	Take some time for relaxation each day.	N	S	O	R
12.	Believe that my life has purpose.	N	S	O	R
13.	Maintain meaningful and fulfilling relationships with others.	N	S	O	R
14.	Eat 6-11 servings of bread, cereal, rice and pasta each day.	N	S	O	R
15.	Question health professionals in order to understand their instructions.	N	S	O	R
16.	Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times a week).	N	S	O	R
17.	Accept those things in my life which I can not change.	N	S	O	R
18.	Look forward to the future.	N	S	O	R
19.	Spend time with close friends.	N	S	O	R
20.	Eat 2-4 servings of fruit each day.	N	S	O	R
21.	Get a second opinion when I question my health care provider's advice.	N	S	O	R
22.	Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).	N	S	O	R
23.	Concentrate on pleasant thoughts at bedtime.	N	S	O	R
24.	Feel content and at peace with myself.	N	S	O	R
25.	Find it easy to show concern, love and warmth to others.	N	S	O	R

	NEVER	SOMETIMES	OFTEN	ROUTINELY
26. Eat 3-5 servings of vegetables each day.	N	S	O	R
27. Discuss my health concerns with health professionals.	N	S	O	R
28. Do stretching exercises at least 3 times per week.	N	S	O	R
29. Use specific methods to control my stress.	N	S	O	R
30. Work toward long-term goals in my life.	N	S	O	R
31. Touch and am touched by people I care about.	N	S	O	R
32. Eat 2-3 servings of milk, yogurt or cheese each day.	N	S	O	R
33. Inspect my body at least monthly for physical changes/danger signs.	N	S	O	R
34. Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away from destination and walking).	N	S	O	R
35. Balance time between work and play.	N	S	O	R
36. Find each day interesting and challenging.	N	S	O	R
37. Find ways to meet my needs for intimacy.	N	S	O	R
38. Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day.	N	S	O	R
39. Ask for information from health professionals about how to take good care of myself.	N	S	O	R
40. Check my pulse rate when exercising.	N	S	O	R
41. Practice relaxation or meditation for 15-20 minutes daily.	N	S	O	R
42. Am aware of what is important to me in life.	N	S	O	R
43. Get support from a network of caring people.	N	S	O	R
44. Read labels to identify nutrients, fats, and sodium content in packaged food.	N	S	O	R
45. Attend educational programs on personal health care.	N	S	O	R
46. Reach my target heart rate when exercising.	N	S	O	R
47. Pace myself to prevent tiredness.	N	S	O	R
48. Feel connected with some force greater than myself.	N	S	O	R
49. Settle conflicts with others through discussion and compromise.	N	S	O	R
50. Eat breakfast.	N	S	O	R
51. Seek guidance or counseling when necessary.	N	S	O	R
52. Expose myself to new experiences and challenges.	N	S	O	R

Appendix L

GENERAL SLEEP DISTURBANCE SCALE

How often in the past week did you:	NO DAYS							EVERY DAY
1. have difficulty getting to sleep	0	1	2	3	4	5	6	7
2. wake up during your sleep period	0	1	2	3	4	5	6	7
3. wake up too early at the end of a sleep period	0	1	2	3	4	5	6	7
4. feel rested upon awakening at the end of a sleep period	0	1	2	3	4	5	6	7
5. sleep poorly	0	1	2	3	4	5	6	7
6. feel sleepy during the day	0	1	2	3	4	5	6	7
7. struggle to stay awake during the day	0	1	2	3	4	5	6	7
8. feel irritable during the day	0	1	2	3	4	5	6	7
9. feel tired or fatigued during the day	0	1	2	3	4	5	6	7
10. feel satisfied with the quality of your sleep	0	1	2	3	4	5	6	7
11. feel alert and energetic during the day	0	1	2	3	4	5	6	7
12. get too much sleep	0	1	2	3	4	5	6	7
13. get too little sleep	0	1	2	3	4	5	6	7
14. take a nap at a scheduled time	0	1	2	3	4	5	6	7
15. fall asleep at an unscheduled time	0	1	2	3	4	5	6	7
16. drink an alcoholic beverage to help you get to sleep	0	1	2	3	4	5	6	7
17. use tobacco to help you get to sleep	0	1	2	3	4	5	6	7
18. use herbal product to help you get to sleep	0	1	2	3	4	5	6	7
19. use an over-the-counter sleeping pill to help you get to sleep	0	1	2	3	4	5	6	7
20. use a prescription sleeping pill to help you get to sleep	0	1	2	3	4	5	6	7
21. use aspirin or other pain medication to help you get to sleep	0	1	2	3	4	5	6	7

K. Lee (GSDS, Sleep, 1992)

Appendix M

What I Need to Know About Gestational Diabetes

(NIDDK, 2006)

What is gestational diabetes?

Gestational diabetes is diabetes that is found for the first time when a woman is pregnant.

Gestational (jes-TAY-shun-ul) diabetes is diabetes that is found for the first time when a woman is pregnant. Out of every 100 pregnant women in the United States, three to eight get gestational diabetes. Diabetes means that your blood glucose (also called blood sugar) is too high. Your body uses glucose for energy. But too much glucose in your blood can be harmful. When you are pregnant, too much glucose is not good for your baby.

This booklet is for women with gestational diabetes. If you have type 1 or type 2 diabetes and are considering pregnancy, call the National Diabetes Information Clearinghouse at 1–800–860–8747 for more information and consult your health care team before you get pregnant.

What causes gestational diabetes?

Changing hormones and weight gain are part of a healthy pregnancy. But both changes make it hard for your body to keep up with its need for a hormone called insulin. When that happens, your body doesn't get the energy it needs from the food you eat.

What is my risk of gestational diabetes?

To learn your risk for gestational diabetes, check each item that applies to you. Talk with your doctor about your risk at your first prenatal visit.

- I have a parent, brother, or sister with diabetes.
- I am African American, American Indian, Asian American, Hispanic/Latino, or Pacific Islander.
- I am 25 years old or older.
- I am overweight.
- I have had gestational diabetes before, or I have given birth to at least one baby weighing more than 9 pounds.
- I have been told that I have "pre-diabetes," a condition in which blood glucose levels are higher than normal, but not yet high enough for a diagnosis of diabetes. Other names for it are "impaired glucose tolerance" and "impaired fasting glucose."

If you checked any of these risk factors, ask your health care team about testing for gestational diabetes.

- You are at **high risk** if you are very overweight, have had gestational diabetes before, have a strong family history of diabetes, or have glucose in your urine.

- You are at **average risk** if you checked one or more of the risk factors.

- You are at **low risk** if you did not check any of the risk factors.

When will I be checked for gestational diabetes?

Your doctor will decide when you need to be checked for diabetes depending on your risk factors.

- If you are at **high risk**, your blood glucose level may be checked at your first prenatal visit. If your test results are normal, you will be checked again sometime between weeks 24 and 28 of your pregnancy.

- If you have an **average risk** for gestational diabetes, you will be tested sometime between weeks 24 and 28 of pregnancy.

- If you are at **low risk**, your doctor may decide that you do not need to be checked.

How is gestational diabetes diagnosed?

Your health care team will check your blood glucose level. Depending on your risk and your test results, you may have one or more of the following tests.

Fasting blood glucose or random blood glucose test

Your doctor may check your blood glucose level using a test called a fasting

blood glucose test. Before this test, your doctor will ask you to fast, which means having nothing to eat or drink except water for at least 8 hours. Or your doctor may check your blood glucose at any time during the day. This is called a random blood glucose test.

These tests can find gestational diabetes in some women, but other tests are needed to be sure diabetes is not missed.

Your health care provider will check your blood glucose level to see if you have gestational diabetes.

Screening glucose challenge test

For this test, you will drink a sugary beverage and have your blood glucose level checked an hour later. This test can be done at any time of the day. If the results are above normal, you may need further tests.

Oral glucose tolerance test

If you have this test, your health care provider will give you special instructions to follow. For at least 3 days before the test, you should eat normally. Then you will fast for at least 8 hours before the test.

The health care team will check your blood glucose level before the test. Then you will drink a sugary beverage. The staff will check your blood glucose levels 1 hour, 2 hours, and 3 hours later. If your levels are above normal at least twice during the test, you have gestational diabetes.

Above-normal results for the oral glucose tolerance test*	
Fasting	95 or higher
At 1 hour	180 or higher

At 2 hours	155 or higher
At 3 hours	140 or higher
Note: Some labs use other numbers for this test. *These numbers are for a test using a drink with 100 grams of glucose.	

How will gestational diabetes affect my baby?

Untreated or uncontrolled gestational diabetes can mean problems for your baby, such as

- being born very large and with extra fat; this can make delivery difficult and more dangerous for your baby
- low blood glucose right after birth
- breathing problems

If you have gestational diabetes, your health care team may recommend some extra tests to check on your baby, such as

- an ultrasound exam, to see how your baby is growing
- "kick counts" to check your baby's activity (the time between the baby's movements) or special "stress" tests

Working closely with your health care team will help you give birth to a healthy baby.

Both you and your baby are at increased risk for type 2 diabetes for the rest of your lives.

How will gestational diabetes affect me?

Often, women with gestational diabetes have no symptoms. However, gestational diabetes may

- increase your risk of high blood pressure during pregnancy
- increase your risk of a large baby and the need for cesarean section at delivery

The good news is your gestational diabetes will probably go away after your

baby is born. However, you will be more likely to get type 2 diabetes later in your life. (See the information on how to lower your chances of getting type 2 diabetes.) You may also get gestational diabetes again if you get pregnant again.

Some women wonder whether breastfeeding is OK after they have had gestational diabetes. Breastfeeding is recommended for most babies, including those whose mothers had gestational diabetes.

Gestational diabetes is serious, even if you have no symptoms. Taking care of yourself helps keep your baby healthy.

How is gestational diabetes treated?

Treating gestational diabetes means taking steps to keep your blood glucose levels in a target range. You will learn how to control your blood glucose using

Using a meal plan will help keep your blood glucose in your target range.

- a meal plan
- physical activity
- insulin (if needed)

Meal Plan

You will talk with a dietitian or a diabetes educator who will design a meal plan to help you choose foods that are healthy for you and your baby. Using a meal plan will help keep your blood glucose in your target range. The plan will provide guidelines on which foods to eat, how much to eat, and when to eat. Choices, amounts, and timing are all important in keeping your blood glucose levels in your target range.

You may be advised to

- limit sweets
- eat three small meals and one to three snacks every day
- be careful about when and how much carbohydrate-rich food you eat; your meal plan will tell you when to eat carbohydrates and how much to eat at each meal and snack
- include fiber in your meals in the form of fruits, vegetables, and whole-grain crackers, cereals, and bread

For more about meal planning, call the National Diabetes Information Clearinghouse for a copy of *What I need to know about Eating and Diabetes*.

Physical activity can help you reach your blood glucose targets.

Physical Activity

Physical activity, such as walking and swimming, can help you reach your blood glucose targets. Talk with your health care team about the type of activity that is best for you. If you are already active, tell your health care team what you do.

Insulin

Some women with gestational diabetes need insulin, in addition to a meal plan and physical activity, to reach their blood glucose targets. If necessary, your health care team will show you how to give yourself insulin. Insulin is not harmful for your baby. It cannot move from your bloodstream to the baby's.

How will I know whether my blood glucose levels are on target?

Your health care team may ask you to use a small device called a blood glucose meter to check your levels on your own. You will learn

Each time you check your blood glucose, write down the results.

- how to use the meter
- how to prick your finger to obtain a drop of blood
- what your target range is
- when to check your blood glucose

You may be asked to check your blood glucose

- when you wake up
- just before meals
- 1 or 2 hours after breakfast
- 1 or 2 hours after lunch
- 1 or 2 hours after dinner

The following chart shows blood glucose targets for most women with gestational diabetes. Talk with your health care team about whether these targets are right for you.

Blood glucose targets for most women with gestational diabetes	
On awakening	not above 95
1 hour after a meal	not above 140
2 hours after a meal	not above 120

Each time you check your blood glucose, write down the results in a record book. Take the book with you when you visit your health care team. If your results are often out of range, your health care team will suggest ways you can reach your targets.

Will I need to do other tests on my own?

Your health care team may teach you how to test for ketones (KEE-tones) in your morning urine or in your blood. High levels of ketones are a sign that your body is using your body fat for energy instead of the food you eat. Using fat for energy is not recommended during pregnancy. Ketones may be harmful for your baby.

If your ketone levels are high, your health care providers may suggest that you change the type or amount of food you eat. Or you may need to change your meal times or snack times.

After I have my baby, how can I find out whether my diabetes is gone?

You will probably have a blood glucose test 6 to 12 weeks after your baby is born to see whether you still have diabetes. For most women, gestational diabetes goes away after pregnancy. You are, however, at risk of having gestational diabetes during future pregnancies or getting type 2 diabetes later.

How can I prevent or delay getting type 2 diabetes later in life?

After you have your baby, you can do a lot to prevent or delay type 2 diabetes.

You can do a lot to prevent or delay type 2 diabetes.

- Reach and maintain a reasonable weight. Even if you stay above your ideal weight, losing 5 to 7 percent of your body weight is enough to make a big difference. For example, if you weigh 200 pounds, losing 10 to 14 pounds can greatly reduce your chance of getting diabetes.
- Be physically active for 30 minutes most days. Walk, swim, exercise, or go dancing.
- Follow a healthy eating plan. Eat more grains, fruits, and vegetables. Cut down on fat and calories. A dietitian can help you design a meal plan.

Remind your health care team to check your blood glucose levels regularly. Women who have had gestational diabetes should continue to be tested for diabetes or pre-diabetes every 1 to 2 years. Diagnosing diabetes or pre-diabetes early can help prevent complications such as heart disease later.

Your child's risk for type 2 diabetes may be lower if you breastfeed your baby and if your child maintains a healthy weight.

Where can I get more information?

Diabetes Teachers (nurses, dietitians, and other health professionals)
To find a diabetes teacher near you, call the American Association of Diabetes Educators toll-free at 1–800–TEAMUP4 (1–800–832–6874). Or go to www.diabeteseducator.org and click on "Find a Diabetes Educator."

Dietitians
To find a dietitian near you, call the American Dietetic Association's National Center for Nutrition and Dietetics at 1–800–877–1600. Or go to www.eatright.org and click on "Find a Nutrition Professional."

Health Information
To learn more about pregnancy, contact the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD), part of the National Institutes of Health. Call NICHD toll-free at 1–800–370–2943. Or go to www.nichd.nih.gov.

For more information about diabetes, contact the National Diabetes Information Clearinghouse (NDIC) for free copies of these publications or read them online:

Managing Diabetes
What I need to know about Diabetes Medicines
What I need to know about Eating and Diabetes
What I need to know about Physical Activity and Diabetes
Your Guide to Diabetes: Type 1 and Type 2

Preventing Type 2 Diabetes
Am I at Risk for Type 2 Diabetes?
Small Steps. Big Rewards. Your GAME PLAN for Preventing Type 2 Diabetes

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Durham Regional Hospital
Durham, NC

National Diabetes Information Clearinghouse

1 Information Way
Bethesda, MD 20892–3560
Phone: 1–800–860–8747
TTY: 1–866–569–1162
Fax: 703–738–4929
Email: ndic@info.niddk.nih.gov
Internet: www.diabetes.niddk.nih.gov

The National Diabetes Information Clearinghouse (NDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1978, the Clearinghouse provides information about diabetes to people with diabetes and to their families, health care professionals, and the public. The NDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about diabetes.

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Appendix N

Small Steps. Big Rewards. Your GAME PLAN to Prevent Type 2 Diabetes: Information for Patients

Download This Publication (NDEP-60)

This three-booklet package helps people assess their risk for developing diabetes and implement a program to prevent or delay the onset of the disease and it includes an activity tracker and a fat and calorie counter.

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Introduction

You don't have to knock yourself out to prevent diabetes. ***The key is: small steps that lead to big rewards.***

Diabetes prevention is proven, possible, and powerful. Studies show that people at high risk for diabetes can prevent or delay the onset of the disease by losing 5 to 7 percent of their weight, if they are overweight—that's 10 to 14 pounds for a 200-pound person. **Two keys to success:**

- Get at least 30 minutes of moderate-intensity physical activity five days a week.
- Eat a variety of foods that are low in fat and reduce the number of calories you eat per day.*

In other words, **you don't have to knock yourself out to prevent diabetes.**

Have you wondered or possibly been told that you are at risk for developing diabetes or that you have pre-diabetes? To find out more about what things put you at risk, go to and read the "Are You At-Risk Check List" section. If you haven't already done so, be sure to talk with your health care team about your risk and whether you should be tested.

*See Small Steps for Eating Healthy Foods starting on page 18 for examples of foods that are lower in fat and calories.

Small steps lead to big rewards.

When you take steps to prevent diabetes, you will also lower your risk for possible complications. That's a big reward for you and your family and friends.

When you take steps to prevent diabetes, you will also lower your risk for possible complications of diabetes such as heart disease, stroke, kidney disease, blindness, nerve damage, and other health problems. That's a big reward for you and your family and friends.

This ***Small Steps. Big Rewards. GAME PLAN*** kit is based on the Diabetes Prevention Program (DPP). This research study proved that type 2 diabetes could be prevented or delayed in persons with increased risk by losing a small amount of weight and getting 30 minutes of moderate-intensity physical activity, such as brisk walking, five days a week. We used the findings from the study to prepare this kit and to make it as easy as possible for you to take steps now to prevent diabetes.
Congratulations on taking your first small step!

Here's what's in your GAME PLAN kit:

Type 2 diabetes can be prevented ... by losing a small amount of weight and getting 30 minutes of activity, such as brisk walking, five days a week.

Those who kept a daily log of food intake were more likely to lose the recommended amount of weight than those who did not.

GAME PLAN Booklet—This booklet will help you take steps to prevent diabetes. Learn how to start your own GAME PLAN by setting goals, and tracking your progress. Learn more about pre-diabetes and your risk for getting diabetes.

Get healthy eating and physical activity tips to keep you focused and reach your goals. Learn more from the list of groups and websites that can help you lose weight and be more physically active.

GAME PLAN Food and Activity Tracker—This booklet will help you keep track of the foods you eat and how much physical activity you get. The DPP study showed that those who kept a daily log of their food intake and physical activity were more likely to lose the recommended amount of weight than those who did not. You can make more copies as you need them. Feel free to photocopy the Food and Activity Tracker pages at the back of this booklet.

GAME PLAN Fat and Calorie Counter—Use this booklet to look up the calories and fat grams in the foods you eat and drink and record the amounts in your Food and Activity Tracker.

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Overview of the small steps Big Rewards. GAME PLAN

One Small Step: ***Know your risk***.

Work with your health care team to find out if you have pre-diabetes, a condition that puts you at risk for type 2 diabetes. Learn more about your risk for diabetes.

Big Reward: Knowing you can prevent or delay diabetes can give you peace of mind. Ask yourself these questions and write down your answers.

- Why do you want to prevent diabetes?

- Who do you want to do it for?

Review your answers every week to help you stay with your GAME PLAN.

One Small Step: ***Start your GAME PLAN***.

Use this booklet to create your own GAME PLAN to prevent diabetes. Work with your health care team, family, and friends. All of you can form a winning team to prevent diabetes. Here's how to get started.

Plan to set a weight loss goal:

The key to preventing diabetes is to lose weight by eating healthy foods that are lower in fat and calories and being physically active. Set a goal that you can achieve. A good goal is to lose at least 5 to 10 percent (10 to 20 pounds if you weigh 200 pounds) of your current weight. A 5 to 7 percent weight loss was shown to have a big impact on lowering the risk of diabetes in the DPP study.

Here's how to figure out your weight loss goal. Multiply your weight by the percent you want to lose. For example, if John weighs 240 pounds and wants to lose 7 percent of his weight, he would multiply 240 by .07.

240 pounds

x .07 (7 percent)

16.8 pounds

240 pounds

- 17 pounds

223 pounds

Find out if you are at risk for diabetes. Talk to your health care provider.

Losing 5 to 7 percent of your weight is one big step to reduce your risk of diabetes.

John's goal is to lose about 17 pounds and bring his weight down to 223 pounds.

Choose your weight loss goal

Now, start thinking about how much better you will feel when you reach your goal. Keep in mind that losing even a small amount of weight can help you prevent diabetes. Weigh yourself at least once a week and write down your progress. Research shows that people who keep track of their weight reach their goals more often than those who don't.

Make Healthy food choice to help reach your weight loss goal.

Eat healthy foods:

Make healthy food choices to help reach your weight loss goal. There are many weight loss plans from which to choose. But the DPP showed that you can prevent or delay the onset of diabetes by losing weight through a low-fat, reduced calorie eating plan, and by increasing physical activity. Use the tips to eat healthy to help you reach your goals.

Figure out how many calories and fat grams you should have per day. Use this chart to figure out your goals for losing one to two pounds per week.

Recommended Calories and Fat Grams Daily

**It is not advised to eat less than 1,200 calories a day

Current Weight	Calories and Fat Grams per day
120 –170 pounds	1,200 calories a day 33 grams fat a day

Current Weight	Calories and Fat Grams per day
175 – 215 pounds	1,500 calories a day 42 grams fat a day
120 – 245 pounds	1,800 calories a day 50 grams fat a day
250 – 300 pounds	2000 calories a day 55 grams fat a day

Source: DPP Lifestyle Manual of Operations

Try dancing, swimming, biking, walking, or any activity that keeps you moving for 30 minutes most days.

It is important to find out early if you have diabetes or if you are at risk for developing it.

Use the Fat and Calorie Counter to help you keep track of the number of fat grams and calories you take in each day.

Move more:

When you move more every day, you will burn more calories. This will help you reach your weight loss goal. Try to get at least 30 minutes of moderate-intensity physical activity five days a week. If you have not been active, start off slowly, building up to your goal. Try brisk walking, dancing, swimming, biking, jogging, or any physical activity that helps get your heart rate up. You don't have to get all your physical activity at one time. Try getting some physical activity throughout the day in 10 minute sessions. Use the tips on getting more physically active to get moving toward your goals.

Big Reward: Losing weight by eating healthy and getting more physical activity not only can help you prevent diabetes, but it also lowers your risk for heart disease, certain types of cancer, arthritis, and many other health problems. Also, you will feel better, and have more energy to do the things you enjoy.

Take your next small step now! Add one or two healthy changes every week.

One Small Step: ***Track your GAME PLAN progress***.

Write down your goals in the GAME PLAN Food and Activity Tracker. Make copies of the tracker and keep them with you. Write down everything you eat and drink. Then, when you have time, use the GAME PLAN Fat and Calorie Counter booklet to add up your calories and fat grams for the day.

Big Reward: Keeping track of what you eat and drink and how many minutes of physical activity you get each day is one of the best ways to stay focused and reach your goals. As you lose weight, you will feel better about yourself and about reaching your goal.

One Small Step: ***Start your own team to prevent diabetes***.

You don't have to prevent diabetes alone. Invite other people to get involved. Try teaming up with a friend or family member. Start a local walking group with your neighbors or at work or at your church. Trade healthy recipes and weight loss tips with your co-workers. Tell other people about the small steps you are taking to prevent diabetes and make sure you help each other stick to your GAME PLANs.

Big Reward: When you involve other people in your GAME PLAN, you will be more likely to stay at it and you will be helping others to prevent diabetes and other health problems.

Take your next small step now!

Add one or two healthy changes every week. If you fall off the wagon, don't get down on yourself. Review your GAME PLAN and get back on track. It's not easy to make lifelong changes in what you eat and in your level of physical activity, but you can use the tips and ideas in this booklet to help you stick to your goals and succeed. And remember: **Preventing diabetes is good for you and for your family and friends. Keep at it!**

Am I at risk for type 2 diabetes and pre-diabetes?

What is diabetes?

At least 54 million Americans have pre-diabetes and are more likely to go on to develop diabetes within 10 years.

Almost 21 million Americans have diabetes, a serious disease in which blood glucose (blood sugar) levels are above normal. Most people with diabetes have type 2, which used to be called adult-onset diabetes. At one time, type 2 diabetes was more common in people over age 45. But now more young people, even children, have the disease because many are overweight or obese.

Diabetes can lead to problems such as heart disease, stroke, vision loss, kidney disease, and nerve damage. About one-third of people with type 2 diabetes do not even know they have it. Many people do not find out they have diabetes until they are faced with problems such as blurry vision or heart trouble. That's why you need to know if you are at risk for diabetes.

What is pre-diabetes?

At least 54 million Americans over age 20 have pre-diabetes. Before people develop type 2 diabetes, they usually have "pre-diabetes"—that means their blood glucose levels are higher than normal, but not yet high enough to be called diabetes. People with pre-diabetes are more likely to develop diabetes within 10 years and they are more likely to have a heart attack or stroke.

Are You At-Risk Check List

Find out if you are at risk for diabetes and pre-diabetes.

Almost 21 million Americans have diabetes—one-third don't even know it. You need to know if you are at risk for diabetes.

There are many factors that increase your risk for diabetes.

There are many factors that increase your risk for diabetes. To find out about your risk, check each item that applies to you.

- I am 45 years of age or older.
- The At-Risk Weight Chart shows my current weight puts me at risk.
- I have a parent, brother, or sister with diabetes.
- My family background is African American, Hispanic/Latino, American Indian, Asian American, or Pacific Islander.
- I have had diabetes while I was pregnant (this is called gestational diabetes) or I gave birth to a baby weighing 9 pounds or more.
- I have been told that my glucose levels are higher than normal.
- My blood pressure is 140/90 or higher, or I have been told that I have high blood pressure.
- My cholesterol (lipid) levels are not normal. My HDL cholesterol ("good" cholesterol) is less than 35 or my triglyceride level is higher than 250.
- I am fairly inactive. I am physically active less than three times a week.
- I have been told that I have polycystic ovary syndrome (PCOS).

- The skin around my neck or in my armpits appears dirty no matter how much I scrub it. The skin appears dark, thick and velvety. This is called acanthosis nigricans.
- I have been told that I have blood vessel problems affecting my heart, brain, or legs.

AT-RISK WEIGHT CHARTS

Find your height in the correct chart. If your weight is equal to or greater than the weight listed, you are at increased risk for type 2 diabetes.

IF YOU ARE ASIAN AMERICAN AT RISK BMI ≥ 23	
HEIGHT	**WEIGHT**
4'10"	110
4'11"	114
5'0"	118
5'1"	122
5'2"	126
5'3"	130
5'4"	134
5'5"	138
5'6"	142
5'7"	146
5'8"	151

IF YOU ARE
ASIAN AMERICAN

AT RISK BMI ≥ 23

HEIGHT	WEIGHT
5'9"	155
5'10"	160
5'11"	165
6'0"	169
6'1"	174
6'2"	179
6'3"	184
6'4"	189

IF YOU ARE
PACIFIC ISLANDER

AT RISK BMI ≥ 26

HEIGHT	WEIGHT
4'10"	124
4'11"	128
5'0"	133
5'1"	137
5'2"	142
5'3"	146
5'4"	151

IF YOU ARE
PACIFIC ISLANDER

AT RISK BMI ≥ 26

HEIGHT	WEIGHT
5'5"	156
5'6"	161
5'7"	166
5'8"	171
5'9"	176
5'10"	181
5'11"	186
6'0"	191
6'1"	197
6'2"	202
6'3"	208
6'4"	213

IF YOU ARE NOT
ASIAN AMERICAN OR
PACIFIC ISLANDER
AT RISK BMI ≥ 25

HEIGHT	WEIGHT
4'10"	119
4'11"	124
5'0"	128

IF YOU ARE NOT ASIAN AMERICAN OR PACIFIC ISLANDER AT RISK BMI ≥ 25	
HEIGHT	**WEIGHT**
5'1"	132
5'2"	136
5'3"	141
5'4"	145
5'5"	150
5'6"	155
5'7"	159
5'8"	164
5'9"	169
5'10"	174
5'11"	179
6'0"	184
6'1"	189
6'2"	194
6'3"	200
6'4"	205

Source: *Adapted from Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*

What is the next step?

Be sure to talk to your health care team about your risk for diabetes and whether you should be tested.

If you have checked any of the items on pages 13 or 14, be sure to talk to your health care team about your risk for diabetes and whether you should be tested.

- If you are age 45 or older, testing for pre-diabetes and diabetes should be considered, especially if you have an at-risk weight according to the charts on page 15.
- If you are age 45 or older without any risk factors, ask about your risk for pre-diabetes or diabetes and if you should get tested.
- If you are 20 to 44 years old, have an at-risk weight, and have checked any other items on pages 13 or 14, ask about your risk for pre-diabetes or diabetes and if you should get tested.
- Repeat testing should be done every 3 years

Know Your Blood Glucose Numbers

	Fasting Blood Glucose Test	2-Hour Oral Glucose Tolerance Test
Normal	Below 100	Below 140
Pre-diabetes	100-125	140-199
Diabetes	126 or above	200 or above

It is important to find out early if you have pre-diabetes or type 2 diabetes, because early treatment can prevent the serious problems caused by high blood glucose.

Ask your health care team about these tests and ask for your blood glucose numbers. It is important to find out early if you have pre-diabetes or type 2 diabetes, because early treatment can prevent the serious problems caused by high blood glucose.

Medicare Benefits for People At Risk for Diabetes

For people with Medicare who are at risk for diabetes, Medicare covers a screening blood glucose test to check for diabetes. If you are obese or have a history of high blood glucose, high blood pressure, high cholesterol, or other risk factors, you may qualify for this test. Based on the test results, you may be able to get up to two screening tests per year. Medicare covers the full cost of this screening test. For more information, visit the Medicare page for people with diabetes.

Type 2 diabetes is a serious disease but it can be prevented or delayed. Take steps now to lower your risk for diabetes.

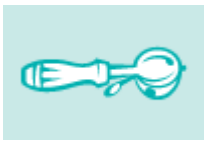
Small steps for eating healthy foods

When it comes to eating healthy to lose weight, the three most important steps are:

1. Take in fewer calories than you burn during the day.
2. Eat less fat (especially saturated fats and trans fats—see page 20) than you currently eat.

3. Eat smaller portions of high fat and high calorie foods than you currently eat.

Portion sizes are often smaller than we think. Use this chart as a guide for portion sizes:

	Portion Size	*Same size as*
	1/2 cup of cooked rice or pasta	An ice cream scoop
	1 1/2 ounces of low fat cheese	Four dice
	3 ounces of lean meat or fish	A deck of cards or a cassette tape
	2 tablespoons low-fat peanut butter	A ping pong ball

Use the Fat and Calorie Counter to look up the number of grams of fat and the number of calories in the foods you eat.

The key to losing weight and preventing diabetes is to make lifelong changes—not quick fixes—that work for you.

Remember: The key to losing weight and preventing diabetes is to make lifelong changes—not quick fixes—that work for you. While some diets may be popular now, there is no proof about their long-term success or if they can prevent diabetes. But the DPP showed that you can prevent or delay the onset of diabetes by losing weight through a low-fat, reduced calorie eating plan, and by increasing physical activity.

Saturated fat is found mostly in foods that come from animals like fatty cuts of beef, lamb, pork, poultry with skin, whole and 2% milk, butter, cheese, and lard. It can also be found in palm and coconut oil.

Trans fat is found in some of the same foods as saturated fat, such as vegetable shortening and hard or stick margarine. It can also be found in processed foods that are made with partially hydrogenated vegetable oils, for example, cookies, baked goods, fried foods and salad dressings.

Eat a Variety of Healthy Foods From Each Food Group

Focus on fruits. Eat a variety of fruits—whether fresh, frozen, canned, or dried—rather than fruit juice for most of your fruit choices. For a 2,000-calorie diet, you will need 2 cups of fruit each day (for example, 1 small banana, 1 large orange, and 1/4 cup of dried apricots or peaches).

Vary your veggies. Eat more dark green veggies, such as broccoli, kale, and other dark leafy greens; orange veggies, such as carrots, sweet potatoes, pumpkin, and winter squash; and beans and peas, such as pinto beans, kidney beans, black beans, garbanzo beans, split peas, and lentils.

Get your calcium-rich foods. Get 3 cups of low fat or fat-free milk—or an equivalent amount of low-fat yogurt and/or low-fat cheese (11/2 ounces of cheese equals 1 cup of milk)—every day. For kids aged 2 to 8, it's 2 cups of milk. If you don't or can't consume milk, choose lactose-free milk products and/or calcium-fortified foods and beverages.

Make half your grains whole. Eat at least 3 ounces of whole-grain cereals, breads, crackers, rice, or pasta every day. One ounce is about 1 slice of bread, 1 cup of breakfast cereal, or 1/2 cup of cooked rice or pasta. Look to see that grains such as wheat, rice, oats, or corn are referred to as "whole" in the list of ingredients.

Go lean with protein. Choose lean meats and poultry. Bake it, broil it, or grill it. And vary your protein choices— with more fish, beans, peas, nuts, and seeds.

Know the limits on fats, salt, and sugars. Read the Nutrition Facts label on foods. Look for foods low in saturated fats and trans fats. Choose and prepare foods and beverages with little salt (sodium) and/or added sugars (caloric sweeteners).

2005 USDA DIETARY GUIDELINES FOR AMERICANS

Drink lots of water.

Take these small steps to eat healthy:

A healthy eating plan is one that:

- Highlights eating fruits, vegetables, whole grains, and fat-free or low-fat milk, and milk products.
- Includes lean meats, poultry, fish, beans, eggs, and nuts.
- Is low in saturated fats, trans fats, cholesterol, salt (sodium), and added sugars.

Keep these healthy eating tips in mind:

- Try not to exceed the amount of calories and fat grams that you need on a daily basis.
- Try to eat meals and snacks at regular times every day.
- Make less food look like more by serving your meals on a smaller plate.
- Take your time when you eat. It takes about 20 minutes for your stomach to tell your brain that you are full.
- Try to limit your alcoholic beverage intake. If you drink alcohol, chose light beer and avoid mixed drinks.

Chew sugar-free gum between meals to help cut down on snacking.

At home:

- Choose foods that are not fried. Instead of fried chicken, try it grilled or baked. Instead of greasy french fries or potato chips, slice potatoes, mix them with a little bit of oil, herbs, and pepper, and bake them in the oven.
- Lighten your recipes by using reduced-fat (light) or fat-free versions of items such as sour cream, cream cheese, mayonnaise, cheese and salad dressing.
- Use herbs and seasonings to add flavor to low-fat dishes. Instead of salt, give foods a little kick by adding hot sauce or red pepper flakes.

- Wrap up and refrigerate leftover foods right after cooking so you're less tempted to go back for seconds.
- Make time to cook healthy main dishes, casseroles, or soups. Freeze portions so you have healthy meals ready for days when you are too busy or too tired to cook.
- For dessert, eat a piece of fruit. Also, try fat-free or low-fat frozen yogurt or sherbet instead of ice cream. Instead of cakes or brownies, have one scoop of vanilla fat-free frozen yogurt with a tablespoon of fat-free chocolate sauce on top.

In-between meals:

- Replace snacks high in fat with crunchy fruits, vegetables, or a tablespoon or two of unsalted nuts.
- Drink lots of water. Choose water or sugar-free soda instead of a regular 20-ounce soda or juice drink. By doing this, you can cut about 250 calories.
- Chew sugar-free gum between meals to help cut down on snacking. Reach for a piece of gum or a hard candy instead of a snack high in fat or calories.

Read and compare food labels when shopping.

When shopping:

- Make a list of what you need ahead of time and try to stick to it.
- Avoid going shopping when you are hungry. Often, you will end up with things you really don't want or need.
- Read and compare food labels when shopping. Choose foods with fewer calories and that are lower in saturated fats, trans fats, cholesterol and sodium. Check the serving size and the number of servings in the package on the label.
- Buy a variety of fruits, vegetables, and whole grain foods. Try a new fruit or vegetable each week, such as kiwi fruit or butternut squash.
- Choose reduced-fat or light versions of mayonnaise, cheese, and salad dressing. Use fat-free or 1 percent low-fat milk instead of whole milk.

- You know best what high-calorie foods tempt you the most, such as cookies, cake, ice cream and snacks. Make it easy on yourself: Don't have them in your home, your office, or anywhere else.

Bring your lunch to work so you can take charge of what you eat.

At work or on the run:

- Bring your lunch to work so you can take charge of what you eat. Make a sandwich with whole grain bread and turkey or lean beef. Use mustard or a little bit of "light" mayonnaise. Pack carrots and celery sticks instead of chips. Choose low-fat/fat-free milk, water, or other drinks without added sugar.
- Pack a healthy snack in case you get hungry. Try an apple, a banana, a cup of fat-free yogurt, or reduced-fat or light string cheese sticks.
- Try to pack your lunch the night before so it's ready to go when you are.
- Take a different route to work to avoid passing by tempting high-calorie foods at nearby restaurants, bakeries, or stores.

Take time to look over the menu and make a healthy choice.

When eating out:

- Take time to look over the menu and make a healthy choice.
- Don't be afraid to ask for items not on the menu or to have a meal prepared with less or no added fat.
- Ask about portion sizes and the fat and calorie content of menu items.
- Choose steamed, grilled, or broiled dishes instead of those that are fried or sautéed.
- Be the first to order so you are not influenced by what others are ordering.

- Always order the smallest size meal instead of the larger, super-sized versions at fast-food restaurants.
- You can eat half of what you order and take the rest home for a second meal.
- Order salad dressing, gravy, sauces, or spreads "on the side."
- Order a salad for starters and share a main dish with a friend.
- When you crave high-calorie foods, desserts, or snacks, don't be too hard on yourself. It's okay to have a small portion once in a while or to share a dessert with a friend. Just keep your weight loss goal in mind.
- Stay away from "all-you-can-eat restaurants or buffets" where it's hard to control portion sizes and how much you eat.

Once you get going, you'll find lots of other ways to make small changes.

These healthy eating tips are examples of the small steps you can take to jumpstart your GAME PLAN. Try a few new steps each week. Once you get going, you'll find lots of other ways to make small changes.

For more ideas and help, check your local library or bookstore for healthy cookbooks and weight loss books. These web sites have lots of ideas as well.

United States Department of Agriculture (USDA)

Dietary Guidelines for Americans

Food and Drug Administration's (FDA) Nutrition Facts Label

My Pyramid: Steps to a Healthier You

National Heart, Lung, and Blood Institute

Weight-Control Information Network

American Diabetes Association

American Dietetic Association

You don't have to play a sport or go to a gym to be more active, unless that's what you like to do.

Small steps for getting more physical activity

The Diabetes Prevention Program (DPP) showed that you could prevent or delay the onset of diabetes by losing weight through small changes in eating and physical activity. To help lose weight, most of the people in the study who made lifestyle changes chose walking briskly for 30 minutes, 5 days a week.

There are lots of things you can do at home and at work to get more physical activity throughout the day. You don't have to play a sport or go to a gym to be more active, unless that's what you like to do. You can walk or try swimming, water aerobics, biking, dancing, or any activity that keeps you moving toward the goal of 30 minutes of moderate-intensity physical activity five days a week. Before you start a physical activity program, be sure to talk with your health care provider.

Use these tips to get started, keep you moving, and make your physical activity time more fun.

Dress to move.

Dress to move. Wear supportive shoes with thick, flexible soles that will cushion your feet and absorb shock.

Wear supportive shoes with thick, flexible soles that will cushion your feet and absorb shock. Your clothes should allow you to move, and keep you dry and comfortable. Look for synthetic fabrics that absorb sweat and remove it from your skin.

Start off slowly.

Start off by taking a 5-minute walk (or doing another physical activity that you like) on most days of the week. Slowly, add more time until you reach at least 30 minutes of moderate-intensity physical activity five days a week.

Build physical activity into your day.

Start or end your day by taking your dog—or a friend's dog—for a brisk walk. When shopping, park a little further away from the store's entrance. If it's safe, get off the bus a stop or two before your work place and walk the rest of the way. While watching TV, walk or dance around the room, march in place, or do some sit-ups and leg lifts. Double bonus: cut out a TV show and get moving instead!

Start off by taking a 5-minnute walk (or doing another physical activity that you like) on most days of the week.

Move more at work.

Try to get a "movement break" during the day. Take a walk during lunchtime. Deliver a message in person to a coworker instead of sending an email. Walk around your office while talking on the telephone. Take the stairs instead of the elevator to your office.

Count your steps.

You may be surprised to learn how much walking you already do every day. Try using a pedometer to keep track of every step in your Game Plan Food and Activity Tracker. A pedometer is a gadget that counts the number of steps you take. The number of steps in one mile depends on the length of your stride, but one mile equals roughly 2,000 steps. Each week, try to increase the number of steps you take by 1,000 (about 250 steps per day), aiming for a goal of 10,000 steps per day. If you decide to count steps as a part of your GAME PLAN, use this information to help you meet your 30 minutes of physical activity per day. Also, be sure to read the instructions for your pedometer.

When you involve others in your activities, you are more likely to stick to your program.

Stretch it out.

Avoid stiff or sore muscles or joints by stretching after doing physical activity. Try not to bounce when you stretch. Perform slow movements and stretch only as far as you feel comfortable.

Make it social.

Try to schedule walking "dates" with friends or family members throughout the week. For family fun, play soccer, basketball, or tag with your children. Take a class at a local gym or recreation center. Organize a walking group with your neighbors or at work. When you involve others in your activities, you are more likely to stick to your program.

Getting more physical activity doesn't have to be boring.

Have fun.

Getting more physical activity doesn't have to be boring. Turn up the music and boogey while cleaning the house. Go dancing with friends and family members. Play sports with your kids. Try swimming, biking, hiking, jogging, or any activity that you enjoy and gets you moving. Vary your physical activities so you won't get bored.

Keep at it.

Pay attention to small successes. The longer you keep at it, the better you'll feel. Making changes is never easy, but getting more physical activity is one small step toward a big reward—a healthier life.

Making changes is never easy, but getting more physical activity is one small step toward a big reward—a healthier life.

Additional Resources

American Association of Diabetes Educators
1-800-TEAM-UP4 or www.diabeteseducator.org

American Diabetes Association
1-800-DIABETES or www.diabetes.org

American Dietetic Association
1-800-877-1600 or www.eatright.org

Centers for Disease Control and Prevention
1-877-232-3422 or www.cdc.gov/diabetes

United States Department of Agriculture (USDA)
www.nutrition.gov

Healthier US Initiative
www.healthfinder.gov

National Institute of Diabetes and Digestive and Kidney Diseases
National Diabetes Information Clearinghouse
1-800-860-8747 or www.niddk.nih.gov

Weight-Control Information Network
win.niddk.nih.gov/

National Heart, Lung, and Blood Institute
301-592-8573 or www.nhlbi.nih.gov

For on-line fat and calorie counters, visit these web sites:

National Heart, Lung, and Blood Institute
hp2010.nhlbihin.net/menuplanner/menu.cgi

United States Department of Agriculture
Nutrient Data Laboratory
www.nal.usda.gov/fnic/foodcomp/search/

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Appendix O

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