

**Understanding Nutrition Behaviours of Women
with Gestational Diabetes**

By

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Abstract

Gestational Diabetes (GDM) is considered a high-risk pregnancy. Nutrition management plays a critical role in GDM management. How women with GDM make food choice decisions and how they follow dietary advice have not been fully investigated especially how stress and anxiety during a GDM pregnancy influence dietary management. This study used a mixed methods approach. Qualitative and quantitative data were collected concurrently and analysed together to answer research questions on factors that affected women with GDM at 26-38 gestational weeks in making food choice decisions, the stress and anxiety that they experienced, and the barriers that they encountered when following dietary advice. The results showed:

1. Despite of the dietary recommendations from the healthcare professionals, food choice decisions were still strongly influenced by individual factors such as personal food preference, cravings, and hunger. Women sought information from different sources to adapt to the dietary changes, especially when the health services information provided was too general, and when some of the dietary advice conflicted with their eating habits. Difficulties in dealing with cravings, food portion size, hunger, and eating out led to a sense of decreased control and to stress and frustration.

2. The GDM diagnosis triggered stress in some women. Women who were on insulin were more likely to experience dietary management related stress

compared to the ones on diet treatment only. Anxiety was explained as the fear of the macrosomia and labor complications. These kinds of fear could be aggravated by abnormal blood glucose readings and hence triggered some emotional breakdown and coping actions.

3. Underlying beliefs such as behavioural, normative, and self-efficacy beliefs can produce barriers to following dietary advice. Other factors such as environmental constraints and lack of knowledge added more challenges to following dietary advice. Quick adaptation to dietary management in a short time period was not easy for women with first time diagnosed GDM and created emotional distress, often leading to unhealthy dietary coping strategies.

The above results concluded that women with first time diagnosed GDM faced challenges of quick adaptation of dietary behavioral changes in a limited time frame. These challenges were rooted in the expected health behavior changes that are often in conflict with the individual's behavioral, normative, and self-efficacy beliefs. Stress and anxiety generated in the process of GDM management sometimes led to altered dietary behaviors to cope with blood glucose control.

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Finally to my parents: I did it!

Abbreviations

ADA	American Diabetes Association, American Dietetic Association
BMI	Body Mass Index
CDA	Canadian Diabetes Association
DC	Dietitians of Canada
DM2	Diabetes Mellitus, type 2
DRI	Dietary Reference Intakes
FCM	Food Choice Map
GDM	Gestational Diabetes Mellitus
HAPO	The Hyperglycemia and Adverse Pregnancy Outcome study
LGA	Large for Gestational Age
OGTT	Oral Glucose Tolerance Test
PCOS	Polycystic Ovary Syndrome
1 hrPG	One-Hour Plasma Glucose
PG	Plasma Glucose
PAS	Pregnancy Anxiety Scale
PSS	Perceived Stress Scale
SES	Socioeconomic Status
STAI – T	State Trait Anxiety Inventory - Trait

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Chapter 1

Introduction

Background

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance with onset or first recognition during pregnancy [1]. The prevalence of GDM in Canada varies from a range of 3.5-3.8% in the non-Aboriginal population to a range of 8-18% in Aboriginal populations [2, 3].

GDM is considered a high-risk pregnancy. Untreated GDM leads to complications such as macrosomia, neonatal hypoglycemia, neonatal hypocalcemia, hyperbilirubinemia and respiratory distress syndrome [4-6]. Treatment of GDM must begin immediately after the diagnosis. Risk reduction requires extensive behavioural and self-care modifications, which can include strict dietary regulations, frequent blood glucose monitoring, insulin injections, and increased visits to healthcare providers for maternal and fetal surveillance.

It is recommended that woman with a diagnosis of GDM be referred to a registered dietitian for individual nutrition management [7]. Nutrition management plays a critical role in GDM management. However, the balance between keeping an optimum blood glucose level and maintaining control of dietary management is not easy to achieve for women with GDM [8]. Previous studies also reported that stress and anxiety during pregnancy could lead to adverse birth outcomes [9, 10]. Quality of life was affected when

women with GDM struggled with dietary self-management as they sensed a decreased control.

How a woman with GDM makes her food choice decisions and how she follows dietary advice in real life have not been fully investigated. Little is known about the stress and anxiety during a GDM pregnancy and how stress and anxiety influence dietary management. The understanding of the ways women with GDM make food choice decisions, as well as the stressors that they encounter and how they cope when following dietary advice is important for strengthening educational activities and achieving increased rates of compliance with diet management.

Purpose and design of the study

This study was intended to provide a better understanding of food choice behaviours of women with GDM and the barriers when following nutrition recommendations. This study used a mixed methods approach. Qualitative and quantitative data were collected concurrently and analysed together to answer research questions. The advantage of the mixed methods approach is that two methodologies are brought together to generate richer data and deeper understanding of the study subjects behaviour. In this study, the quantitative data on stress and anxiety provided quantitative descriptions of stress and anxiety in a way that descriptions could complement the study results published by others. The qualitative data in this study was a description of the perceptions of women with GDM about food and the influences on food choice. The perceptions were described

in the context of life experienced by each woman with the intent to understand her GDM experience in a real life context.

The qualitative and quantitative data descriptions were analyzed and interpreted using different analytical procedures. Comparing and contrasting the descriptions that referred to specific research questions achieved the integration of these two types of data.

This study was designed to answer the following questions:

1. What are the factors affecting food choice decision making in women with GDM?
2. What is the self-reported stress and anxiety status of women with GDM?
3. What are the barriers that prevent women with GDM to follow dietary advice?
4. Is the reported stress an important factor in dietary management?

Organization of the thesis

The results of this study have been presented as three papers in a publishable format. The titles of the three papers are:

- 1) Food choice decision making in women with gestational diabetes
- 2) Stress and anxiety in women with gestational diabetes during dietary management

- 3) Barriers and coping strategies of women with gestational diabetes to follow dietary advice

Also included in this thesis are an introduction, a literature review, a methodology, a discussion, and a summary. The results of this study may enhance our understanding about the behaviours of women with GDM, which may lead to more client-centred education or education tools.

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Chapter 2

Literature Review

Historical perspective of gestational diabetes (GDM)

It has been almost 200 years since the first GDM case was documented. This case report was from a PhD thesis of a German medical doctor. The case described a 22-year-old German pregnant woman who during her fifth pregnancy started to show diabetic symptoms in the third trimester. Her self-treatment for thirst was drinking large amounts of Berlin beer or spring water. Medical treatment at the time included a high protein diet and bloodletting of 360 ml of venous blood. At 36 weeks of gestation, a twelve- pound stillbirth baby was delivered. Postpartum treatment still included diet and bloodletting. The diabetic symptoms went away and the patient was discharged [1].

In the last century, researchers recognized that diabetes symptoms during pregnancy were related to high neonatal mortality rates and adverse fetal outcomes. The term “prediabetes” was used to describe the condition in which pregnant woman develop diabetes symptoms during pregnancy [2]. These women tended to deliver large babies and develop diabetes later in life. These prediabetic women had a 20% to 67% fetal mortality rate. The live births of these women had a 20% higher large-for-gestation rate compared to women who did not have “prediabetes” [3-5].

At the First International Workshop-Conference on Gestational Diabetes in 1979, GDM was defined by the expert committee as “any degree of glucose intolerance with onset or first recognition during pregnancy” [6]. The risk of developing diabetes after delivery caused by this pregnancy glucose intolerance was recognized. At the same conference, the Oral Glucose Tolerance Test (OGTT) was suggested as diagnosis criteria.

Definition and prevalence of GDM

The Canadian definition of GDM is in accordance with the international definition, which was launched during the ‘Fourth International Workshop-Conference on Gestational Diabetes’ in 1998. GDM is defined as hyperglycemia with onset or first recognition during pregnancy [7].

The prevalence of GDM depends on the population being assessed and the screening criteria. International studies reported the prevalence of GDM is 15.5%. Native North American, Baraini and Asian women are high risk populations for GDM [8]. In Canada, the prevalence of GDM is around 3.7% in the non-Aboriginal population and 8-18% in the Aboriginal populations [7]. In Manitoba, the prevalence of GDM increased from 2.3% in 1985-1989 to 3.7% in 1999-2004. First Nations women had a three times higher prevalence than the non-First Nations women. The GDM recurrent rate was 44.4% in Manitoba from 1985 to 2004 [9].

Risk factors of GDM

The risk factors for developing GDM include 1) age over 35 years; 2) previous history of macrosomia; 3) high risk ethnic group; 4) high pre-pregnancy Body Mass Index (BMI); 5) family history of diabetes; 6) polycystic ovary syndrome (PCOS), and 7) acanthosis nigricans [7]. These risk factors are often used to identify high risk women for GDM screening. Life intervention programs have been suggested by the Institute of Medicine to control the modifiable factor pre-pregnancy BMI, to reduce the risk of GDM [10].

Screening for GDM

Diagnosis of GDM is important for appropriate treatment. A recent large study on the impact of hyperglycemia on pregnancy outcomes, the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study, confirmed that elevated glucose during pregnancy is associated with increased risk of maternal or fetal complications compared to overt diabetes [11]. The OGTT was suggested as the screening tool for GDM diagnosis. The HAPO study reported that GDM was associated with fetal hyperinsulimia, macrosomia, increased caesarian delivery and increased neonatal hypoglycemia rates. In March 2010, the International Association of Diabetes and Pregnancy Study Group (IADPSG) published recommendations on the diagnosis and classification of hyperglycemia in pregnancy [12]. The IADPSG recommendations along with the HAPO study provided the impetus to revising the Canadian guidelines.

Although screening for GDM is important, the literature remains divided on whether every pregnant woman should be screened or only the high risk groups need the screening. Some studies suggested only the high risk groups need to be screened to avoid the unnecessary stress and anxiety to pregnant women caused by the screening [13-15]. Others argued that the screening was an effective method to prevent undiagnosed and untreated GDM [16, 17] and there was no significantly increased psychological distress between the women with GDM after screening and the normal pregnant women at the same gestational stage [18].

The 2013 Canadian Diabetes Association (CDA) Clinical Practice Guidelines recommended that all pregnant women should be screened at 24-28 weeks of gestation. It also suggested that women with high risk factors for GDM could be screened at any stage of the pregnancy, as well as 24-28 gestational weeks if not diagnosed earlier [19].

The 2013 CDA Clinical Practice Guidelines recommended two screening options. The preferred method is the two-step method with a 50 gram glucose load given at any time of the day followed by a 75 gram OGTT if required. The one hour plasma glucose (1 hrPG) measurement is used for diagnosis. GDM is confirmed if the 1hrPG is equal or greater than 11.1 mmol/L with the 50 gram glucose load. If the 1 hrPG is between 7.8-11.0 mmol/L, a 75 gram OGTT will be prescribed. A GDM diagnosis is made if two of the following values are confirmed: 1) fasting plasma glucose is equal or greater than 5.3 mmol/L; 2) 1 hrPG equal or greater than 10.6 mmol/L; 3) 2 hrPG equal or greater than 9.0 mmol/L. The other screening method is to use a fasting 75 gram OGTT alone. A

diagnosis of GDM is made if one of the following values is confirmed: 1) fasting blood glucose is equal or greater than 5.1 mmol/L; 2) 1 hrPG equal or greater than 10.0 mmol/L; 3) 2 hrPG equal or greater 8.5 mmol/L.

Complications associated with GDM

Maternal

Several maternal complications are associated with GDM. Short-term complications such as hypertension, preeclampsia, pre-term delivery, and caesarean section rates are higher in GDM pregnancy [20-22]. Long term complications include development of type 2 diabetes (DM2) and increased risk of GDM in the following pregnancy. A meta-synthesis study revealed that women with GDM have a seven fold increased risk for developing DM2 after delivery compared to women with a normal pregnancy [23].

Fetal

Macrosomia and infant shoulder dystocia are common complications of abnormal maternal glucose control [20, 24, 25]. Neonatal hypoglycemia is a complication that requires intensive care and monitoring in the neonatal intensive care units [20, 26]. Pre-term delivery has been reported to be associated with GDM as well [24, 25]. Studies have reported that the offspring of women with GDM could have increased health risks such as childhood obesity and DM2 [21, 27]. Children who were born as Large for Gestational

Age (LGA) infants have a higher chance of developing metabolic syndrome later on in life [28].

Treatment and management of GDM

The 2013 CDA Clinical Practice Guidelines recommend the glycemic targets in a GDM pregnancy listed in Table 2.1. It was recommended that women diagnosed with GDM be referred to a registered dietitian for lifestyle intervention.

Table 2.1: Recommended glycemic targets during gestational diabetes pregnancy

Time	Plasma Glucose (mmol/L)
Fasting	< 5.3 mmol/L
1-Hour Postprandial	< 7.8 mmol/L
2-Hour Postprandial	< 6.7 mmol/L

(Source: 2013 CDA Clinical Practice Guidelines, p178)

Nutrition therapy

Nutrition therapy plays an important role in GDM management. Both the CDA and American Dietetic Association (ADA) guidelines proposed that the nutrition therapy goals should be: 1) to achieve and maintain normoglycemia; 2) to ensure adequate

nutrition intake for maternal and fetal growth; 3) to consume the appropriate amount of energy to prevent ketosis and ensure appropriate gestational weight gain [29, 30].

In 2006, the Canadian Diabetes Association (CDA), Dietitians of Canada (DC), Diabète Québec (DQ), and the Ordre professionnel des diététistes du Québec (OPDQ) developed nutrition practice guidelines for GDM management [30]. These recommendations were based on a systematic literature review of the human studies published in English from 1995 to 2005 with a topic of GDM nutrition management. It is recommended that the weight gain and nutrition intake of women with GDM should consider the pre-pregnancy BMI, which is consistent with the gestational weight gain recommendations from the Institute of Medicine [31]. Total carbohydrate intake could be restricted to 40-45% of total calorie intake and distributed into three meals and two to three snacks. Fat could consist up to 40% of the total calorie intake (Table 2.2).

Although it is recommended that the weight gain and energy intake should consider pre-pregnancy BMI, there are no clear guidelines on the appropriate weight gain and calorie intake for overweight or obese women with GDM. There is also a lack of recommendations on calorie intake to achieve appropriate gestational weight gain for overweight or obese pregnant women with normal pregnancies. In practice, detailed nutrition recommendations for women with GDM vary with practice and are inconsistent [30].

Table 2.2: Recommendations for Nutrition Best Practices for Women with GDM

1	Nutrition counseling by a registered dietitian is recommended.
2	Recommendations on total weight gain and energy intake should take pre-pregnancy BMI into consideration. Energy intake for overweight or obese women may be restricted. Ketones should be monitored and ketosis be avoided.
3	The amount of carbohydrate should be individualized based on individual clinical measurements. General recommendation is 40-45% total energy comes from low glycemic index foods.
4	General recommendation of carbohydrate distributed into 3 meals and 2-4 snacks and should be individualized based on clinical parameters.
5	Artificial sweeteners except saccharin and cyclamates could be consumed in moderation.
6	Forty percent of the total energy could come from dietary fat with preference on healthier source of fat.
7	Requirements for vitamin and mineral supplementation are similar to pregnant women without GDM.
8	Physical activity should be encouraged and individualized to reflect obstetric risks and individual preference.
9	CDA guidelines and professional judgment are recommended in the provision of individualized care.

(Adapted from Anderson et al., 2006)

For overweight and obese women with GDM, the common practice is to minimize gestational weight gain and provide minimal energy from carbohydrates. While there is no clear evidence to support this rationale, hypocaloric diets are not recommended due to the result of ketosis, which has been reported to affect fetal cognitive development [32, 33]. The ADA position statement suggests monitoring gestational weight gain,

performing weekly ketone testing, and keeping food records to determine individual energy requirement to prevent under-or over-eating and restricting carbohydrate intake [34]. The Dietary Reference Intakes (DRI) published by the Institute of Medicine recommended a minimum of a 175 grams of carbohydrates per day during pregnancy [35], could help with meal planning. The 2013 CDA Clinical Practice Guidelines also suggest that carbohydrates need to be distributed through small to moderate sized meals. Breakfast carbohydrate amounts could be less due to more insulin resistance in the morning. An evening snack might be necessary to prevent overnight ketosis [19].

Physical Activity

Physical activity plays an important role in diabetes management and is considered beneficial during pregnancy [19, 36]. Pregnant women with no obstetric complications are encouraged to do mild to moderate exercise during pregnancy. Regular exercise during pregnancy may prevent gestational glucose intolerance and prevent pregnancy-induced hypertension. For pregnant women with no pregnancy complications, the best time to start exercise is during the second trimester. Aerobic exercise should be increased gradually and range from 15 to 30 minutes per session, three to four times per week [36]. International recommendations from the Fifth International Conference of Gestational Diabetes suggested 30 minutes of daily physical activity for all pregnant women with no medical contradictions to exercise. Exercise such as walking and arm exercise were suggested [37]. The position statement from the DC suggests that total weight gain and energy intake should consider pre-pregnancy BMI. Therefore, energy intake for

overweight or obese women may be restricted for better gestational weight control.

Physical activity should be included in this management but needs to be individualized according to obstetric condition, exercise tolerance, and personal preference [30].

Several randomized control trials on normal pregnant women reported that routine exercise during pregnancy combined with daily intake of 1,700 - 2,000 kcal could reduce excessive gestational weight gain in a normal pregnancy [38-40]. One study on women with GDM suggested added exercise combined with controlled energy and carbohydrate intake could lower blood glucose [41].

Self-monitoring of blood glucose level

Self-monitoring of blood glucose has been used as a tool to assess diet therapy and physical activity level. One study reported that self-monitoring blood glucose did not cause adverse effects on women's feeling about GDM management [42]. The 2013 CDA Clinical Practice Guidelines suggest that women with GDM should test both pre-prandial and postprandial blood glucose. If insulin is used as part of the treatment, testing at night could be useful to prevent nocturnal hypoglycemia. Monitoring of urine and/or blood is suggested if diet is inadequate [19].

Pharmacological interventions

Insulin

Insulin therapy is the only approved medical treatment method for GDM. When diet and exercise interventions fail to achieve blood glucose control after two weeks, insulin therapy is initiated.

Multiple injections (before meals and at bedtime) have been considered the most effective regimen to control blood glucose. Dietary education on carbohydrate content of foods and how to adjust insulin to fit with meals needs detailed education, hence to prevent hyperglycemia or hypoglycemia. In clinical practice, some women with GDM may refuse insulin treatment. The possibility of using oral agents or at least add oral agents to insulin to improve glycemic control has been proposed and one research study is ongoing in this field [43].

Oral agents

Although insulin was the recommended treatment for hyperglycemia during pregnancy, glyburide and metformin have been used during pregnancy in different practices. The 2013 CDA Clinical Practice Guidelines discussed these oral agents in GDM treatment [19]. Metformin has been shown to decrease the risk of neonatal hypoglycemia but it may also increase the rate of preterm delivery [44]. Glyburide has shown to have effects on lowering glucose levels and it does not cross the placenta as metformin does, but it has

been reported to be associated with adverse perinatal outcomes [45, 46]. Women who rejected insulin use might consider glyburide use. However, the use of these oral agents is not currently recommended as treatment options by Health Canada [19].

Dietary education compliance

Dietary education plays an important role in GDM management. However, education strategies developed for GDM management are not well defined. A client-centered approach for nutrition counselling is recommended in Canadian dietetic practice. However, issues remained as during limited clinic consultation time, dietitians struggle between their pre-determinate health information and what the clients wants [47]. From the author's clinical practice observations, healthcare professionals quite often assume that the patient will evaluate the seriousness of the high risk pregnancy the same as the educators. Therefore, it is quite often that the educators assume that the education plan will be carried out by the patient with maximum cooperation and compliance.

However, the definition of high-risk pregnancy could have different meanings or trigger different reactions for pregnant women and to their healthcare providers. These differences could lead to tension and/or conflicts between these two parties [48, 49]. Researchers have reported that an at-risk pregnancy often made women feel stressed, powerless, vulnerable and uncertain [50-53]. A Canadian qualitative study done by Evans and O'Brien interviewed twelve women in a GDM pregnancy and discussed their

perception of “at-risk pregnancy”. One of the major themes was these women struggled to balance between following the advised behavior change and maintaining their personal self-control in life. Although with being more familiar with their condition as the pregnancy progressed and having more knowledge and practice, there were still many women who reported cheating on their diet and intentionally skipped blood glucose testing at the same time [54].

A recent study on the perception of quality of life in Italian and immigrant women with current GDM was conducted in Italy. One hundred and ninety-eight questionnaires with 51 items focused on GDM diagnosis, dietary compliance, home blood glucose monitoring experience, family support, and relationships with the doctors were collected from women with GDM during pregnancy. The findings showed that dietary compliance was a major concern, especially for immigrants to adapt to unfamiliar foods [55].

Another study in 1994 interviewed 17 women with GDM in the United States and reported that these women felt that the change of dietary behaviors was a stressor [56]. The evidence suggested that women encountered challenges when following dietary advice from healthcare professionals. It is important to understand from these women's perspective what it is like being told to change long existing eating behaviors.

Determinants of food choice have been investigated intensively in the past years. Raine (2005) summarized the determinants of healthy eating in Canadians into personal determinants, collective determinants [57]. Physiological influences, food preferences, nutrition knowledge, and psychological factors affect food choice decision at the

individual level. Interpersonal influences, physical environment, economic environment, and social environment are considered as collective determinants. Fowles (2008) reported that the determinants of eating during pregnancy were similar to the determinants of healthy eating in Raine's review [58]. Fowles added a few more factors such as stress and depression might lead to binge eating and knowledge and perceptions of healthy eating and weight gain in pregnancy. Nicklas (2011) conducted a study to identify barriers to healthy lifestyle changes postpartum of a GDM pregnancy. The study reported that the barriers were related to the collective determinants of healthy eating [59].

GDM is a high risk pregnancy. Women were prescribed a therapeutic diet and were expected to use her resources to follow the diet to lower the health risk within limited time. What are the factors that affect food choice under this condition has not been explored in the literature. The FCM can explore reasons of eating that are important to the individual herself. Factors at the collective level are very likely to affect individual decisions but may not be recognized by the individual and reflected in her perception. However, reasons like food budgeting and access will be captured if the woman using these factors as reasons for food choices. At the end, the reasons for choice that collected from the FCM interviews are the factors that are very important to the woman in her perception. This study was intended to capture these important individual perceptions.

Although there is no specific study that has investigated food decision making in women with GDM, food habits have been reported to be related to glycemic control among people with DM2 [60]. Previous eating habits, knowledge of dietary management, social

support, time management, and self-efficacy were reported to be influencing factors related to dietary behavior change in people with DM2 [61].

Personal food preference

Personal food preference is a common factor that influences people's food choice behaviour. Food pleasure is an important factor for people to select food [62]. In pregnancy, this type of personal preference is often expressed as "craving for certain food". Restricting a personal favourite food as part of dietary management could cause frustration in DM2 diabetes patients [63]. It is logical to expect that a strong personal preference, which conflicts with dietary advice, could create challenges to dietary change for women with GDM.

Social support

Women with supportive relationships can benefit from help with the housework, caring and understanding from the partner. It has been reported that the baby's father plays an important role in support in a GDM pregnancy [54]. Supports could also relieve pregnancy stress and improve the psychological well-being of pregnant women. Social support has been identified as a mediating variable for DM2 to apply knowledge to their daily food behaviour [61]. Therefore, it is logical to expect social support can be an important factor that affects GDM patient's nutrition management.

Self-efficacy

Self-efficacy is the confidence an individual has in achieving personal goals, which can be recognized as someone who has that “I can” attitude. Self-efficacy reflects an individual’s belief about their ability to perform behaviors under particular circumstances [64]. Self-efficacy is reported to be associated with the frequency of blood sugar monitoring, taking medicines and control of binge eating in DM2 patients [65]. A recent review paper addressed and advocated for the importance of improving self-efficacy in GDM self-management to achieve medical adherence [66].

Stress and anxiety in women with GDM

Although pregnancy can be a wonderful life experience for many women, a variety of biomedical (e.g., medical high risk conditions), psychological (e.g., an unwanted pregnancy), and social factors (e.g., lack of support from the baby’s father or family) may also make it a time of stress [67].

According to the cognitive theory of psychological stress and coping, stress is perceived when a person has appraised that the threat has exceeded his or her resources and could endanger wellbeing [68]. Cognitive appraisal can be affected by mastery or optimism,

and the attitudes toward the event. Coping can be affected by social support and resources.

Perceived control, optimism and self-esteem have been shown to improve adaptation to stress events in non-pregnant women [69]. Perceived control was also shown as a predictor for prenatal anxiety [70]. Major et al (1998) suggested that perceived control acts as a positive filter, which influences how stressful events are appraised and related [71].

The Diagnostic and Statistical Manual of Mental Disorders defines anxiety as “apprehensive anticipation of future danger or misfortune accompanied by a feeling of dysphonia or somatic symptoms of tension” [72]. It refers to a future-oriented state thus the apprehension is over a potential danger in the future. Worry is considered as a cognitive manifestation of anxiety that helps a person to avoid certain danger [73]. State-anxiety is defined as emotional responses to stressors at a perceived period [74]. Spielberger, the author of the State-Trait Anxiety Inventory, suggests that “anxiety states are characterized by subjective feelings of tension, apprehension, nervousness, and worry, and by activation or arousal of the autonomic nervous system” [75]. Trait Anxiety was defined by Spielberger as a relatively consistent, stable individual’s difference to state anxiety response. People with higher trait anxiety could be more sensitive to anxiety triggers or could experience more intense state anxiety compared to people with low trait anxiety.

Stress and anxiety have been reported as risk factors for adverse birth events [76, 77]. The adverse outcomes include pre-term delivery (birth before 37 gestational weeks) and low birth weight (birth weight \leq 2,500 g). Wadhwa et al (1993) measured the life event stress, daily hassles, chronic stress, strain, and pregnancy-related anxiety of 90 pregnant women at 28 and 30 gestational weeks using five instruments including Pregnancy Related Anxiety Questionnaire. The findings suggest that an increase in prenatal life event stress was associated with a decrease of birth weight. An increase in pregnancy related anxiety was associated with a shorter gestational age of the infant [76]. Glynn et al (2008) assessed prenatal stress and anxiety using the Perceived Stress Scale and the Pregnancy Related Anxiety questionnaire on 415 pregnant women at 18-28 and 30-32 weeks gestation. She reported that it was the level of increase in stress and anxiety that was associated with preterm birth, rather than associated with exact stress and anxiety levels [77]. The literature finds no relationship between pregnancy trait anxiety and adverse birth outcomes [78].

Socioeconomic factors such as age, education, income, and ethnicity also play major roles in the experience of stress, as is increasingly clear in recent research [79]. Pregnant women with low socioeconomic status (SES) could encounter more stressors and have relatively higher stress compared to pregnant women with higher SES [80]. Pregnant women with low SES tended to have less resources and supports to buffer stress [81]. Gurung et al (2005) conducted 453 structured interviews on pregnant women in the United States to investigate factors that affect prenatal anxiety. He concluded that: mastery, attitudes towards pregnancy, life events, social support and demographics were

the contributing factors to prenatal anxiety. Low SES, higher number of life events, and unwanted pregnancy tended to result in a higher anxiety level [70].

Stress and anxiety in GDM dietary management

Stress has been considered as a factor that triggers emotional eating in many studies [82, 83]. However, there were no specific studies on stress and anxiety in relation to GDM dietary management. It is logical to assume that dramatic behavior modifications in a complicated pregnancy could increase the stress and anxiety level of women with GDM. Although pregnant women might be more motivated to healthier behavior changes compared to their non-pregnant stage, it is not known just what kind of stress and anxiety that women with GDM have to live with, and how these affect their dietary changes.

In addition, different people have different thresholds for stress and anxiety, and have different reactions to different stressors. The GDM diagnosis and self-management education could motivate changes in some women, but could be stressful and desperate for others and hinder following advice from health professionals.

Gaps in GDM self-management research

Nutrition plays a critical role in GDM management. It is recommended that women with a diagnosis of GDM be referred to a registered dietitian for individual nutrition

management [19]. However, the balance between keeping an optimum blood glucose level and providing adequate nutrition for the mother and fetus is not easy to achieve.

There are a few qualitative studies in the literature on women's perceptions of managing diabetes during pregnancy. The subjects for these studies included women with current GDM, GDM postpartum, and a pregnancy with type 1 or type 2 diabetes. These studies reported that women with a diabetes pregnancy experienced a sense of decreased control and negative feelings toward the high risk pregnancy [54, 56, 84, 85]. Diet management is an area that women felt vulnerable and lacked control [54, 85]. They demanded more health service information [86, 87] and the failure of compliance led to increased stress and anxiety throughout pregnancy [56].

There is still a lack of understandings on: 1) what affects food choice decision making in women with first time diagnosed GDM; 2) what specific dietary events lead to the sense of decreased control; 3) what specific barriers are related to dietary management; 4) what beliefs and factors lead to these barriers; and 5) how emotional distress affects these women in following dietary advice.

This thesis research aimed to address the foregoing lack of understanding with the proposed four research questions. Therefore, dietary consultation could go beyond reinforcing general diet restrictions to become more client-oriented and effective, and may increase compliance with diet management.

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Chapter 3

Theoretical Approach, Design and Methodology

The aim of this thesis was to provide better understanding of the nutrition behaviors of women with gestational diabetes (GDM). Within this aim, research questions were focused on: 1) what affected the food decision making of women with GDM regardless of whether they used the healthcare information or not; 2) when they were presented with dietary behavior change recommendations, what kind of barriers might they encounter that hinder their dietary behavioral change; 3) if there was any stress and anxiety that occurred during this behavioral change process; and 4) how did it affect following dietary advice. The answers to the above research questions could provide a detailed picture on how women with GDM process and use the healthcare information they received and the challenge and emotional distress that they encountered in a dietary behavioral change process.

Theoretical approach

To understand the factors that affected food decision making and the stress and anxiety experiences of women with GDM, the qualitative descriptive study method was used to explore the factors affecting food choice decisions in women with GDM and their emotional experiences related to dietary management. A qualitative descriptive study method is one of the qualitative research methods that allows researchers to describe real

life phenomena strictly from the data. In qualitative descriptive studies, the researchers stay closer to the reported data to generate descriptions that answer the research questions [1].

To understand the barriers of following dietary advice, the Integrative Model of Behavioral Prediction [2] was used to explain the barriers of women with GDM for following dietary advice. Health behavior theories can provide explanations for determinants that lead to health behavioral changes and provide frameworks for conceptualizing, measuring, and identifying factors that affect a behavior change. The Integrative Model of Behavioral Prediction was developed from integrating determinants from three popular behavioral models: Theory of Reasoned Action, Social Learning Theory, and the Health Belief Model.

Theory of Reasoned Action

The Theory of Reasoned Action was developed by Fishbein and Ajzen in 1975. The theory identifies and defines key variables that affect a person's intention to act. It also identifies the sequence of variables, and their relationships that predict the behavioral intention. The assumptions of this theory are: 1) Human beings are rational and make systematic use of information available to them; 2) People consider the implication of their actions before they decide to engage or not engage in certain behaviours [3].

The theory can be used to explain virtually any behaviour over which an individual has volitional control [4, 5]. The theory assumes that behavioral intention is the immediate

determinant of behavior and that all other factors that influence behavior are mediated through intention. Behavioral intention is an indication of how hard people are willing to perform a behavior. It is influenced by three components: a person's attitude toward performing the behavior; the perceived social pressure, also called subjective norm; and perceived behavioral control.

Attitude is a determinant of behavioral intention. It is an individual's positive or negative belief about performing a specific behavior. Attitudes are determined by the individual's beliefs about the consequences of performing the behavior (behavioral beliefs), weighted by his or her evaluation of those consequences (outcome evaluations).

A subjective norm refers specifically to the individual's perceptions on how important others think of the behavior change. Subjective norm may or may not reflect what the important others actually think the person should do. Beliefs that underlie subjective norms are termed normative beliefs, which are beliefs about the social expectations for behavior, also called social norms.

The Theory of Reasoned Action predicts behavior under the condition of volitional control. However, coping with a medical condition through behavior changes does not always give the patient complete volitional control of the situation. Ajzen and colleagues added the "perceived behavior control" to the Theory of Reasoned Action as another determinant to the behavior intention [5-7]. Internal and external control are indicative of an individual's dependence or independence on environment and important others.

Therefore, a person exhibiting an internal control believes one has the ability and control over a given situation or event to command the desired outcome. However, a person with an external control believes the outcomes are controlled by an external power such as fate, luck, or gods. The extended theory is called Theory of Planned Behavior.

Social Cognitive Theory

Social Cognitive Theory uses the concept of observational learning to indicate that environment provides models of behavior so that a person may learn from others not only by receiving reinforcement from them but also from observing them. This theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences. A change in one aspect will imply changes in other aspects [8].

There are two primary factors that determine if a behavior change is likely to happen or not: 1) the person needs to believe that the changes will provide more benefits (positive outcomes) over costs (negative outcomes); 2) the person must sense the ability and confidence to perform the behavior successfully – self efficacy. This may determine the effort invested in a given task. Self-efficacy is similar to the concept of perceived internal control in the Theory of Planned Behavior.

Health Belief Model

The Health Belief Model was developed by Becker in the 1950's [9-11]. This model proposed that for someone to make a health behavior change, he or she has to first believe that there is a health risk if the behavior change does not happen. Secondly, the person has to value the benefits that come with the behavior change will outweigh the cost of performing such a change. Janz and Becker later added another two cognitions to the model: cues to action and health motivation. Cues to actions refers to internal (e.g. physical symptom) or external triggers (mass media campaign, advice from others) that perceived by the individual. Health motivation refers to the value of reduction of perceived threats [12].

An Integrative Model of Behavioral Prediction

Fishbein integrated the determinants of the above theories and model together and used the Theory of Reasoned Action approach to form the integrative model of behavioral prediction [2]. Compared to the Theory of Reasoned Action, this model includes skills and environmental constraints as moderators in the behavior prediction process. This model proposed that in order to predict a change or to reinforce a particular behavior in a particular population, a number of variables needed to be considered. A behavior change is likely to happen if the person has a strong intention for behavior change, has the necessary skills and ability to perform the changes, and there are no environmental constraints to prevent the behavior change to happen. This conceptual framework can

account for different health behaviors in different populations. The added skills and environmental constraints moderators fit into the reality of diabetes self-management. Therefore, this model was chosen to aid in the interpretation of the results on how women with GDM made dietary behavioral changes.

Determinants of behavior and intention

There are three determinants of the intention-behavior relationship: attitude, perceived norm, and self-efficacy. It is important to note that attitude, perceived norm, and self-efficacy are global perceptions that represent a variety of specific beliefs about the particular behavior. Attitude represents the beliefs on what outcome will come with the behavioral changes – behavioral beliefs and outcome evaluations. Perceived norm represents the beliefs from the individual's perception of how other people think the individual should or should not perform a behavior – normative beliefs, and the motivation to comply with the referents. Self-efficacy represents the beliefs that one can or cannot perform a certain task – efficacy beliefs.

For intention of a behavior to result in the behavior action, two factors must be present: the necessary skills to perform the behavior and the absence of environmental constraint.

Background Variables

The integrative model proposes that other variables could be associated with behavior other than intention [2]. For example, demographic characteristics, culture, exposure to media or to health messages, and personality traits could affect behavior. However, in the integrative model, these variables are assumed to occur prior to the belief items. The influences of these variables on behavior are considered indirect but are conceptualized as possible sources of the above beliefs. Therefore, these variables are considered as “background” variables. The integrative model suggests that at the individual level, the relationship between these background variables and outcome behavior is rather weak and inconsistent across behaviors and populations. However, adding these background variables to the model demonstrates the flexibility and adaptability of applying this model to different cultures and populations.

Application of the model

The integrative model helped in formulating the research interview guide. The Food Choice Map (FCM) semi-structured interview was used to collect reasons for food choice decisions (the FCM method is described later on in this chapter). The underlying beliefs that affected women in following dietary advice were explored during the interviews. Other factors such as knowledge and skills, and environmental constraints in following dietary advice were also explored during the interview. The constructs of the model were used to start the analysis on barriers for following dietary advice. These constructs did not limit other new construct to be identified and defined during the analysis.

Design

This study was designed to answer the following research questions from a purposive sample of 30 women diagnosed with GDM, who were selected from patients attending one clinic in Winnipeg during a ten- month period:

1. What are the factors affecting food choice decision making in women with GDM?
2. What is the self-reported stress and anxiety status of women with GDM?
3. What are the barriers that prevent women with GDM to follow dietary advice?
4. Is the reported stress an important factor in dietary management?

This study used an exploratory embedded mixed methods design to explore women's life experience of eating and coping with GDM. The assumption behind the mixed methods approach was that one type of data conceptualization could not answer all research questions. Two different types of concepts about data need to be brought together to increase understanding of the perceptions and constructs. The embedded design can collect both qualitative and quantitative data concurrently. One data type is primary and the other data type plays a supportive, secondary role [13]. The purpose of this combination is to answer different research questions within the study.

In this study, the qualitative approach was the primary method used to answer research questions 1, 3, and 4. Qualitative data were descriptive and explanatory. It is suited to the type of data needed to answer the above research questions in this thesis because it describes the effect of multiple determinants on food decision making and provides descriptions of the barriers, stress, and anxiety perceived by the participants.

The quantitative approach included using stress and anxiety questionnaires to describe the stress and anxiety levels of women with GDM to answer research question 2. These questionnaire data were used to aid explanation of the real life experiences related to stress and anxiety. Therefore, quantitative data were embedded within a qualitative methodology in this study (Figure 3.1).

Figure 3.1. Exploratory embedded mixed methods design (Creswell & Plano Clark, 2011)



(Used with permission)

Methodology

Population and Respondent Selection

The sample frame for this study was thirty women who have attended GDM education at the St. Boniface Hospital (SBH) Outpatient Endocrinology Clinic. The clinic receives GDM referrals from physicians in Winnipeg and in Manitoba. The participants were purposively recruited and met the following predefined selection criteria:

- ♦ Lived in Winnipeg or surrounding communities but worked and did grocery shopping in Winnipeg.
- ♦ Had not been previously diagnosed with GDM
- ♦ Attended at least one education session with a registered dietitian after diagnosis of GDM
- ♦ Were able to communicate in English and were not visually impaired (i.e. were able to complete the FCM interview)

The researcher contacted the Outpatient Endocrinology Clinic at St. Boniface Hospital (SBH) in Winnipeg to seek support for conducting the study. Upon the approval from the University of Manitoba Research Ethics Board (Appendix A) and the hospital research ethics review committee, the researcher posted a recruitment flyer in the clinic (Appendix B). Respondents who were interested in the study contacted the researcher to set up an appointment to complete the study consent form (Appendix C), a demographic questionnaire, and a research interview.

This study used a mixed methods design. The qualitative data sample size needed to meet data saturation was indicated by no longer having new information coming from the later interviews. This study planned to recruit 30 participants. If qualitative data saturation was not met, additional participants were to be recruited. The quantitative data were from questionnaires. Thirty participants would provide a reasonable sample size, although not the necessary statistical power, the quantitative data could integrate with the qualitative data and answer the research questions.

Recruitment took place from May 2011 to February 2012. A total of 30 women with GDM consented and were interviewed once in the third trimester (26-38 gestational weeks). The researcher and the participant met at the participant's home to conduct the consent, the questionnaires, and the interview. The participant signed the research consent, and then completed the Perceived Stress Scale (PSS) and the Pregnancy Anxiety Scale (PAS) before the interview. After the interview, the participant then completed the State Trait Anxiety Inventory - Trait (STAI-T) questionnaire and the demographic questionnaire. A Thank You card with a \$20 grocery gift card was given to each participant after the interview.

Data collection methods

Qualitative data collection --- Food Choice Map (FCM) interview

One of the most commonly used qualitative approaches is the in-depth interview. Individual narrative data obtained by this type of qualitative approach can capture the

complexity and diversity of the topic discussion in the participant's own words, which provides deeper understanding of the participant's personal perception of the topic [14].

Bryman suggested that the data produced from semi-structured interviews were the easiest to transform, and that semi-structured interviews are the most common qualitative methods combined with quantitative methods [15].

Because the research interest was on dietary management, a qualitative interview design that can record a normal eating pattern and reasons behind food choices was favored.

Such a tool allows the participants to comment on all the foods that she consumed in real life, without missing or neglecting certain foods cognitively. Results from this kind of data collection can capture the whole picture of food choice decision making in the participants. The FCM interview tool provided such an opportunity to obtain a complete weekly intake pattern and reasons behind food choices.

The FCM is a semi-structured in-depth interview technique that has been shown to collect accurate and reliable, and rich qualitative data compared to traditional in-depth interviews or 24-hour recalls when collecting information on eating behaviors [16-18]. It also collects reliable and accurate dietary intake information. When measuring the relationship between adult women's dietary intake and serum folate and vitamin B-12 level using FCM and 3-day food record, the validity coefficient for the FCM was higher than that for the 3-day food record for both folate (FCM 0.97, 3-day food record 0.79) and B-12 (FCM 0.95; 3-day food record 0.85) [19].

The FCM interview uses a large magnet board to record food items and frequencies for meals and snacks in a regular week. Food pictures on magnet stickers at the size of 1.3 cm² can be organized on the magnet board by the participant and/or the interviewer to represent the weekly eating pattern. Meals and snacks spacing are displayed vertically while frequencies of food consumption are displayed horizontally.

The FCM interview uses food to start the conversation and it helps the researcher to explore more meaning towards the eating behaviors, or experiences related to living with GDM. This approach is unique in the literature.

To start the interview, the participant was asked to consider a food they often eat and food picture stickers were placed on the food map board according to the usual time of day and the usual consumption frequency per week reported by the participant. Follow-up questions built a record of the meal or snacks. Participants were asked to create a visual map of food frequencies by arranging these food symbols appropriate to their personal lifestyle. The interview question guide (Appendix D) helped the interviewer to explore reasons and experiences related to food choice decision making in a GDM pregnancy.

The nature of the FCM differs from most existing dietary intake collection methods because the respondents are asked to recall their general food behaviors over a week, which yields meal times and meal composition with alternative and substitute foods, rather than recalling the specific foods eaten at every instance of eating in a set time

period. The result is a pattern of eating characterized by the frequencies of meal times and frequencies of foods by meals.

The interviews were recorded on a digital recorder with the participant's consent.

Quantitative data collection - Questionnaires

The research questions of this study included exploring the existence of stress and anxiety in GDM patients and how the stress and anxiety affected their eating behaviors. The quantitative questionnaires on pregnancy stress and anxiety provided variables on the degree of stress and anxiety. These variables were used to describe the stress and anxiety status of the group and aid in interpreting the findings in the qualitative data.

Pregnancy stress and anxiety were evaluated using the Perceived Stress Scale (Appendix E), the Pregnancy Anxiety Scale (Appendix F), and the State Trait Anxiety Inventory – Trait (Appendix G).

Perceived Stress Scale (PSS)

The Perceived Stress Scale is a widely used psychological instrument for measuring the perception of stress [20]. The questionnaire asks about feelings and thoughts during the last month. Because of its general nature and free of specific content, it has been adapted for pregnancy use [21, 22].

The PSS measures the degree of perceived stress of certain situations in one's life. It also included a few queries on current levels of experienced stress. The intent of the PPS is to capture the unpredictable, uncontrollable, and overloaded perceptions in the respondent's life. The alpha reliability estimate for this scale was 0.78 [23]. The PSS contains 10 items and the responses were (a) never, (b) almost never, (c) sometimes, (d) very often. Each item is coded with a numerical score range from 0 to 4. Total scores are used to define the level of perceived stress of the respondents. Higher PSS scores were shown to be associated with failure among diabetics to control blood sugar levels and greater vulnerability to stressful life-event-induced depressive symptoms [23]. The questionnaire is easy to understand and valid for respondents with at least a junior high school education.

Predictive validity of the PSS ranged from four to eight weeks after the completion. This is because stress is influenced by daily hassles, different life events, coping strategies, and coping resource. One person's perceived stress could be altered as time goes by and change the above mentioned factors. The PSS is suitable for this study because the majority of the GDM patients see dietitians at the end of second trimester or in the third trimester, which fit into the validity range of the PSS.

Pregnancy Related Anxiety Scale (PAS)

The original 5 item Pregnancy Related Anxiety Scale was developed by Wadhwa in 1993 [24]. The revised version was developed by Rini and Wadhwa in 1999 with ten items on

the questionnaire to assess the frequency with which a participant worried or was concerned about her health, her baby's health, labor and delivery, and caring for the baby (Appendix F) [25]. This anxiety scale is intended to be used as a diagnostic tool of anxiety during pregnancy. It has also been used in research studies on pregnancy anxiety. The participant selects one answer on the scale for each question. The scale ranged from 1 (never or not at all) to 4 (a lot of time or very much). The internal reliability of the scale was tested in Rini and Wadhwa's study with Cronbach $\alpha=0.78$. It has been found to have high correlation with STAI-State [25, 26]. Another study also found high correlation of 0.80 between PAS and PSS at 30-32 gestational weeks in 415 normal pregnant women in the United States [27]. The PAS provides more tied context to the pregnancy situation. Therefore, in this study, the PAS was used to measure the state anxiety of the women.

State Trait Anxiety Inventory – Trait (STAI-T)

The STAI was originally developed as a research instrument to measure anxiety in a normal population sample. It is one of the best-established anxiety measures, having been used in many studies in many fields of health research.

The STAI is a self-report assessment tool, which measures state (a temporary condition experienced in specific situations) and trait (a general tendency to perceive situations as threatening) anxiety. State anxiety may fluctuate over time reflecting a person's perception of how threatening her environment is. The state anxiety includes unpleasant feelings of apprehension, nervousness, worry and tension in a transitory stage. Trait

anxiety reflects the general tendency to perceive situations as threatening. As Spielberger has noted, trait anxiety is "relatively stable individual differences in anxiety proneness" [28].

Both state anxiety (STAI-S) and trait anxiety (STAI-T) questionnaires have 20 items. The STAI-S questionnaire collects information on the anxiety that the respondent feel at the current state. Questions include: "I am tense; I am worried" and "I feel calm; I feel secure." For STAI-T questionnaire, the questions concern "how do you generally feel" and the response scale indicates frequency: "almost never", "sometimes", "often", and "almost always". Total scores were calculated, ranging from 20 to 80. If four or more items were not answered, the validity of that scale should be questioned [28].

The stability of the STAI scales was assessed on students for test-retest intervals ranging from one hour to 104 days. For the Trait-Anxiety scale, the coefficients ranged from 0.65 to .86, whereas the range for the State-Anxiety scale was 0.16 to 0.62. This low level of stability for the State-Anxiety scale is expected since responses to the items on this scale are thought to reflect the influence of whatever transient situational factors exist at the time of testing. [28]

Spielberger reported that the correlation between STAI State and Trait Scales in two female samples (college students and working adults) were 0.59 – 0.70. He also reported that this correlation tends to be higher if there is a threat to self-esteem or personal adequacy is evaluated rather than environmental physical danger. The state and trait

correlation also will be higher if the questionnaires are given at the same testing session, as what had occurred in this study.

Because STAI-S measures anxiety level in general but not specifically in the pregnancy context, this study chose to use the Pregnancy Related Anxiety Scale to assess anxiety levels specifically related to GDM pregnancy. The STAI-T questionnaire was used to assess the person's tendency to perceive a situation as threatening. The STAT-T questionnaire is simple to use and is appropriate for those who have at least a sixth-grade reading level.

Because the PSS, PAS, and STAI questionnaires have been reported with correlation with each other in pregnancy psychometric studies, the correlations among the questionnaires will be tested again in this study to validate these instruments.

Demographic data collection

A demographic questionnaire (Appendix H) was administered at the end of the interview session. The demographic data included height, pre-pregnancy weight, age, and education level and income bracket. The researcher clarified any questions about the questionnaire.

Data analysis and data integration

Qualitative data analysis

Audiotaped interviews were transcribed and imported into NVivo 9 [29] for further analysis. The constant comparative method is an appropriate content analysis tool in qualitative descriptive studies [31]. Qualitative data were segmented into units and coded into categories that reflected a participant's life experience and worldview. Codes were revised and data were recoded as analysis progressed to ensure the categories truly reflected the life events and the project's focus-of-inquiry [14]. Through constantly comparing and contrasting similarities and differences between categories, relationships between categories were identified and categorized into themes [31, 32].

A theme is an extended phase that can represent ideas from observation or from understanding at the manifest level [33]. Themes generated from the data represent the important meaning and patterns of the data in relation to the research question [34].

Quality Control

Because this study design required the direct comparison of qualitative and quantitative data, it was important that the thematic analysis be as systematic as possible, to reduce analytic bias.

Verbatim quotes selected for presentation are good illustrations of the identified themes. Steps were taken to corroborate study findings, a concept in qualitative research similar to reliability and validity in quantitative research [14]. These included: 1) transcripts were reviewed by the participants to verify their interview conversation; 2) data transcription and data analysis occurred concurrently during data collection to ensure sample

saturation; 3) use of an independent investigator to code four transcripts to calculate a kappa score (values above .80 are regarded as nearly perfect agreements) [35]; 4) systematic checking of themes against supporting quotations, and 5) independent review of transcripts, categories, frequency tables, and themes by a third investigator.

Quantitative data analysis

Scores were calculated for the stress and anxiety surveys based on calculation instructions for each tool. Spearman's correlation coefficient was calculated to test the correlations among the three questionnaire scores.

The survey score data were displayed on an excel sheet with all the participants. These data were imported into NVivo 9 [29]. Matrix inquiries between the qualitative data (themes) and participants' survey scores were made. Demographic data were imported into NVivo for each participant. Matrix inquiries between the qualitative data, questionnaire scores, and the demographic characters were performed. This procedure provided the opportunity to detect relationships between themes and background variables such as demographic information and questionnaire scores. Demographic data collected from the questionnaire were used to describe the sample population.

Different ways of data integration

Triangulation

Data integration in a concurrent design can differ. “Triangulation” is a common method to interpret qualitative and quantitative data. Qualitative and quantitative data sets are analyzed separately. The results are integrated and often interpreted in the discussion section. This kind of analysis looks for evidence of convergence, divergence, or contradiction between two sets of data [36].

Matrix inquiry

Matrix inquiry technique is another way of data integration. Bryman considered that analyzing qualitative and quantitative data separately and then combining them for interpretation might not be the optimal form of mixing and could be shallow in nature [37]. A mixing based on the two different sets of data might provide better understanding of the nature. Qualitative data such as themes and constructs, quantitative data such as means, frequencies, and survey scores can be put into rows and columns to cross-reference each other. This type of comparison could be facilitated with qualitative analysis software. Bazeley promoted this kind of matrix comparison through qualitative analysis software [38]. She stated:

Combinations of survey questionnaires with interviews, this kind of the integration occurs only after completion of analysis of the separate sources, at the point of interpreting conclusions. A software provides capacity to sort coded text by categorized responses or background variables – whether these be demographic information, response to questions asking or opinions or experience, or ratings given in response to scaled items.

Benefits from these analyses extended beyond detecting simple patterns of associations for further exploration about other relationships. In addition, such analyses provide insights regarding dimensionalization of concept and the potential to validate scaled measures and to identify and explore deviant cases.

Source: (Sage handbook of mixed methods in social & behavioral research, 2010, p.438)

Data transformation

Data transformation is another integration method. For example, qualitative data can be transformed into code frequencies or percentage of participants who mentioned a certain theme. The presence or absence of a qualitative code or theme can be created as dichotomous variables for all participants [39]. The transformed data then can be used to compare with quantitative data together to determine descriptive results [13].

In this qualitative and quantitative concurrent design, both qualitative and quantitative data were collected at the same time on the same participants. In the present study, qualitative sample was purposively selected rather than randomly selected and the sample size is small. In data integration, the qualitative data were expected to reveal life experience of women with GDM in relation to food choice behavior and dietary advice acceptance. The qualitative data were used to describe the participants' stress and anxiety levels that were reflected as survey scores.

The sample size of the quantitative data collection was the same as the qualitative data collection. This sample size was not meant to perform regression analysis. Newman and Ramlo suggested that small size mixed methods research samples might not be able to perform statistical analysis such as regression, but nonparametric statistics can be used to interpret characteristics and comparisons [40].

Questionnaire scores were calculated based on each instrument's instruction. After major themes were identified, data integration occurred with matrix crosschecking was performed among themes, demographic data and different questionnaire scores of the participants. The nonparametric Fisher's exact test was used to describe the differences between category data (e.g. the demographic differences between women who mentioned a theme experience and the ones who did not). Nonparametric Wilcoxon Mann Whitney U test was used to describe the differences between two sets of nonparametric data collected from interval scales (e.g. questionnaire score differences between women who mentioned a theme experience and the ones who did not). The purpose of using demographic characteristics and questionnaire scores to distinguish women who mentioned a certain theme from the ones who did not, was to ensure a person's stress and anxiety experiences were captured qualitatively and quantitatively, and aided in explaining each other.

Neither the quantitative survey nor the qualitative interview alone answered the research question in relation to stress and anxiety in dietary management. Therefore, at a certain point, these two sets of data were "mixed" to provide explanation, and hence provide a

rich understanding of the issues rather than having two sets of analysis results from two data sets [13]. The supplemented quantitative data enabled the researcher to link qualitative and quantitative data together for a deeper understanding of self-assessments of stress and anxiety in the context of their real life experiences (interview content).

Figure 3.3 demonstrates the analytic flow of this concurrent design. Qualitative and quantitative data were collected separately. The dominant qualitative design generated results through qualitative analysis to answer certain research questions (e.g. identify factors that affected food choice behaviors in women with GDM). The supplementary quantitative inquiry component in this study was designed to answer the questions regarding the existence of stress and anxiety.

Figure 3.2 Procedural summary of this concurrent design study (Adapted from Creswell & Plano Clark, 2007)

QUALITATIVE Data collection (n=30)	QUALITATIVE Data analysis	QUALITATIVE Results	QUALITATIVE + quantitative Data integration	quantitative Data analysis	quantitative Data collection (n=30)
Procedures:	Procedures:	Procedures:	Procedures:	Procedures:	Procedures:
FCM semi-structured Interviews	Thematic analysis	Discuss findings	<u>Matrix inquires and data transformation:</u> Scores, demographic data and themes (presence vs. absence) put into columns and rows and cross-reference with each other to explore relationships. Nonparametric comparisons to check significant differences among the relationships categories	Calculate total scores and medians. Nonparametric comparisons to check significant differences among different demographic variables. Correlation coefficient comparisons among different questionnaire scores	Stress and anxiety questionnaires Demographic questionnaire
Products:	Products:	Products:	Products:	Products:	Products:
Transcripts	Themes	Answer research question - Factors affecting food choice behaviors of women with GDM. Answer research question - Barriers that prevent women with GDM to follow dietary advice	Interpret the survey results with interview content. Answer research question #4 – if the reported stress and anxiety are important factors of dietary management	Descriptive stress and anxiety status. Answer research question #2 – self-reported stress and anxiety status in women with GDM	Ordinal data - questionnaire scores Demographic data

The importance of this study is that it explored the dietary experience of women with GDM with an emotional wellbeing component. Rich information was generated from in-depth interviews that described every woman's unique experience. Stress and anxiety levels were obtained through participants' self-assessment, which provided some direct understanding of the self-reported stress and anxiety in this sample. Linking the qualitative interview information to the quantitative data could clarify what those stress and anxiety scores referred to, particularly if they related to dietary management. This mixed methods design deepened the understanding of women with GDM's dietary behavior and why they rated themselves to a certain status of emotional wellbeing.

Ethical considerations

Prior to data collection, approvals were obtained from the University of Manitoba Joint Research Ethics Board and the Research Review Committee at St. Boniface Hospital. All participants in the study signed consent forms. It was explained to all the participants that the study was voluntary and any decline of the participation at any stage would not affect their quality of medical care. Protocols to protect participants' confidentiality and research data followed the Winnipeg Regional Health Authority guidelines and Personal Health Information Act. The quotations from transcripts presented in the study results were anonymized to protect participants' identities.

Limitations and implementation

The sample size of 30 women was not intended to represent the Winnipeg or Manitoba GDM population statistically. However, The Outpatient Endocrinology Clinic receives referrals from all areas within Winnipeg and from all Provincial Health Regions. In practice, GDM patients have regular clinical visits during their pregnancy. The 30 women were expected to represent a GDM population with certain demographic and geographic characteristics. A major part of the analysis focused on the common elements in their views and comments. These common elements are likely to be shared with other GDM populations. Future studies focus on women in different socio-economic groups could complement the results from this study.

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Chapter 4

Food Choice Decision Making of Women with Gestational Diabetes

The Food Choice Map interviews collected thirty complete weekly eating patterns from the participants. In each interview, the participant had a chance to review all the foods that she consumed in a regular week and commented or gave reasons for her food choice decisions. At the interview stage, all the participants had met with the dietitian for GDM dietary consultation. The investigator was curious if the women in the study used information provided by the healthcare professionals in their dietary management. In addition, the investigator wanted to explore if other factors determine the food choice decision-making.

The results from this chapter were considered as the first layer of analysis on the qualitative data that explained why combinations of food stickers were on the Food Choice Maps for the participants. It provided understandings on what the reasons were for those women who picked and chose certain foods to eat over other foods. The results also reported the feelings associated with the food choice decisions by these women.

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Food Choice Decision-Making of Women with Gestational Diabetes

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AH conceptualized the research design, carried out data collection and data analysis procedures, and wrote the manuscript. GS contributed to the research design and data analysis. DH and ES made intellectual contribution to the research design.

ABSTRACT

Objective: To enhance the dietary education presented to women with gestational diabetes (GDM) by exploring the reasons and experiences that women with GDM reported in making their food-choice decisions after receipt of dietary education from a healthcare professional.

Methods: Food Choice Map (FCM) semi-structured in-depth interviews were conducted with 30 women with GDM living in the Winnipeg area during their pregnancies.

Verbatim transcripts were generated from the interviews. A constant comparative method was used to generate common themes to answer research inquiries. **Results:** Personal food preferences, hunger and cravings were the main factors affecting food choice decision-making in women with GDM. Although the information from healthcare professionals was one factor that affected food choice decision-making for most of the participants, more than half of the women, including all the women who were on insulin, reported difficulties in quick adaptation to dietary management in a limited time period. Information from other sources such as family members, friends, and internet were used to cope with the adaptation. These difficulties led to a sense of decreased control of GDM and were accompanied by frustration, especially for women taking insulin. **Conclusions:** Food choice decision-making varied for this group of women with GDM. Knowledge and information aided in making healthy food choices and in portion control. However, balancing individual needs and blood glucose control in a short time period was felt to be difficult and created frustration. The findings suggested that dietary consultation needs to be personalized and to be time sensitive to promote confidence in self-control.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance with onset or first recognition during pregnancy.¹ The prevalence of GDM in Canada varies from a range of 3.5-3.8% in the non-Aboriginal population to a range of 8-18% in Aboriginal populations.²⁻⁴ In Manitoba, the prevalence of GDM increased from 2.3% in 1985-1989 to 3.7% in 1999-2004. First Nations women had 3 times higher prevalence than the non-First Nations women. The GDM recurrent rate was 44.4% in Manitoba from 1985 to 2004.⁵

Poor controlled blood glucose in GDM pregnancy increases the risks of maternal and neonatal complications.⁶ A recent large study on the impact of hyperglycemia on pregnancy outcomes, the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study, confirmed that elevated glucose during pregnancy is associated with increased risk of macrosomia, caesarian delivery, and neonatal hypoglycemia rates.⁷ Treatment of GDM has shown to improve maternal and neonatal outcomes.^{8,9} Treatment of GDM must begin immediately after the diagnosis. Risk reduction may require extensive behavioural and self-care modifications, which could include dietary regulations, blood glucose monitoring, possible insulin injections, and increased visits to healthcare providers for maternal and fetal surveillance.¹⁰

Nutrition plays a critical role in GDM management. It is recommended that women with a diagnosis of GDM be referred to a registered dietitian for individual nutrition

management.⁶ However, the balance between keeping an optimum blood glucose level and providing adequate nutrition for the patient and fetus is not easy to achieve. One study reported that pregnant women with type 1 diabetes experienced the sense of losing control and negative feelings toward the high risk pregnancy.¹¹ Several studies on women with GDM in different ethnic backgrounds also reported the existence of the sense of losing control.¹²⁻¹⁴ The demand of more health service information on GDM management was reported in women with GDM.^{15,16} The failure of diet compliance led to increased stress and anxiety throughout the pregnancy.¹⁴

There is still a lack of understanding of what kind of dietary related events lead to the sense of decreased control. Furthermore, there is also a lack of understanding of what affects food decision-making in women with GDM, especially those who have no previous experience of diabetes. This study aimed to collect the above missing information. Therefore, dietary consultation could go beyond reinforcing general diet restrictions to become more client oriented and effective and may increase compliance with dietary management.

METHODS

Study Design

This study was designed as a qualitative descriptive study which allowed the researcher to describe what the factors were that influenced women with GDM in making food

choice decisions. The qualitative descriptive study method is one of the qualitative research methods which allows researchers to describe real life phenomena straight from the data.¹⁷ In qualitative descriptive studies, the researchers stay closer to the reported data to generate descriptions, rather than looking beyond the words and sentences to elicit a conceptual framework as in grounded theory, phenomenological, or ethnographic studies.¹⁷

In-depth interviews provided the means for participants to express their experiences and ideas freely in their own words. It is an effective way to identify factors that are relevant to a particular health behaviour in a population under investigation.¹⁸ In order to keep the focus on the whole picture of daily intake, a qualitative interview design that could record a normal eating pattern and reasons behind food choices was favored. Such a tool allows the participants to comment on all the foods that she consumed in real life, without missing or neglecting certain foods cognitively. Results from this kind of data collection could capture the whole picture of food choice decision-makings in the participants. The Food Choice Map (FCM) interview tool provided such an opportunity to obtain a complete weekly intake and reasons behind food choices. It has been shown to collect accurate, reliable and rich qualitative data compared to traditional in-depth interviews or 24-hour recalls when collecting information on eating behaviours.^{19,20} It uses food to start the conversation and it helps the researcher to explore more meanings behind the food choices and experiences related to living with GDM. This approach is unique in the literature.

The FCM interview uses a large magnet board to record food items and frequencies for meals and snacks in a regular week. Food pictures on magnet stickers at the size of 1.3 cm² can be organized on the magnet board by the participant and/or the interviewer to form the weekly eating pattern. Meals and snacks spacing are displayed vertically while frequencies of food consumption are displayed horizontally (Appendix I). The interview question guide (Table 4.1) helped the interviewer to explore reasons and experiences related to food choice decision making in a GDM pregnancy. Participants helped to put food picture stickers on the magnet board to answer questions and were encouraged to discuss reasons for the eating pattern. All interviews were audio recorded.

The sample for this study was thirty women who lived in the Winnipeg and surrounding communities but worked and did grocery shopping in Winnipeg. The participants were purposively recruited from a hospital outpatient endocrinology clinic that receives GDM referrals from all over Winnipeg. The inclusion criteria were: 1) attended at least one education session with a registered dietitian after diagnosis of GDM; 2) were able to communicate in English and were not visually impaired (were able to complete the Food Choice Map, the consent, and the demographic questionnaire); 3) had not been previously diagnosed with GDM.

Upon the approval from the University of Manitoba Research Ethics Board and the hospital research review committee, the researcher posted a recruitment flyer in the clinic. Respondents who were interested in the study contacted the researcher to set up an

appointment to complete the study consent form, a demographic questionnaire, and a research interview.

All interviews were conducted at the participants' homes during May 2011 to February 2012. Thank You cards with a \$20 grocery gift cards were given to the participant after the interviews.

Data Analysis and Interpretation

Audiotaped interviews were transcribed and imported into NVivo 9 qualitative data analysis software²¹ for further analysis. The constant comparative method is an appropriate content analysis tool in qualitative descriptive studies.¹⁷ Qualitative data were segmented into units and coded into categories that reflected a participant's life experience and worldview. Codes were revised and data were recoded as analysis progressed to ensure the categories truly reflected the life events and the project's focus-of-inquiry.²² Through constantly comparing and contrasting similarities and differences between categories, relationships between categories were identified and categorized into themes.^{23,24}

Verbatim quotes that were selected for presentation are good illustrations of the identified themes. Steps were taken to corroborate study findings, a concept in qualitative research similar to reliability and validity in quantitative research.²⁵ These included: 1) transcripts were reviewed by the participants to verify the interview conversation; 2) data

transcription and data analysis occurred concurrently during data collection to ensure sample saturation; 3) use of an independent investigator to code four transcripts and achieved high kappa scores (values above .80 are regarded as nearly perfect agreements);²⁶ 4) systematic checking of themes against supporting quotations, and 5) independent review of transcripts, categories, frequency tables, and themes by a third investigator.

Demographic data collected from the questionnaire were used to describe the sample population.

RESULTS

All participants were interviewed at 26 to 38 gestational weeks (median 36). Theoretical saturation was reached with this sample size. Participants ranged in age from 20 to 42 years (median 29), 73% were overweight or obese before pregnancy ($BMI \geq 25$, Table 4.2). The sample consisted of 53% Caucasian and the rest were Asian, African, and Aboriginal. All participants had completed high school education. Eighty percent of the participants were married, 73% of the participants were employed, 13% had a household income less than \$20,000/year and 33% had \$60,000 or over/year. All the participants experienced GDM for the first time whether they had a previous pregnancy history or not. Forty-three percent of the participants were receiving insulin treatment at the time of interview. No participant used oral agents to treat GDM. All participants performed self-glucose monitoring during the GDM pregnancy.

The following major themes emerged as women talked about what influenced their food decision making during a GDM pregnancy. These themes together revealed that in most women, food decision making was affected by personal food preferences and hunger. Besides using the information from healthcare professionals in food decision making, women also sought information from different sources to cope with quick adaptation to dietary management in a limited amount of time. Difficulties in dealing with cravings, portions, hunger, and eating in a different social environment led to the sense of decreased control and caused stress and frustration.

Major Themes

Theme 1. Personal preference and physical needs were the common reasons for choosing what food to eat.

Personal preference was a common reason that women with GDM in this sample gave when choosing food. Of the 30 women in the sample, 27 stated that they tried to choose food based on their culture and taste preference. They preferred to choose food that they were used to and enjoyed eating. One woman said, “Well I don’t limit myself very much on fat, I like cheese to have flavor and when it has no fat it has no flavor.” If there was a conflict between food preference and the dietary advice received from the healthcare professionals, most women tried to keep their preferred food first but coped either with reduced portions or with similar taste alternatives.

The three participants who did not mention personal food preference but rather relied on the advice from health care professionals were on diet control only. Their blood glucose readings were always within the target range. One had hyperemesis throughout the whole pregnancy so food intake was very limited. The other two had positive attitudes toward GDM management and were open minded about following dietary advice and risk reduction. These women had a higher education and income level, and their GDM was less severe.

All participants mentioned eating driven by physical needs such as hunger and cravings. Craving was expressed as the desire to eat certain food, often the “forbidden foods” such as sweets, juices, high calorie meals and snacks. One woman said, “I’ve been craving hamburgers. I have been having cheese burgers for lunch for a week because I have been having cravings for burgers”.

Women responded differently to hunger and cravings. Although women considered pregnancy cravings were normal, and some gave in to their cravings, others used mental power to control their cravings. When hunger presented, almost everyone wanted to eat to ease the hunger, especially for the safety of the baby. One woman stated, “Sometimes I feel hungry and so I feel that I should feed my baby”. On one hand, women were afraid that the extra food would raise their blood glucose; on the other hand, they worried that the baby would be starving.

Women taking insulin had fewer struggles when dealing with hunger. This might be because insulin helped in managing the blood glucose when women increased the amount of carbohydrate intake. Women who were on diet therapy faced challenges as eating a bigger meal would raise the blood glucose level out of the target range. One hunger coping strategy was to add a snack in between meals and not to check their blood glucose afterwards because the “doctor said no need to check at snack time”. Snacks were used as a buffer for these women to eat more food without feeling guilty. Other women used this strategy to ease cravings as well. One woman said, “I had a pie with cherry topping. I actually didn't test my blood sugar because it was a late snack; I usually only test it with dinners”.

Theme 2. Women use information from different sources on making food choice decisions.

Dietary education is an important part of GDM management. Women with GDM often are referred to a registered dietitian for nutrition consultation after diagnosis. All participants in this sample had received dietary education from a registered dietitian. Seventy-three percent of the women mentioned that they used the health services information in making food choice decisions. Women also sought information from different sources such as friends, relatives, or from the internet on making food choice decisions (Table 4.3).

Although health service information was mentioned most often by women during interviews, not everyone felt comfortable with the health services information they received. Twenty-seven percent of the women felt it was difficult to apply the health services information because it was not personalized. Emotions related to the health services information were not always positive. Negative emotions were related to the expectations of eliminating certain personal preference foods or changing long term eating habits. One woman stated, “Like there are things that you crave and they just tell you, well, try not to fall into your craving. You try being pregnant and not falling to your craving”. Another woman explained the difficulty of following dietary advice, “I found the information hard to follow because I am not able to eat what I want to eat, like I normally would eat”.

Two women who did not use the dietary advice from health care professionals had very strong beliefs in their own food and lifestyle practice. For example, one woman turned to her spiritual coach for support and guidance. She said, “She’s actually a spiritual life coach, and she said I can feel that the baby is really stressed right now and you need to get on a meal plan. Google what other people have done and you find a meal plan and you eat healthy”.

Many women used the internet as a resource for GDM information and diet tips. Friends and relatives with diabetes also provided information on how to choose carbohydrate foods and how to read labels. Women felt that they had to make dietary changes and meet blood glucose targets within a limited amount of time. Health service information could

be a general guideline but they need more personalized or detailed instructions, especially when it comes to how to cope with cravings, hungers, and personal food preferences. One woman explained, “I think doing it in the short term is a lot harder because if it was long term, then I would see a dietitian more often, or at least I would have learned what I am learning from my aunt who is a diabetic”.

Theme 3. Women with GDM experienced a sense of decreased control in food choice decision making

Life controlled by a measuring cup

Portion control is a major component of GDM diet management. Participants talked about the everyday challenge of balancing eating, cravings, and keeping the blood glucose in control. Eating was no longer a relaxing or enjoyable event. One woman stated, “Counting everything, knowing how many ounces of meat I eat. I used to just pour a glass of milk and think like that’s a glass of milk, well now it’s like a measuring cup.”

Life controlled by a glucometer

Blood glucose monitoring was recommended to record the impact of food on blood glucose levels. All participants stated that they have been testing their blood glucose and have been honestly recording the testing results. Only one woman mentioned that she

would fake her testing results to avoid insulin treatment if it was necessary. She stated, “I would have to cheat on this (logbook) if I need to. I am not going on needles.”

Women used the meter to test different food combinations and tried to fit their favourite foods into meals. However, when blood glucose rose after the food choice experiments, more than half of the women who were on insulin chose to stay with the meal that worked even though the meal might not have been their preferred food. They found matching insulin to food was hard. Therefore, “sticking to the food that works” seemed to be the best solution for these women. One woman explained, “I think I’ve been kind of sticking to the same things that I know work. Well I know okay yogurts, I’m okay with that, and the cereal’s okay, and the apples are okay. I haven’t really gone off and experimented too much”.

All women that were on insulin experienced difficulties meeting glucose targets. They stated that they did not have enough time to “figure things out”. They also perceived that GDM was temporary; staying with a boring diet was not forever. Therefore, they could control themselves to stay with the boring diet for a short term period but expressed the desire that they would “go wild” on eating forbidden foods once GDM is gone. One woman stated, “After having my baby, I will have a celebration with juice.”

Less control when eating in different social environment

Most participants had a sense of losing control when their food choice decisions resulted in abnormal blood glucose results. One common scenario was eating out or social eating.

During pregnancy, women often felt physically tired and lacked energy in meal preparation, especially when they could not get enough support in food preparation. Eating out becomes inevitable, even for families with low income. Among women who talked about the experience of eating outside their home, 89% (17/19) experienced difficulties making food choice decisions and managing blood glucose control in this context. Unfamiliar food items in the restaurant created challenges in estimating carbohydrate content, hence affected the postprandial blood glucose readings. One woman said, “Like the difficult part is going to a restaurant, like if you are going to a restaurant and you don’t know what you feel like and you can’t really measure, like if you want to go to Moxie’s and have the rice bowl with something but I have no clue what is in there.”

Social eating was another factor that challenged women in blood glucose control. Many were stressed by the abnormal blood glucose readings after the social events. Baby showers, parties, and office potlucks created challenges for women to make decisions on food and portions. Eating unfamiliar foods or eating under social pressure was not easy for these women. Some women chose to “binge out” at these occasions and not worry about it. Some chose to “go with the flow” but would skip a meal later on or exercise right after. Some would simply avoid these kinds of occasions by not attending.

Needs more support because of losing control

Women talked about trying to follow dietary advice but were challenged by unpredictable blood glucose readings. The frustration created doubts in themselves on the capability to manage GDM. One woman stated, “It is frustrating when you watch your carbs, you portion it and then your reading is still high.”

Women found ways to resume emotional balance. For example, praying, looking for emotional coaching, or planning for binge eating after delivery were mentioned in the interviews by women who experienced losing the sense of self-control. One woman said, “I pray a lot and I trust in the Lord and I know things will be fine. That helps me not to want things that I shouldn’t be eating”.

Half of the women mentioned receiving support from their spouse or family member on food decisions. Their spouse helped in grocery shopping and food preparation but left the food choice decisions to the women. Some spouses even supervised the portion size of the meals or eliminated food high in simple sugar in the house to facilitate the diet control.

Three participants who were single lived with parents for the majority of their pregnancy. Food preparation and purchasing decisions were made by the parents most of the time with good intentions to help the GDM management. These participants shifted their GDM management responsibilities to their parents and reported to have more frequencies of high blood glucose readings. They also experienced more challenges with facing food

temptations due to easy access to foods that were brought into the house by other family members.

DISCUSSION

Personal preference was a factor that influenced food decision making in this sample. Food pleasure is an important factor for people to select food.²⁶ In pregnancy, this type of personal preference is often expressed as “craving for certain food”. Restricting a personal favourite food due to dietary treatment has been reported to cause frustration in GDM diabetes patients^{13,14} and sometimes could lead to “cheating on desired food”¹³ This is consistent with our study finding. It is logical to expect that a strong personal food preference, which conflicts with dietary restrictions, can become a barrier to dietary change, and accompanied with negative emotions.

Seeking different sources of information in GDM diet management have not been specifically explored in the literature. In this study, although everyone received information on dietary management, not everyone used the information in food choice decision making. Women who used dietary information sometimes felt controlled by the diet. Some women sought extra information from family, friends, and the internet when they felt the dietary information they received was inadequate or not meeting their personal needs. Several studies suggested that women with higher socioeconomic status (SES) tended to use information or make plans to reduce stress.²⁷⁻²⁹ This sample of participants included 53% Caucasian and the majority had high education levels. The

recruitment criteria possibly contributed to these sample characteristics. Women with previous GDM diagnosis, who live outside Winnipeg, especially First Nations women from Northern communities, were not included. Therefore, this sample does not reflect the GDM proportion in Manitoba. This is a limitation on applying this study's results to women with low socioeconomic status, who may have less resource access to adapt to the recommended dietary changes.

The sense of decreased control in food decision making was a major theme that described food decision-making experience in this study. The perception of losing control during a GDM pregnancy has been reported in previous studies showing that women with GDM became overwhelmed by increased number of clinic visits, diet restriction and the cost of diabetic supplies¹² or unable to achieve blood glucose targets.³⁰ Our study, with its specific focus on food choice decision-making and unique data collection methods, provided opportunities to understand participants' daily food choices and reasons for making those specific food choices. This study identified the decreased sense of control in relation to the food decision making and explained in detail about this decreased sense of control related to diet restriction on personal preference foods, inability to increase food variety, and challenges in social eating. The findings are meaningful in developing dietary education plans targeted at these areas.

In this study, all women who were on insulin reported difficulties in meeting blood glucose targets. More than half of them coped with repeating the meals that worked and felt controlled by their GDM. Insulin therapy is recommended when diet and exercise

failed to achieve target blood glucose levels.¹⁰ Insulin therapy should not jeopardize food varieties and appropriate nutrition intake for the mother and the fetus. However, women in this study sample have shown that insulin users felt more restricted about making food decisions.

CONCLUSION AND FUTURE IMPLICATIONS

Personal food preference, cravings, and hunger were important factors in food decision-makings in this group of women who had no previous experience of GDM. Limited time to adapt to dietary management created frustrations and decreased the sense of control. Women sought information from family, friends, and the internet to adapt, and often simplified their meals to meet blood glucose targets, especially for women on insulin.

Future education needs to be time sensitive. Individual meal planning with consideration of personal food preference, cravings, and hunger may improve the plan acceptance. Ongoing education and empowerment to help these women with healthy meal planning and achieving blood glucose targets are important, especially for women using insulin treatment.

Women with GDM with low socioeconomic status may face more challenges when making food choice decisions. Future investigation in the low socioeconomic group could compliment the results of this study.

AUTHOR DISCLOSURE

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TABLES

Table 4.1. Sample of Food Choice Map semi-structured interview questions

For this pregnancy, what food do you eat often?
You seem to eat this food more often than that food, is it very important for you?
Have you changed the amount or type of foods you eat?
Where do you get the information on the best buys, what is in the food, how healthy is it?
Who decides what foods will be purchased?

Table 4.2. Demographic characteristics of participants (n=30)

Characteristic	Distribution		
	Median	Min - Max	
Age (year) (range)	29	20 - 42	
Weight gain (kg) (range)	11.90	0 - 28.18	
Gestational weeks at interview (week) (range)	36	26 – 38	
Weeks after initial dietary session (week) (range)	4.5	2 – 10	
	% of total participants	Participants/total participants	
Pre-pregnancy BMI	Normal Overweight or obese	27% 73%	8/30 22/30
Marital Status	Single Married or Common Law	20% 80%	6/30 24/30
Number of children < 18 years of age	None ≥ 1	50% 50%	15/30 15/30
Level of education	High school College/University Post-graduate	20 % 73% 7%	6/30 22/30 2/30
Employment status	Unemployed Employed	27% 73%	8/30 22/30
Annual household income	Less than 20,000 20,000 – 39,999 40,000 – 59,999 60,000 over	13% 27% 27% 33%	4/30 8/30 8/30 10/30
Ethnic	Caucasian Asian African Aboriginal	53% 27% 10% 10%	16/30 8/30 3/30 3/30
Received insulin treatment	Yes No	43% 57%	13/30 17/30

Table 4.3. Sources of information that women used in making food choice decisions

Source of Information	Percentage of participants who used information	Quote from interview transcripts
Health care professionals	73% (22/30)	I spoke to the dietician and she told me that whole-wheat was a better choice.
Family members and relatives	17% (5/30)	I didn't ask the dietitian but my aunt is a diabetic and she drinks the Fresca, so she was the one that recommended it to me.
Friends and others	7% (2/30)	I was taking Materna because where I was working, there was a nurse there and she was pregnant too. She told me "You have to take it. It's good for you, for your baby. You have to take it."
Internet	30% (9/30)	When they told me that I have gestational diabetes, I went online and looked it up to find out what I can eat and what I can't eat and what would happen to the baby.

Chapter 5

Stress and Anxiety in Women with Gestational Diabetes during Dietary Management

Pregnancy itself could lead to a stressful stage. In the literature, stress and anxiety during pregnancy have been investigated to predict birth outcomes and postpartum depression. The history of stress and anxiety investigation in a GDM pregnancy started with the debates on whether the GDM diagnosis could affect how women perceive their health and therefore created more stress than is necessary. The findings on the diagnosis of stress and anxiety were used to justify if routine screening for GDM is necessary among all pregnant women. Later research on women's experiences with GDM revealed that a sense of "losing control" was an emotional characteristic for this group, as reported in Chapter 4 of this thesis. In the literature, the reported sense of losing control was related to being unable to achieve blood glucose targets, difficulties in following dietary and exercise advice, or insulin injection. However, this kind of conceptual finding still does not provide an operational context, especially to the spectrum of the emotional distress. The purpose of this paper was to explore the existence of stress and anxiety experiences in the context of dietary management and the factors that triggered stress and anxiety responses. This paper used a concurrent mixed methods approach to collect real time data using psychological instruments and the FCM in-depth interviews.

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Stress and Anxiety in Women with Gestational Diabetes during Dietary Management

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ABSTRACT

Background: Stress and anxiety could originate from a perceived high-risk pregnancy and the challenge of altering dietary behaviors. **Aim:** To explore the stress and anxiety experiences during dietary management in women with gestational diabetes (GDM).

Methods: Thirty women with GDM from the Winnipeg area participated in the mixed methods study. Each participant completed a Food Choice Map (FCM), semi-structured interview, a Perceived Stress Scale (PSS), a Pregnancy Anxiety Scale (PAS), a State Trait Anxiety Inventory –Trait (STAI-T) questionnaire, and a demographic questionnaire. Stress and anxiety experiences were identified from interview transcripts and categorized into themes using the constant comparative method. Questionnaire scores aided in interpreting the stress and anxiety experience in the qualitative data. **Findings:** Three major themes were generated from the interviews: 1) Stress related to GDM diagnosis and the perception of a high risk pregnancy; 2) Stress over losing control of GDM occurred in the process of dietary management; and 3) Anxiety related to the fear of maternal and infant complications. Women on insulin experienced significantly higher levels of perceived stress ($p<0.010$) and the dietary management stress was more prevalent in women using insulin compared to the ones on diet treatment only (Fisher's exact test, $p<0.01$). Unhealthy diet coping strategies occurred with the stress and anxiety.

Conclusions: Stress and anxiety were associated with different contexts in this study sample. Women who were on insulin experienced significantly higher levels of perceived stress related to dietary management.

Introduction

Although pregnancy can be a positive experience for many women, a variety of biomedical and social factors may also make it a time of stress.¹ In the literature, increased stress and anxiety during pregnancy were reported to be associated with pre-term delivery and other birth complications.^{2,3} Stress and anxiety in a GDM pregnancy have been investigated in the literature to examine whether the GDM diagnosis could affect how women perceive their health and therefore created more stress than necessary.⁴⁻⁸ Some quantitative studies suggested that the stress and anxiety level in women at diagnosis were no different compared to women with a normal pregnancy, or declined and became similar to the levels in a normal pregnancy group by the end of the pregnancy.^{4,5,8} It is logical to assume that after GDM diagnosis, dietary modifications could increase the stress and anxiety level of these women. A number of qualitative studies on women's experiences with GDM revealed that emotional distress and a sense of losing control in this group and these were related to being unable to achieve blood glucose targets, difficulties in following dietary and exercise advice, or insulin injection.⁹⁻¹² However, these kind of conceptual findings still do not provide an operational context to the emotional distress. The conflicting results on stress and anxiety measures and real life experiences in the literature created a research gap on understanding the existence of stress and anxiety in women with GDM especially in the context of dietary management.

This study was intended to explore the existence of stress and anxiety experiences in the context of dietary management. The results may enhance our understanding of the

emotional health of this target population, and may lead to more meaningful and client-centered education or educational tools.

Methods

Research design

This study used an exploratory embedded mixed methods design to explore the stress and anxiety experiences of women in a GDM pregnancy quantitatively and qualitatively. The assumption behind the mixed methods approach was that one type of data conceptualization could not answer all research questions. Two different types of concepts about data needed to be brought together to increase understanding of the perceptions and constructs. The embedded design can collect both qualitative and quantitative data concurrently. One data type is primary and the other data type plays a supportive, secondary role.¹³

In-depth interviews were used as the primary qualitative approach to understand the participant's stress and anxiety experiences. Stress and anxiety questionnaires were used to collect quantitative data to describe the degrees of perceived stress and anxiety of women with GDM in this sample. These questionnaire data played a supportive role to confirm the real life experiences related to stress and anxiety.

Sample

The sample for this study was thirty women who lived in the Winnipeg and surrounding communities but worked and did grocery shopping in Winnipeg. The participants were purposively recruited from a hospital outpatient endocrinology clinic, which receives GDM referrals from all over Winnipeg for endocrine consultation and care. The inclusion criteria were: 1) attended at least one education session with a registered dietitian after diagnosis of GDM; 2) were able to communicate in English and were not visually impaired (were able to complete the FCM); 3) had not been previously diagnosed with GDM.

Data collection procedures

Upon the approval from the University of Manitoba Research Ethics Board and the hospital research review committee, the researcher posted a recruitment flyer in the clinic. Respondents who were interested in the study contacted the researcher to set up an appointment to complete the study consent form, a demographic questionnaire, and a research interview. A thank you card with a \$20 grocery gift card was given to each participant after the interview.¹ Thirty women who met the recruitment criteria were recruited from May 2011 to February 2012. One-time interviews took place in the participants' home. Perceived Stress Scale and the Pregnancy Related Anxiety Scale were

¹The methodology described has been published in Hui, et.al. Food choice decision-making by women with gestational diabetes. 2014 and may be included in future publications

completed before the interview. The State-Trait Anxiety Inventory –Trait questionnaire and the demographic questionnaire were completed after the interview.

Measures

Food Choice Map (FCM) interview

In-depth interviews provide the means for participants to freely express their experiences and ideas in their own words. It is an effective way to identify factors that are relevant to a particular health behavior in a population under investigation¹⁴. The Food Choice Map (FCM) interview is a semi-structured in-depth interview technique that has been shown to collect accurate, reliable and rich qualitative data compared to the regular in-depth interview when collecting information on eating behaviors¹⁵. It uses food to start the conversation and it helps the researcher to explore more meaning towards the eating behaviors, or experiences related to living with GDM. The FCM was used as the interview tool for this study.

The FCM interview uses a large magnet board to record food items and frequencies for meals and snacks in a regular week. Food pictures on magnet stickers the size of 1.3 cm² can be organized on the magnet board by the participant and/or the interviewer to represent the weekly eating pattern. Meals and snacks spacing are displayed vertically while frequencies of food consumption are displayed horizontally.

To start the interview, the participant was asked to consider a food they often eat and food pictures were placed on the food map board according to the usual time of day and the usual consumption frequency per week reported by the participant. Follow-up questions built a record of the meals or snacks. Participants were asked to create a visual map of food frequencies by arranging these food symbols appropriate to their personal lifestyle. The interview question guide (Appendix D) helped the interviewer to explore reasons and experiences related to food choice decision making in a GDM pregnancy. The interviews were recorded using a digital recorder with the participants' consents.

Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS) is a widely used psychological instrument for measuring the perception of stress¹⁶. It measures the degree of perceived stress of certain situations in one's life. It also included a few queries on current levels of experienced stress. The intent of the PPS is to capture the unpredictable, uncontrollable, and overloaded perceptions in the respondent's life. The PSS contains 10 questions and the scale responses range from 1 (never) to 4 (very often). The questionnaire is easy to understand and valid for respondents with at least a junior high school education. Higher PSS scores were shown to be associated with failure among patients with diabetes to control blood sugar levels¹⁷ and greater vulnerability to stressful life-event-induced depressive symptoms. Because of its general nature and freedom of content specifics, it has been adapted for pregnancy use.^{9, 17} In this study, the questionnaire asked about feelings and thoughts during the last month of pregnancy. All the participants had already

met with the dietitian and were in the process of dietary management. In the present study, internal reliability was acceptable (Cronbach's $\alpha = 0.86$). Cronbach's α is widely used in the medical education research to provide a measure of the internal consistency of a test or scale.^{18,19} The Cronbach's α is expressed as a number between 0 and 1. George and Mallery suggested the acceptable range of Cronbach's α should be " $> .9$ – Excellent, $> .8$ – Good, and $< .5$ – Unacceptable". An alpha of .8 is probably a reasonable goal.²⁰

Pregnancy Related Anxiety Scale (PAS)

The Pregnancy Related Anxiety Scale was developed by Wadhwa in 1993 to predict pre-term deliveries.³ Ten questions on the questionnaire assess the frequency with which participants were worried or were concerned about their health, the baby's health, labor and delivery, and caring for the baby. The scale responses range from 1 (never or not at all) to 4 (a lot of time or very much). The Pregnancy Related Anxiety Scale was reported to be correlated with the 10 item State Anxiety Inventory at 0.42 ($p < 0.001$)²¹ and the PAS provides more tied context to the pregnancy situation and was recommended among other pregnancy anxiety measure tools when exploring perceptions of and reactions to possible triggers.²² The PAS was used in this study to collect concerns, worries, and fears during GDM management. In the present study, internal reliability was acceptable (Cronbach's $\alpha = 0.84$).

State Trait Anxiety Inventory – Trait (STAI-T)

The STAI-T is a self-reported assessment tool which measures the trait (a general tendency to perceive situations as threatening) anxiety.²³ It has 20 items on the questionnaire. The question concerns “how do you generally feel” and the scale responses ranged from 1 (almost never) to 4 (almost always). Total scores ranged from 20 to 80. The STAI-T questionnaire was simple to use and ideal for people with lower education backgrounds. It has been used in other studies of women with GDM⁵ and was used in this study to assess the person’s tendency to perceive a situation as threatening. In the present study, internal reliability was acceptable (Cronbach’s $\alpha = 0.86$). Demographic data were collected for the purpose of describing the sample.

Data analysis and interpretation

Both qualitative and quantitative data were analyzed or prepared separately at the beginning to generate themes from interviews and total scores for each questionnaire of each participant.

Audiotaped interviews were transcribed and imported into NVivo 9 qualitative data analysis software²⁵ for further thematic analysis. Important steps of the analysis were: 1) coding or giving meaning to all units of information; 2) revising codes and / or recoding previously coded data; 3) comparing and contrasting the data among each participant and among all participants with attention given to discovering similarities and differences among the participants; and 4) aggregating and clustering codes into themes and categories. The goal was to identify and develop themes that explore the stress and anxiety experiences that women had during a GDM pregnancy.

Verbatim quotes that were selected for presentation are good illustrations of the identified themes. Steps were taken to corroborate study findings, a concept in qualitative research similar to reliability and validity in quantitative research.²⁶ These included: 1) transcripts were reviewed by the participants to verify their interview conversation; 2) data transcription and data analysis occurred concurrently during data collection to ensure sample saturation; 3) use of an independent investigator to code four transcripts to calculate a kappa score (values above .80 are regarded as nearly perfect agreements);²⁷ 4) systematic checking of themes against supporting quotations, and 5) independent review of transcripts, categories, frequency tables, and themes by a third investigator.

Questionnaire scores were calculated based on each instrument's instruction. Data integration occurred after major themes were identified and individual questionnaire scores were calculated. Matrix crosschecking among themes, demographic data and different questionnaire scores to detect simple patterns of associations for further exploration about other relationships. In addition, such analyses provide insights regarding dimensionalization of concept and the potential to validate scaled measures.²⁸ The nonparametric Fisher's exact test was used to describe demographic differences of a group of women who mentioned a theme experience compared to the ones who did not). Nonparametric Wilcoxon Mann Whitney U-test was used to identify the significance between two sets of nonparametric data collected from interval scales (e.g. questionnaire scores differences between different demographic categories, and the questionnaire scores difference between women who mentioned a theme experience and the ones who did not). The purpose of using demographic characteristics and questionnaire scores to

distinguish women who mentioned a certain theme from the ones who did not, was to ensure the significance and the existence of stress and anxiety experiences were captured qualitatively and quantitatively, and aided in explaining each other. Because the PSS and PAS questionnaires have been reported with a correlation range of 0.47 to 0.80 ($p<0.001$ and $p< 0.01$) in normal pregnancies studies,^{2,29} therefore, the correlations among the questionnaires were calculated in this study using Spearman's rank correlation to explore their relationship to each other.

Results

All participants were interviewed at 26 to 38 gestational weeks (median 36). Participants ranged in age from 20 to 42 years (median 29), 73% were overweight or obese before pregnancy ($BMI \geq 25$, Table 5.1). The sample consisted of 53% Caucasian and the rest were Asian, African, and Aboriginal. All participants had completed high school education. Eighty percent of the participants were married, 73% of the participants were employed, 13% had a household income less than \$20,000/year and 33% had \$60,000 or over/year. All the participants experienced GDM for the first time whether they had a previous pregnancy history or not. Forty-three percent of the participants received insulin treatment at the time of interview. No participant used oral agents to treat GDM. All participants performed self-glucose monitoring during the GDM pregnancy.

In this mixed methods design study, theoretical saturation for qualitative data collection was reached with this sample size. Stress and anxiety were expressed during interviews by many participants. Three major themes were generated from the interviews:

1. Stress related to GDM diagnosis and the perception of a high risk pregnancy
2. Stress over losing control of GDM occurred in the process of dietary management
3. Anxiety related to the fear of maternal and infant complications

Theme 1: Stress related to GDM diagnosis and the perception of a high-risk pregnancy.

Negative feelings such as shocking, guilty, and sad about the GDM diagnosis and negative perceptions of a GDM pregnancy were mentioned by seventeen women. These women desired a “normal pregnancy” like their friends had. GDM was perceived as a high-risk pregnancy for these women. Possible complications created fear and stress for them. Common statements were, “It was heartbreaking. What did I do wrong”; “My first thought was when they phoned me and said you have gestational diabetes, all I heard was we’re scheduling you for a C-section and your delivery date is this.”

Women who mentioned this theme experience had significantly higher PSS and STAI-T scores compared to those who did not (Table 5.2). There were no significant demographic differences between the two groups.

Theme 2: Stress over losing control of GDM occurred in the process of dietary management

Women who mentioned this theme experience had significantly higher PSS and STAI-T scores compared to those who did not (Table 5.2). There were significantly more women on insulin who mentioned this theme experience compared to the ones on diet treatment only (Fisher's exact test $P=0.002$).

The perception of successfulness of GDM self-management was related to meeting blood glucose targets among these women. In this study sample, all women monitored their blood glucose postprandial. Emotional response related to abnormal blood glucose readings in dietary management caused frustration and stress, especially when efforts were made to follow dietary advice, or when trying to use learned knowledge and skills to improve the quality of eating. This kind of frustration and stress was mentioned by eighteen women. One woman said, "It is frustrating still when you watch your carbs, you portion it and your reading is still high, almost every day."

This dietary management related stress was mentioned significantly more by women using insulin compared to women on diet treatment only. Women on insulin felt stressed and frustrated when they tried to increase a variety of food selections, to match carbohydrates to insulin, or calculate portion sizes but failed to achieve target blood glucose. These affected their confidence on GDM self-management. One woman said, "Multigrain sounds healthier but it has more carbs, so I don't know what to do. It is

frustrating. Trying to eat right and then you look at it after and compare it and it's just like, oh, made the wrong decision with the carbs". Another one talked about her experience of trying different food but resulted in disappointment, "You'd think, okay, well this will be good; this will be fine for me to eat. Then I will check my sugars two hours later and it would not. I would be why? That's not okay. It was disappointing and it was definitely stressful, like it was just really not fun."

One common coping strategy that women used to avoid fluctuated blood glucose was staying with simple repeated meals that worked. As one woman commented, "That's why I have such a limited diet, because I'm trying... because we've been increasing my insulin, trying to get it to normal and then whenever I bring something new in, I find that I spike, so I'm trying to get my sugars to a normal level and it's not easy. That's frustrating." Another comment was, "it's about trying to balance my sugars. We've been having a hard time getting them down, so when I find something that works, I stick to it".

Theme 3: Anxiety related to the fear of maternal and infant complications

Sixteen participants mentioned fears toward maternal and infant complications. Concerns related to the infant complications were related to the baby's health at delivery, such as "I don't want any complications during labor or don't want the baby to have any difficulty breathing". Maternal complications were related to the fear of a C-Section due to a large baby and future diabetes. Example comments were "I don't want getting too big to where I can't deliver her without having to go for a C-section. I want to try (vaginal delivery)

and avoid that as much as possible". "She could have problems after and I could continue to have gestation diabetes after if it continues to stay high." Abnormal blood glucose readings aggravated the anxiety of complication in some women and led to reactions such as to stop eating after seeing a high blood glucose reading, crying, drinking plenty of water in hopes of diluting the blood sugar.

Women who mentioned this theme experience had significantly higher PSS, STAI-T, and PAS scores compared to the ones who did not (Table 5.2). There were no significant demographic differences between the two groups.

Median and 25-75 percentiles of the questionnaire scores are listed in Table 5.3. Women who used insulin treatment had significantly higher stress (PSS) scores compared to the ones on diet treatment only (Wilcoxon Mann Whitney U Test, $P < .01$). Women with a household income under \$20,000/year had significantly higher PSS and STAI-T scores compared to the rest of the income groups (Wilcoxon Mann Whitney U Test, $P < .01$ and $P < .05$). No other significance was found between questionnaire scores and other demographic data.

The Spearman's correlation coefficient was used to compare correlations among questionnaire scores. The correlation coefficient between PSS and STAI-T scores $r=0.74$ ($P < .01$); between PSS and PAS scores was $r=0.67$ ($P < .01$); and between PAS and STAI-T scores $r=0.65$ ($P < .01$).

Discussion

There are limited quantitative studies in the literature that measured stress and anxiety levels in women with GDM.^{4,5,8} One study reported that the diagnosis of GDM did not have an adverse effect on emotional status compared to the emotional status in a normal pregnancy population.⁸ Langer reported that insulin use did not have a significant negative mood impact on women with GDM compared to diet treatment.⁴ Another study reported that the anxiety level at GDM diagnosis was higher but declined towards the end of the pregnancy and became similar to the anxiety level in a normal pregnancy group⁵. These studies justified the importance of GDM screening and emphasized the importance of insulin treatment.

Although the above literature showed that the stress and anxiety at diagnosis were either not significant or would decline, this study showed that at 33-37 gestational weeks, more than half of these women were still distressed about the diagnosis and the high risk pregnancy; still struggling with GDM dietary management, and had anxiety toward the complications. This study revealed that women who had the above-mentioned stress and anxiety experiences had significantly higher levels of stress and anxiety scores respectively than those who did not have such experiences. More specifically, significantly more women on insulin tended to be stressed by dietary management compared to the ones on diet treatment only. These findings contradict with the literature that women on insulin experienced no more negative mood impact or they considered

insulin was an “easier option” in GDM management.^{4,30}

In this study, every woman tested her blood glucose after meals. In their self-evaluation, high blood glucose reading reflected the success or failure of their dietary management. Women on insulin had significantly higher perceived stress levels, which were related to a failure of dietary management and difficulties in achieving target blood glucose. According to the 2013 Canadian Diabetes Association Clinical Practice Guidelines, insulin therapy is recommended when diet and exercise failed to achieve target blood glucose levels.³¹ Insulin therapy should not jeopardize the woman’s ability of choosing healthy balanced meals. However, in this study, women on insulin felt more stressed and restricted in eating due to difficulties in achieving blood glucose targets. This was correlated with the PSS scores that were significantly higher among women on insulin.

Fear of large sized babies, C-section, and future diabetes were the major anxiety experiences in this sample. These anxiety experiences could be aggravated by the perception of a high-risk pregnancy and stress from dietary management failures. Women who shared this kind of anxiety experience had significantly higher PSS, PAS, and STAI-T scores compared to the ones who did not have this kind of anxiety experience. Abnormal glucose readings aggravated the anxiety experience and sometimes led to an emotional breakdown and restricted eating for some women.

In this study, individual PSS, PAS, and STAI-Trait scores were correlated. Spielberger reported that the correlations between STAI State and Trait Scales in two female samples were 0.59 and 0.70 (college students and working adults).²³ He also reported that this state and trait correlation tends to be higher if there is a threat to self-esteem or personal adequacy under evaluation rather than environmental physical danger. The state and trait correlation also will be higher if the questionnaires are given at the same testing session. This study was intended to explore the perceptions of dietary self-management, thus self-esteem and personal adequacy were important components. Questionnaires were given to the participants at the same interview session. These could influence the correlation between the state and trait anxiety measurements in this study. A study by Pluess reported that trait anxiety was significantly associated with state-related psychological measures such as perceived stress, depression, and pregnancy anxiety in women with GDM.⁹ Dipietro suggested that no matter how we design the state anxiety questionnaire wording to reflect a certain time parameter, the results seemed to measure participant's psychological attributes, not state³². Table 5.2 suggests that the STAI-T associates with potential stresses over which the women do not have control. It also suggests that women who talked about anxiety were expressing both anxiety and stress. This phenomenon has been reported in Glynn's study in pregnant women in the United States. The study found high correlation of 0.80 between PAS and PSS at 30-32 gestational weeks in 415 normal pregnant women.² Besides the possible influence of anxiety traits on stress and anxiety response, this study showed that significantly more women who used insulin experienced higher levels of perceived stress and dietary management related stress.

The Food Choice Map (FCM) interview was unique in capturing participants' eating patterns, reasons behind the food choices, and the emotional distress. The interview dynamic ensured that experience on dietary management was fully discussed, but also provided opportunities to extend the discussion to exercise, blood glucose testing, and insulin injections if the participant felt they were related to the diagnosis and dietary management. In this study, the results from FCM interviews data collection identified common distressful experiences such as perception of a high-risk pregnancy, stress related to diagnosis and dietary management, and anxiety related to complications. Some of the results such as stress related to diagnosis and the perception of a high-risk pregnancy have been reported in the literature¹¹ but new insights were provided such as stress and anxiety were associated with different contexts in GDM management. More importantly, a vulnerable group, women who were on insulin was found to be more challenged by dietary management. The findings of this study suggested that women with GDM need mental health supports for them to handle emotional distress, as proposed by Persily,³³ but more especially dealing with dietary management and complication fears.

The nature of a concurrent mixed methods approach caused limitation in this study. The participants were recruited purposively and the sample size was small. This resulted in a demographic composition where the majority of the participants were married and with high education levels. The results of the study were not meant to be applied to the general GDM population. Future studies on dietary barriers in low SES group will complement this study.

Implications for diabetes educators

This study reported that women who received insulin treatment had significantly higher perceived stress levels. Their real life experiences behind the perceived stress could be the result of their difficulties in dietary management. This was an important finding, which suggested that women with GDM using insulin treatment might need more support to cope with their dietary management. While more tailored education might decrease dietary management stress, other emotional distress that women had less control over, such as stress related to diagnosis and high risk pregnancy and the fear of complications, should not be neglected. Methods to reduce existing stress and anxiety in a short-term period may improve the quality of mental health. One study has demonstrated that pregnant women who received 7-weeks of relaxation training during the second trimester could significantly reduce perceived stress scores and STAI-State anxiety scores compared to the control group.³⁴ Future studies could explore programs that can reduce stress and anxiety levels in this targeted group.

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TABLES

Table 5.1. Demographic characteristics of participants (n=30)

Characteristic	Distribution		
	Median	Min - Max	
Age (year) (range)	29	20 - 42	
Weight gain (kg) (range)	11.90	0 - 28.18	
Gestational weeks at interview (week) (range)	36	26 – 38	
Weeks after initial dietary session (week) (range)	4.5	2 – 10	
	% of total participants	Participants/total participants	
Pre-pregnancy BMI	Normal Overweight or obese	27% 73%	8/30 22/30
Marital Status	Single Married or Common Law	20% 80%	6/30 24/30
Number of children < 18 years of age	None ≥ 1	50% 50%	15/30 15/30
Level of education	High school College/University Post-graduate	20 % 73% 7%	6/30 22/30 2/30
Employment status	Unemployed Employed	27% 73%	8/30 22/30
Annual household income	Less than 20,000 20,000 – 39,999 40,000 – 59,999 60,000 over	13% 27% 27% 33%	4/30 8/30 8/30 10/30
Ethnic	Caucasian Asian African Aboriginal	53% 27% 10% 10%	16/30 8/30 3/30 3/30
Received insulin treatment	Yes No	43% 57%	13/30 17/30

Table 5.2. Difference in questionnaire scores between participants who mentioned a certain theme and the ones who did not (Wilcoxon Mann-Whitney U Test)

Questionnaire	Theme 1: Stress related to GDM diagnosis and the perception of a high risk pregnancy			Theme 2: Stress related to the dietary management process			Theme 3: Anxiety related to GDM complications		
	Mentioned (n=17)	Did not mention (n=13)	p value	Mentioned (n=18)	Did not mention (n=12)	p value	Mentioned (n=16)	Did not mention (n=14)	p value
PSS Score (median, 25-75%)	21.00 (17.00-23.00)	13.00 (9.00-17.00)	* <u>0.001</u>	20.50 (17.00-22.75)	12.50 (9.00-15.50)	* <u>0.001</u>	20.50 (17.00-23.25)	12.50 (9.25-16.50)	* <u>0.0006</u>
STAI-T Score (median, 25-75%)	42.00 (36.00-50.00)	36.00 (34.00-37.00)	* <u>0.02</u>	42.50 (34.50-48.50)	36.00 (33.00-37.25)	0.062	43.00 (39.25-49.50)	34.50 (32.50-36.00)	* <u>0.002</u>
PAS Score (median, 25-75%)	21.00 (18.00-27.00)	18.00 (14.00-22.00)	0.13	19.50 (17.25-24.00)	19.00 (15.50-22.00)	0.49	22.50 (19.00-27.25)	16.50 (14.00-19.50)	* <u>0.002</u>

* p value less than 0.05

Table 5.3. Descriptive values of maternal psychological measures at 33-37 gestational weeks

Questionnaires	Median (25-75%)
Perceived Stress Scale (PSS)	17.00 (13.00-21.75)
Pregnancy Anxiety Scale (PAS)	19.50 (17.00-23.75)
State Trait Anxiety Inventory (STAI-Trait)	37.00 (34.00-43.75)

Chapter 6

Barriers and Coping Strategies of Women with Gestational Diabetes to follow Dietary Advice

Chapter 4 reported that not every woman felt the same about the dietary information they received. Although everyone went through the education session, health information was not the one and only reason that directed their eating. This is the chapter that practice dietitians would probably be most curious. What happened after the patient left the consultation? Do they follow the dietary advice and recommendations? If not, why not?

The purpose of this paper was to explore the common barriers that women with GDM encountered during the dietary management period. Then the analysis went further, using the Integrated Model of Behavioral Prediction to explore underlying beliefs and factors that may lead to these barriers. Using the model to understand the important factors that caused the barriers may aid in further studies to influence or nudge certain beliefs and external factors to promote dietary behavioral change.

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AH conceptualized the research design, carried out data collection and data analysis procedures, and wrote the manuscript. GS contributed to the research design and data analysis. DH and ES made intellectual contribution to the research design.

ABSTRACT

Objective: To understand barriers and coping strategies of women with Gestational Diabetes (GDM) to follow dietary advice. **Design:** Qualitative study. Participants: Thirty women with GDM from the Winnipeg area participated. Each participant completed a Food Choice Map (FCM) semi-structured interview and a demographic questionnaire.

Major Outcome Measures: Underlying beliefs of women with GDM and factors that hinder following dietary advice. **Analysis:** Qualitative data analyzed using a constant comparative method to identify emergent themes of factors and beliefs that affected following dietary advice. Themes were categorized within the Integrative Model of Behavioral Prediction. **Results:** GDM women faced challenges and barriers when 1) personal food preference conflicted with dietary advice; 2) eating in different social environments where food choice and portions were out of control and food choice decisions were affected by social norms; 3) lack of knowledge and skills in dietary management and lack of a tailored dietary plan; and 4) limited time for dietary changes.

Conclusions and Implications: Quick adaptation to dietary management in a short time period created challenges and emotional distress for women with GDM. Tailored educational and emotional health consultation with consideration of the barriers may promote dietary compliance and overall better health.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance with onset or first recognition during pregnancy.¹ In Canada, the prevalence of GDM varies from a range of 3.5-3.8% in the non-Aboriginal population to a range of 8-18% in Aboriginal populations.^{2,3} Treatment of GDM has shown to improve maternal and neonatal outcomes.^{4,5} Risk reduction requires extensive behavioral and self-care modifications, which can include strict dietary regulations, possible insulin injections, frequent blood glucose monitoring, and increased visits to healthcare providers for maternal and fetal surveillance.⁶ Treatment of GDM must begin immediately after the diagnosis. It is recommended that women with a diagnosis of GDM be referred to a registered dietitian for individual nutrition consultation.⁶ However, managing diabetes in pregnancy can be challenging, especially for women with no previous experience with diabetes but need to meet the blood glucose target within a limited period of time. Previous studies have reported that women with diabetes during pregnancy felt a sense of decreased control and frustration about their condition.⁷⁻⁹ Following dietary advice has been considered a major challenge in GDM management.^{10,11} However, there still are research gaps on: 1) what specific barriers are related to dietary management in women with first time diagnoses of GDM; 2) what beliefs and factors caused these barriers; and 3) how do women cope when they encounter barriers in dietary management.

This study was intended to address the above questions. The results will provide a better understanding of the barriers to following dietary advice that women with GDM might encounter, and how they coped when presented with dietary challenges. This may enhance our understanding of the target population so that dietary management education would be meaningful and client-centered.

METHODS

Study Design

This study used a qualitative approach. In-depth interviews provide the means for the participants to freely express their experiences and ideas in their own words. It is an effective way to identify factors that are relevant to a particular health behavior in a population under investigation.¹² An in-depth interview that could both record a complete eating pattern and also provide opportunities to explore reasons for food decision making was favored in obtaining the data for this study. The Food Choice Map (FCM) is a semi-structured in-depth interview method that was used to understand a participant's weekly eating pattern and meanings of the eating pattern.¹³⁻¹⁵ It uses food to start the conversation and it helps the researcher to explore meanings behind eating behaviors.²

² The recruitment method described has been published in Hui, et.al. Food choice decision-making by women with gestational diabetes. 2014 and may be included in future publications

The FCM interview tool consists of a board to record food frequency and meal/snack time in a regular week, and food picture stickers from common food groups that could represent 9,100 different foods. The participant placed the food pictures that represent the foods consumed in a week on the food map board. The dynamic of building this weekly food pattern allows opportunities to explore hidden reasons behind food behaviors. The advantage of using the FCM interview is that it collects a whole week eating pattern. It provides the opportunity for the woman to discuss any food that was important to her in the context of dietary management without forgetting any food by chance. This kind of data collection has been validated to collect accurate, reliable, and rich qualitative data when collecting information on eating behaviors.^{13,15,16}

A semi-structured interview guide (Appendix D) was developed with probes on reasons for food decision making in following dietary advice. Through the FCM interview, a woman's experience on dietary management was explored by discussing reasons of her food decisions. Any perceptions of barriers for following dietary advice, if reported, were captured through the interview to answer questions in the mentioned research gaps.

The Integrative Model of Behavioral Prediction¹⁷ was used to guide the interpretation of the interview data. The Integrative Model of Behavioral Prediction has been used in qualitative research in the past to explore risk factors for excessive gestational weight gain in low-income women.¹⁸ This model suggests that an individual's behavior change can be predicted by the intention for such a change, which could be influenced by a set of

beliefs that the individual holds. These beliefs are: behavioral beliefs and outcome evaluations (what outcomes will come with the behavioral change), normative beliefs (the perception of how other people think of what the individual should or should not do) and efficacy beliefs (believe that one can perform a certain task (self-efficacy)). Skills and environmental constraints are two other important factors for a behavioral change to happen. A behavioral change is unlikely to happen if the person lacks skills or encounters environmental constraints, even if the person has intentions for the behavioral change.

Sample Selection and Recruitment

Thirty participants were purposively recruited from a hospital outpatient endocrinology clinic that receives GDM referrals from all over Manitoba.

Upon the approval from the University Research Ethics Committee and the hospital research ethics review board, the researcher posted a recruitment flyer in the clinic. Respondents who were interested in the study contacted the researcher to set up an appointment and to complete the study consent form and a research interview. The inclusion criteria were: 1) lived in Winnipeg and surrounding communities but worked and did grocery shopping in Winnipeg; 2) attended at least one education session with a registered dietitian after diagnosis of GDM; 3) were able to communicate in English and were not visually impaired (were able to complete the FCM, the consent, and the demographic questionnaire); and 4) had not been previously diagnosed with GDM.

Thirty women were recruited and interviewed by the first author at the participants' homes during May 2011 to February 2012. These participants were diagnosed with GDM at 24-28 gestational weeks following the Canadian Diabetes Association Clinical Practice Guidelines.⁶ All the participants received dietary consultation from a dietitian during their first visit to the endocrinology clinic. Dietary follow-ups varied from weekly to bi-weekly. All participants had received dietary consultation and were practicing dietary management at the time of interview. A Thank You card with a \$20 grocery gift card was given to the participant after the interview.

Data Analysis and Interpretation

All the interviews were recorded using a digital recorder and were verbatim transcribed and imported into NVivo 9 qualitative data analysis software¹⁹ for thematic analysis by the first author. Important steps of the analysis were: 1) ongoing coding of all information in transcripts as recruitment and interview progressed; 2) revising codes and recoding previous data as analysis progressed; 3) discovering similarities and differences among the participants through constantly comparing and contrasting the data; and 4) categorizing codes into themes.^{20,21} Interview data coded as women's perceptions of "barrier" and "enabler" were put together to review and looking for common themes. Themes related to experiences that could be barriers to following dietary advice were identified.

After the common barrier themes were identified, the same data were analyzed again using the Integrative Model of Behavioral Prediction¹⁷ to look for underlying beliefs that could enable or hinder following dietary advice. The structures in the model were used to start the analysis but not limiting other new constructs that could emerge during the analysis.

Verbatim quotes that were selected for presentation are good illustrations of the identified themes. Steps were taken to corroborate study findings, a concept in qualitative research similar to reliability and validity in quantitative research.²² These included: 1) transcripts were reviewed by the participants to verify the interview conversation; 2) data transcription and data analysis occurred concurrently during data collection to ensure sample saturation; 3) use of an independent investigator outside the research study to code four transcripts to achieve high kappa scores (values above .80 are regarded as nearly perfect agreements)²³ 4) systematic checking of themes against supporting quotations, and 5) independent review of transcripts, categories, frequency tables, and themes by the second and third author who had experiences in qualitative research. Any disagreements were discussed and data and analysis rechecked until agreement was achieved.

Demographic data collected from the questionnaire were used to describe the sample population.

RESULTS

All participants were interviewed at 26 to 38 gestational weeks (median 36). Theoretical saturation was reached with this sample size. The majority of the women had an above normal pre-pregnancy weight ($BMI \geq 25$), were married and employed. Eighty percent of the participants had at least a college education. Fifty-three percent of the participants were Caucasian and the rest were Asian, African, and Aboriginal. All the participants were diagnosed with GDM for the first time. Forty-three percent of the participants received insulin treatment at the time of the interview. No participant used oral agents for GDM treatment. All participants performed self-glucose monitoring during the GDM pregnancy.

All participants received dietary advice from the dietitians on food groups, portion sizes, sugar alternatives, label reading, and sometimes carbohydrate counting if the participant was on insulin. The Diabetes Food Guide²⁴ (adapted from the Canada Food Guide) was given to all the participants. The Diabetes Food Guide recommends daily intake of 6-8 choices of grain and starches, 3 choices of fruits, 2-3 choices of milk and alternatives, 4-8 choices of meat and alternatives, 5 or more choices of vegetables, and fats and oils in moderation.

Beliefs that may enable women to follow dietary advice were expressed as the controlled eating is temporary and will be over soon, and high blood sugar is dangerous to the baby

and will cause problems in delivery. This group of women generally agreed with the advice from healthcare professionals such as high blood glucose leads to complication for both mother and the baby. Their trust in the medical facts presented by the healthcare professionals could be related to this group of women's education level. As one woman said, "The doctor told me, with gestation diabetes, your target readings have to be lower (than type 1 and 2 diabetes). Then other people who have diabetes actually argue about it. I have to do what the doctor says. I am sorry." Another similar comment was, "I haven't followed what other people say about diabetes. I have been sticking with what the doctor says. I figure she had gone to school long enough. I probably can trust her".

However, the belief in medical facts was not enough to eliminate barriers to following dietary advice. There were four common barriers that women encountered when following dietary advice. 1) personal food preference conflicted with dietary advice; 2) eating in different social environments where food choice and portions were out of control and food choice decisions were affected by social norms; 3) lack of knowledge and skills in dietary management and lack of tailored dietary planning; 4) limited time for dietary changes. These barriers were explained by the underlying beliefs and the influencing factors from the Integrated Model of Behavioral Prediction.

Behavioral beliefs and outcome evaluations

Two behavioral beliefs expressed by twenty-one women were that food decision making should be based on personal food preference and craving during pregnancy is normal and should not be neglected. Therefore, when recommended dietary advice did not fit into this belief, noncompliance could occur. One woman stated, “Sometimes I feel there’s so much meat, and I would normally not eat that much meat. But it’s one of the things that the dietitian said it doesn’t affect your blood sugar”. Another woman said, “I found the advice is hard to follow because I am not able to eat what I want to eat, like I normally would”. One woman commented on her cravings, “I’m sorry, but, if you’re pregnant, guess what, you’re eating ice cream. It just goes hand-in-hand.”

Another behavioral belief was that meal spacing should follow one’s lifestyle habits or work schedule. It was expressed by seven women that rescheduling new meal times was hard because the recommended frequency of meals conflicted with their work schedules and lifestyle. One woman said, “My lifestyle was really low key and just grab something (to eat). But now I have to put things together and sit down and actually have a specific time to eat and so it’s not easy.” Another woman commented on the difficulty of eating smaller frequent meals, “When I was working, I would eat breakfast early in the morning. I am always on my feet so then like a small breakfast would make me hungrier.”

When there was a conflict between eating personal preference foods and trying to meet the blood glucose targets, seven women decided to eat the “forbidden food” as a snack.

They purposely did not check the blood glucose afterwards. One woman said, “The doctor said only check after meals, not after the snacks”.

Although the belief of “high blood sugar is dangerous to the baby” could motivate women to follow dietary advice, fear and worry about GDM complications could hinder women following dietary advice. Some women reacted extremely worried with abnormal blood glucose readings, even if it was slightly outside the target range. The emotional distress often resulted in crying, running outside after high readings hoping to lower blood glucose, or skipping meals. These women believe that achieving the blood glucose target is more important than eating healthy balanced meals. One woman said, “I check with the meter and if it goes high, I don’t eat anymore”. Another woman who chose to have more frequent clinic visits than needed explained that she wanted to receive more monitoring and assurance on the baby’s health. However, she repeatedly ate the same meals that stabilized her blood glucose.

Normative beliefs

Normative beliefs such as “People would expect me to eat like a normal pregnant woman”, and “I don’t want my friends or relatives think I am an outsider” caused barriers to following dietary advice. Seven women were challenged by eating in different social environments. They were uncomfortable measuring the amounts of food in public and

felt that their friends or relatives would expect them to eat like a normal pregnant woman. One woman said, “There’s going to be like twenty-five other people in the house. I do not want my cousins looking and going like – why don’t you just take a scoop and forget about it. I’m debating in my head, should I take my measuring cups and my scale or should I just enjoy myself and write down the consequences?”

In this study, sixteen women mentioned that their spouses or partners showed support by helping with food preparation and grocery shopping. Some spouses even supervised the following of dietary advice from healthcare professionals and believed that “this is the right thing to do” and “it is good for the baby”. However, when women and their spouse involved in social eating events, the social environment posed specific norms and environmental constraints on some women. One woman said, “His friends are here so we have been going out late at night. Like around 8 or 9 o’clock at night and they want to go for wings and ice cream. I had ice cream almost every day this week.”

Although many spouses agreed with the importance of dietary management, some also supported the normative belief that pregnancy craving should be satisfied. This kind of support sometimes provided the opportunity for women to indulge in certain forbidden foods. As one woman said, “we had seen a hot dog vendor again and again but being pregnant I wouldn’t buy from a vendor. I feel comfortable if my husband makes the hot dogs. Finally, we made it to Safeway and bought hot dogs. I had three hot dogs for supper that day”.

Skills and Environmental constraint

Justifying the amount of carbohydrates for a meal was a big challenge for twelve women trying to follow dietary advice. The lack of knowledge and skills in label reading or carbohydrate counting created difficulties in estimating carbohydrate content in daily food and limited food variety. Eighteen women including all the women on insulin experienced challenges on matching food carbohydrate to insulin or understanding the carbohydrate amount in foods. After trials and failures, women felt discouraged and stressed with following dietary advice. One woman stated, “You’d think, okay, this will be fine for me to eat. Then I will check my sugars two hours later and it would not. I would be why? No, no, that is not okay. It was disappointing and it was definitely stressful, it was really not fun”. One woman shared her frustration on giving up the food that she likes, “I was told that I could have oatmeal but every time I have oatmeal my sugar was so high. It was ridiculous”.

Eating out posed as an environmental constraint as not knowing the carbohydrate content of food. One woman expressed her worry about eating in restaurants, “My anxiety and my discomfort come when someone says let’s go for lunch and then I sort of panic. It is like what am I going to eat? Even a salad in a restaurant could be not too good for, you know, like depending on how much sugar is in the dressing”.

Every woman received a copy of the Diabetes Food Guide. However, the Diabetes Food Guide information was considered too general by this group of women. Experiencing how different food affects blood glucose was not easy for them and they preferred more guidance. As one woman stated, “Your first couple of weeks you have to eat and figure out what it does for you. That’s why I found the first couple of weeks were harder”; another woman said, “I don’t need them to give me a meal plan but a list of options or suggestions and then it won’t be like figure it out on your own”.

Structured sample meal ideas were considered helpful by half of these women. One woman said, “I’m finding a meal plan would have been helpful, just to know that if you want to have this, if you put it with this and this you’ll be full and you’ll be safe”; another woman said, “I would like to know like grams of sugar or something, what would be too much in a day, or what would not be enough, like the exact amount of sugar, but they (healthcare professionals) said, “Oh, we don’t really tell you the exact amount of sugar that you should not be eating”.

Efficacy beliefs

Not able to adapt to dietary changes in a limited time period was one common efficacy belief, especially when women had strong food preferences and long-term eating habits. One woman said, “I have to say this whole diabetes thing is really, really new to me so I

have to learn portion size, how much carbohydrate today. It is hard to get your head wrapped around to eat this and that.” Another woman commented, “I am scared of doing the wrong thing, because I have been doing it in a certain way for forty years, that it would slip. I am in a world of unknown”.

Efficacy beliefs also can be affected when women encounter the above-mentioned barriers in dietary management. The abnormal readings created emotional distress, which affected women’s attitudes of “I can do this”. One woman commented, “It is frustrating when you watch your carbs, you portion it and then your reading is still high.” In addition, when women started insulin treatment or increased insulin dosage, there was a sense of failure that their dietary management was not successful. One woman who needed to adjust her insulin said, “It was discouraging to hear that I need that much insulin whereas some people don’t”.

Coping strategies

Challenges in dietary management could affect women’s self-efficacy, their attitude and intention to following dietary advice. Some women developed coping strategies.

Restrict carbohydrates. The fear of going on insulin treatment sometimes resulted in obsessively reducing carbohydrate intake in women treated with diet only. For these women, the evaluation of GDM dietary management was based on blood glucose

readings. The fear of insulin outweighed the concerns of eating imbalanced meals. One woman stated, “Well, I steer clear of the carbs and that’s where I’m struggling; like sometimes I’m not taking the amount that they want me to have. I’m taking less, because I know it’s going to spike my sugar.”

Stay with a simple diet that works. One of the coping strategies used by seven women was to stay with a simple diet that worked. As one woman explained, “I just eat plain, boring for a little period of time, then (after delivery) I will be fine.” Meeting the blood glucose target was often considered the first priority for these women because they worried about infant complications. Following the Diabetes Food Guide and eating balanced meals were not that important for these women. One woman said, “Because, again it’s about trying to balance my sugars. We’ve been having a hard time getting them down, so when I find something that works, I stick to it”. Another woman said, “When I found this breakfast and then with the amount of insulin, the blood sugar is okay, so I stick with the same breakfast”.

However, participants who were “strict” on eating controlled meals, especially simple, repeated meals often expressed that they plan to engage in “binge eating” on their favorite “forbidden foods” after delivery. One woman expressed her desires for the forbidden food, “As soon as this baby is out, get me the biggest cheeseburger you can possibly find”. Another woman had a similar comment, “After the baby is born, I will celebrate with juice”.

Avoid social eating. Six women either reduced frequencies of eating out due to unfamiliar carbohydrate content in restaurant food or avoided eating in social settings because the difficulties of controlling food choices and portion sizes. One woman tried to avoid eating with her parents who lived down the street. She said, “If they’re at mealtime, I won’t go there. I will just come home and eat whatever I have because my family has bad choices. They are where I was. They eat deep fried foods and garbage and Pepsi”.

Spiritual support. Praying for will power to resist food temptation was mentioned by four participants. One woman said, “I pray a lot and I trust in the Lord and I know things will be fine. That helps me not to want things that I shouldn’t be eating”. Another woman relied on a spiritual coach to balance her stressful life with GDM. She said, “The nutritionist in the hospital didn’t emphasize enough that this (GDM) is the major priority. Whereas with the spiritual coach said this (GDM) is number one. It is telling me to stop and pay attention”.

DISCUSSION

A conceptual framework was developed based on the study results to illustrate the underlying factors as possible barriers of following dietary advice (Figure 6.1). In the left box, the underlying beliefs from behavioral, normative, and efficacy beliefs affected women to follow dietary advice based on the Integrative Model of Behavioral Prediction. Two other factors such as skills (perception of lacking of dietary management skills) and environmental constraint (unfamiliar eating environment) added extra barriers in the

following dietary advice process. On the bottom, a new insight is that when women encountered barriers of following dietary advice, several coping strategies emerged.

Client-centered approach nutrition counselling is recommended in Canadian dietetic practice. However, issues remained as during limited clinic consultation time, dietitians struggle between their pre-determinate health information and what the clients wants.²⁵ This study finding contributes to this research gap by providing a better understanding for dietitians about the meaning of dietary management in women with GDM from the clients own perspective.

Women with GDM whose food choice decisions were mainly influenced by personal food preference could be challenged by dietary alterations. The cheating on one's favorite foods or meals has been reported in a Canadian study of Aboriginal women with GDM.⁸ These women could have benefited from a diet consultation, which considered their personal preference foods.

In this study, the benefits of dietary management and controlling blood glucose during GDM pregnancy were recognized by many spouses and partners of the participants. However, the perceptions of eating during a GDM pregnancy were different outside these women's homes. Some women felt they were losing control of how and what they should be eating outside their home. This is consistent with previous studies' findings that

women with GDM felt eating on social occasions could create an inconvenient and awkward situation. Thus, they felt socially apart.^{7,26} In this study, some women chose to avoid these kinds of social eating events. Losing control is not only about losing personal control in following dietary advice, but also losing such control within a social environment.

The participants faced the challenges of adapting to an altered dietary behavior within a limited period of time. Insulin therapy was recommended when lifestyle intervention failed to achieve target blood glucose.⁶ One study reported that women with GDM considered insulin as “an easy option” to achieve optimal glucose targets.²⁶ This study with a specific focus on dietary compliance found that dietary management was especially challenging for women who were on insulin. They coped with sticking to simple, repeated meals that gave them satisfactory postprandial blood glucose readings. Some women who were not on insulin restricted their carbohydrate intake to avoid insulin initiation. These self-practice food restrictions might result in blood glucose readings within target ranges. Hence, these eating behaviors were reinforced. However, restricted low caloric or low carbohydrate diets during pregnancy could increase ketone levels. Studies have shown that ketonuria or ketonemia could affect the cognitive development of infants.^{27, 28} These women could benefit from a structured, personalized meal plan, as suggested by the participants.

Low education level and low health literacy level have been associated with decreased perceptions of the seriousness of GDM and self-management.²⁹ The majority of this group of women had college education and they believe that GDM self-management is important. However, lack of dietary knowledge and skills decreased these women's self-efficacy for making a dietary adaptation in limited time. Some coping strategies that this group of women used could make them feel deprived from the pleasure of eating, both physically and socially. One Canadian study on Aboriginal women with GDM reported that some participants used "binge eating" in diet struggles.⁸ This was not observed in the study sample. However, the intention of binge eating after delivery was mentioned by this group of women. This intention could affect postpartum eating habits. Women with GDM are at higher risks of developing future DM2.^{30,31} Studies have showed that healthy eating after a GDM pregnancy was not easy.^{32,33} An intention of binge eating could create more barriers to dietary improvement postpartum.

This study did not record the frequencies of the participant interaction with the dietitian. In general, women on insulin might have more frequent follow-up visits to adjust insulin and receive dietary review. Increased dietitian interaction might improve the knowledge and skills of women on label reading and carbohydrate counting. However, other beliefs that hinder dietary compliance need to be explored to ensure the behavioral changes happen.

The limitations of this study are related to qualitative research. The participants were recruited purposively and the sample size was small. This resulted in the demographic composition of the majority of the participants were married and with college education level. This could be due to pregnant women with low socioeconomic status tended to have less access to healthcare services.³⁴ Therefore, fewer were contacted at the recruitment clinic. The results of this study cannot be generalized to a larger population but to provide understanding of barriers to following dietary advice in this demographic group. In Manitoba, Canada, advanced age is one contributing factor for the increased rate of GDM.³⁵ In this society, there are an increasing number of women who enter pregnancy at an older age, with established careers and stable incomes, and are at risk of GDM. The findings of this study are still meaningful to understand this group of women.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The finding from this study suggested that an individualized meal plan with considerations on personal food preference and possible social eating environments could be beneficial to women with GDM. Follow-up assessments on appropriate intake and meal balancing could help to identify barriers in dietary modification. Therefore, specific nutrition knowledge and skills can be reinforced, especially for women on insulin. It is important to educate the clients that achieving target blood glucose and health eating are both important for healthy fetal growth.

Further study focusing on women in different socio-economic groups could complement the results from this study.

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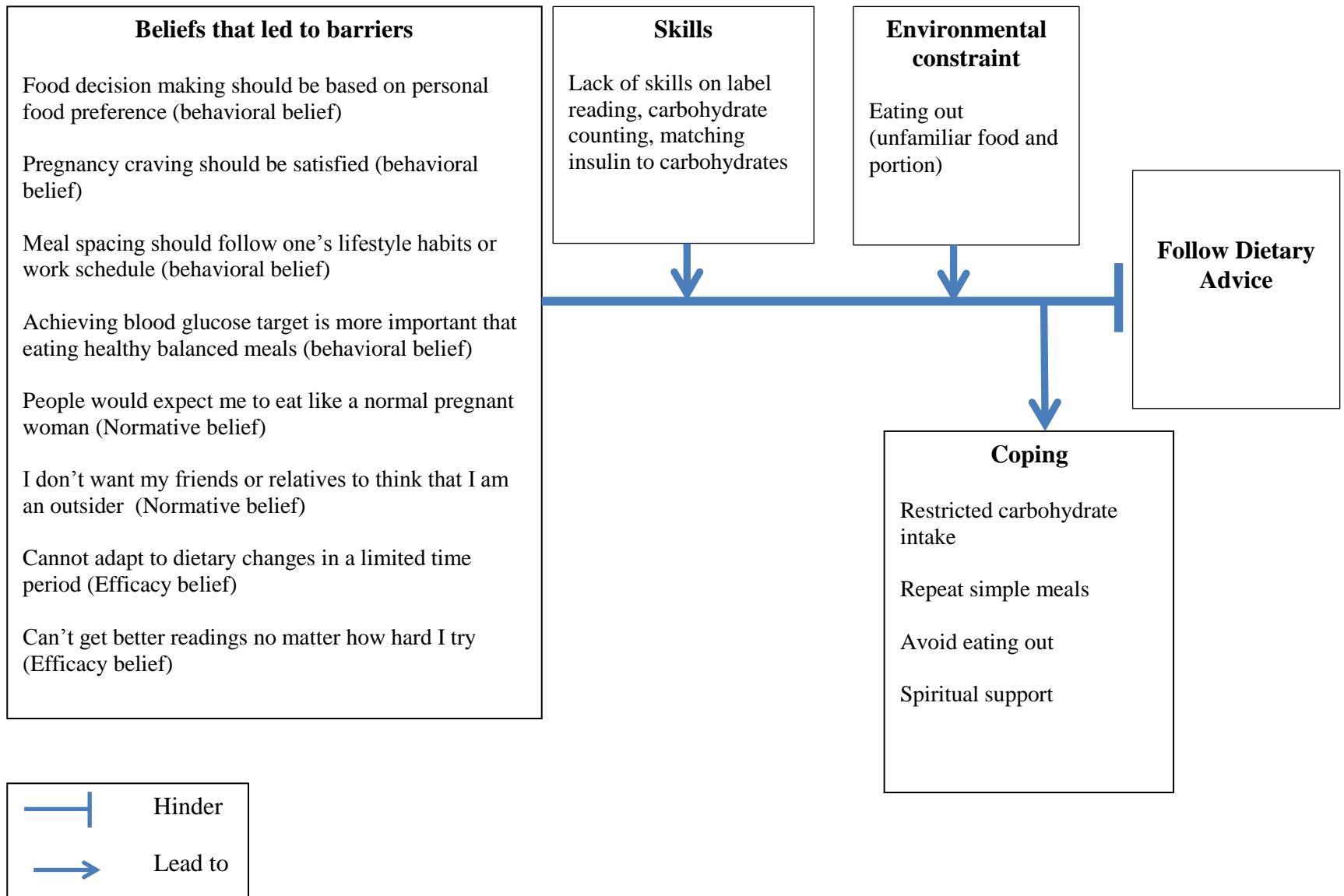
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Figure 6.1. Conceptual framework for the barriers of following dietary advice in women with GDM



Chapter 7

Discussion

The main purpose of this dissertation was to understand nutritional behaviors of women with GDM, how they follow dietary advice, and how they felt about the experiences of dietary management.

Chapter 4 answered research question one by exploring factors that affect what foods women chose to eat. These factors were individual food preferences, hunger, cravings, and information use. Besides the dietary information from the health care professionals, women also sought information from different sources to make food choice decisions. The extra information sources were required because they felt that they needed more information to adapt to the dietary changes, especially when the information provided was too general, and when some of the dietary advice conflicted with their eating habits. Difficulties in dealing with cravings, food portion size, hunger, and eating out led to a sense of decreased control and to stress and frustration. These findings supported that despite the dietary recommendations from the health care professionals, food choice decisions were still strongly affected by individual factors. These findings also explained the sense of decreased control in the context of dietary self-management, which is unique in the literature.

Chapter 5 answered research question two by reporting the stress and anxiety status of women with GDM in this sample who had received dietary consultation. The GDM

diagnosis triggered stress in some women. Since the perception of the successfulness of GDM dietary management was evaluated by blood glucose readings, abnormal blood glucose readings represented a failure of dietary management and caused stress in some women, especially when efforts were made to follow dietary advice, or participants tried to use the learned knowledge and skills to improve the quality of eating. Women who were on insulin were more likely to experience dietary management related stress compared to the ones on diet treatment only. Anxiety was explained as the fear of the size of the infant and labor complications. These kinds of fears could be aggravated by abnormal blood glucose readings and hence triggered some emotional breakdown and coping actions. These are new findings in the literature and suggest that stress and anxiety were associated with dietary management context in a GDM pregnancy. Women on insulin may need more tailored support in dietary management. These findings answered research question four and indicated that stress and anxiety negatively affect women with GDM who are trying to follow dietary advice.

Chapter 6 answered research question three and discussed that barriers to following dietary advice came from a set of beliefs such as behavioral beliefs of personal food preference, normative beliefs of how other people perceive GDM pregnancy, and efficacy beliefs of the capability of performing diet self-management. External factors such as their perceptions of lacking of knowledge and skills on daily dietary management, and making decisions on food choices and portions in unfamiliar eating environments were also barriers to following dietary advice. Stress and anxiety had a negative impact on dietary management because it reduced women's self-efficacy on

GDM management and led to unhealthy dietary coping strategies. It is important not to neglect the emotional influences when promoting dietary behavioral changes.

Collectively these results suggest that maintaining blood glucose control through dietary self-management was an overwhelming experience for more than half of the participants in this study. Dietary compliance was affected by complex factors. The process of dietary management has several stressors that caused stress and anxiety for women.

As Fishbein stated in his book, emotions that arise unexpectedly during a performance of a behavior could be intense [1]. People could be overwhelmed by such emotions and may not act according to the behavioral, normative, and control beliefs [2]. In this study, it was found that some emotions such as stress related to food decision making and anxiety caused by the women's observations of abnormal blood glucose readings, were not pre-existing emotions but arose during the process of adapting to a new dietary behavior. These strong emotions that women experienced plus the challenges that they encountered during dietary management led to alterations of the expected behavior --- instead of following dietary advice, some women used other diet coping strategies to reduce stress and anxiety and to achieve better blood glucose readings.

To cope with the negative emotional impacts from GDM dietary management, women in this sample chose to; 1) restrict carbohydrate intake; 2) stay on simple, repeated meals to avoid unpredictable blood glucose results; 3) avoid eating out or eating in different social environments; and 4) seek spiritual supports. The majority of the women in this sample

had a higher degree of education, were married, and had an average income over \$20,000/year. Research suggested that women with higher socioeconomic status (SES) tended to seek and use information from prenatal classes, books and magazines [3]. This group of women used information from different sources and adapted some “safe” meals and kept repeating them. Previous studies also suggested that the stress coping strategies from pregnant women with low SES could be substance abuse or fatalistic thinking [4-6]. These were not detected in the low SES participants in this study sample. Another study on aboriginal women with GDM’s food perception and coping with GDM from the same geographical area of this study revealed that more than half of the study sample reported overeating and binge eating due to a lack of control over GDM, especially when eating out [7]. This phenomenon was not detected in this study.

Time pressure has been reported to be a great challenge for women with GDM in the literature [8]. The perception of “time pressure” is related to the short time period allowed for women with GDM to achieve blood glucose changes according to medical treatment guidelines. According to the 2013 Canadian Diabetes Association Clinical Practice Guidelines, insulin therapy should be added two weeks after the initiation of diet therapy if the blood glucose has not improved. However, women in the interviews stated that the first couple of weeks were the hardest with which to cope. They felt pressured to achieve blood glucose targets within two weeks, or else they would be put on insulin. All women in this study had no experience of GDM or diabetes prior to pregnancy. The fear of complications caused anxiety, especially triggered by their observations of abnormal blood glucose readings. Lack of knowledge and skills created more stress when following

dietary advice. Some women who started with diet therapy were afraid to go on insulin so they might lower the carbohydrates in meals to achieve the blood glucose target. Women who were on insulin who were stressed about the glycemic control tended to stay with whatever foods that stabilized the blood glucose. Eating to meet a glucose target was perceived as a top priority of these women, thus sometimes outweighed following dietary advice. This kind of behavior contradicted the nutrition goals of GDM management, which was to provide adequate nutrition for maternal health and infant growth, and to achieve blood glucose targets. In this study, limited time created challenges for women with GDM to test their meal ideas to achieve target blood glucose. These women stated that a personal meal plan would help them to reduce the sense of failure compared to trying to create meal ideas on their own.

Stress and anxiety changes over time were investigated in the literature on their impacts to preterm delivery. Glynn's study measured the stress and anxiety levels of normal pregnant women in the United States at 18-20 gestational weeks and again at 30-32 weeks and showed that the increased pattern of stress and anxiety was a predictor of preterm delivery [9]. This study did not measure the changes in stress and anxiety pattern or their impact on birth outcome. One reason was that this study was intended to explore women's experience on following dietary advice after they received nutrition consultation. Another reason was due to the timeline of GDM diagnosis which was around 24-28 gestational weeks according to the Canadian Diabetes Association Clinical Practice Guideline [10]. After diagnosis, after these women met with the endocrinologist and the dietitian and participated in the study, the time left to investigate the impact of

stress and anxiety on birth outcomes was very limited. Therefore, using two questionnaires with a reasonable interval to investigate birth outcomes was not applicable in this study.

In the literature, Daniells' study measured the anxiety levels at GDM diagnosis and at the end of pregnancy in 50 women with GDM in Australia. The results showed a decline of stress and anxiety levels compared to the time of diagnosis, which was interpreted as women being able to adapt to GDM management as pregnancy progresses [11]. This study did not investigate if the stress and anxiety levels increased or declined compared to the time of diagnosis. However, it was clear that these women were still struggling with dietary management and still experienced stress and anxiety. A future study that measures the stress and anxiety levels at diagnosis and combined with an in-depth interview could provide more information on the stress and anxiety changes from diagnosis to the coping stage after dietary consultation. Therefore, stressors, levels and meaning of stress and anxiety could be assessed and explored, both quantitatively and qualitatively.

This study did not assess the nutrition intake of the women with GDM at the time of the interview. Although some women modified their meals to simple, repeated meals to achieve target glucose levels, the nutrition quality of the meals might not have been adequate. Restricted eating happened both in women on a diet or on insulin therapy in this sample. In women using diet treatment only, restricting or eliminating carbohydrates to avoid insulin was observed through the FCM interviews. In women who were on

insulin, eating repeated simple meals were used as a way to avoid fluctuated blood glucose. These self-practice food restrictions might result in blood glucose readings within target ranges. Hence, these eating behaviors were reinforced. However, restricted low caloric or low carbohydrate diets during pregnancy could increase ketone levels. Studies have shown that ketonuria or ketonemia could affect the cognitive development of infants [12, 13]. The FCM dietary interview tool does have the capability to document the quantity of food intake and perform nutrient analysis. Future studies could add the dietary assessment component to justify the diet quality.

This study was intended to explore the perceptions of women in GDM dietary management other than judging if the perceptions were correct. Although some perceptions were not scientifically correct, these perceptions were valid to women themselves. The perceptions that were discovered in this study could be used in future program implementation, to assess the risks associated with the perceptions.

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Chapter 8

Summary

GDM care involves a multi-disciplinary team approach that includes an obstetrician, an endocrinologist, a diabetes educator nurse and a diabetes educator dietitian. Different instructions are given to the patients and the team holds expectations of achieving these goals. There is a large body of research literature on the needs to improve patient's self-efficacy, to empower the patient, to improve mental health, and therefore to achieve better medical compliance. Thus, many approaches were invented and implemented such as motivational interviews and other patient empowerment strategies. However, maybe it is time the health services providers need to step back, think about the obstacles that patients encounter in real life, and realize that the patients do not have that much control. This study explored some of these factors such as the lack of knowledge and skills, social influences, and strong physical factors (cravings and hunger). The daily struggles with these factors often resulted in their observations of abnormal blood glucose readings, and hence created stress and anxiety in the process of dietary management. The sense of failure related to blood glucose evaluations has a negative impact on self-efficacy.

Study implications and limitations

These research results have significant implications for assisting diabetes educators to better design education programs and provide follow-up supports. First and most

importantly, setting up proper goals for self-management is important and could prevent women from evaluating all the self-management efforts based on the glucometer readings. Dietary education should be assessed by both meeting blood glucose targets and meeting individual nutrition goals. Optimal blood glucose readings should be achieved without losing diet quality. Women with GDM are at risk of future DM2 [1]. Future eating habits are important for DM2 diabetes prevention. The educators should take this pregnancy window opportunity to educate women on the importance of healthy eating and encourage postpartum healthy eating practices.

Second, time sensitive education should be considered in future education plans to relieve the “time pressure” on adapting new dietary behaviors. Extra support might be helpful, such as having a structured meal plan as indicated by the participants. A structured meal plan could incorporate personal preference foods and may relieve the stress caused by women who tried and failed with their own dietary experiments. A structured meal plan may also provide ideas on how to incorporate different food groups into balanced meals based on individual food preference. A structured meal plan may also reduce the possibility that women stay on simple repeated meals with low nutrition quality due to the lack of knowledge and skill to plan proper meals. Tips on eating at social events might be beneficial to reduce barriers and stress in these situations.

Third, while tailored education might decrease dietary management stress, other emotional distress that women had less control over, such as stress related to diagnosis and high risk pregnancy, fear of complications, should not be neglected. Methods to

reduce existing stress and anxiety in a short-term period may improve the quality of emotional wellbeing. One study has demonstrated that pregnant women who received 7-weeks of relaxation training during the second trimester could significantly reduce perceived stress scores and STAI-State anxiety scores compared to the control group [2]. Future studies could explore programs that can reduce stress and anxiety levels in this targeted group.

Although more interaction with health care professionals could assist in problem identifying and problem solving, increasing the number of dietitian visits might not be applicable depending on clinic workloads. Methods that could improve women's knowledge and skills, to practice on problem solving and provide instant feedback to direct dietary changes might be beneficial for this target group. In Canada, around 99% of the population has internet access; seventy percent of women in their childbearing years have access to a smartphone [3, 4]. Studies have showed that using innovated technology-based interventions can improve health behaviors in non-pregnant population [5, 6] and in post-partum women [7]. Using social media and mobile applications to provide instant resources and interactive learning might be useful for this population and could be explored in future studies.

An important role of the dietary intervention is a thorough dietary assessment with the consideration of the influencing factors for dietary change. The Food Choice Map can capture a weekly eating pattern with reasons behind the eating pattern and can be

considered in nutrition consultation. For example, how meal frequencies interact with pregnant women's daily activities, access of food, and social eating environment.

Individualized meal plans based on these factors could promote dietary behavioral changes. The FCM has been used as a nutrition intervention tool in pregnant women to control gestational weight gain. It has been shown to improve eating habits and decreased the excessive weight gain in pregnant women [8]. Future studies using this tool for GDM dietary education could be explored.

The nature of concurrent mixed methods approach caused limitations in this study. The participants were recruited purposively and the sample size was small. This resulted in the demographic composition of the majority of the participants were married and with college education levels. The results of the study were not meant to be applied to the general GDM population. Although this group of women had higher SES, another study that interviewed women with GDM in a socially deprived area in the United States showed that time pressure, social constraints, and inadequate knowledge were barriers to overall GDM management [9]. These support some of the findings in this study. Future studies on dietary barriers in low SES group will complement this study.

Study Contributions

This study has made an important contribution to the literature on client-centered approach in dietary counselling. This study is the only "real time" study specifically

targeted at the dietary self-management stage in women who had no previous history of GDM. Other studies in the literature either interviewed women postpartum, or explored overall GDM self-management experience during pregnancy, or had a mixture of new GDM patients and women with previous history of GDM. The concurrent mixed methods design allowed the researcher to collect quantitative psychological measurements and synchronized real life experience therefore gave operational explanations on the measurements.

This is the first study that investigated intensively the dietary management experience of women with newly diagnosed GDM. The FCM interview approach ensured a complete review and discussion of a weekly eating pattern. Each participant was treated evenly due to the dynamic of the FCM (building a map). This approach can minimize the chance that the participant elaborates on certain food and feelings but neglect the overall eating pattern or other important foods. Using the FCM in-depth interview to collect qualitative data to explore meanings behind the food choices and experiences related to living with GDM is an unique approach in the literature. Results from this kind of data collection could capture the whole picture of food choice decision-makings in the participants. This interview method was also able to capture rich information on the emotional distress in the participants to explain the stress and anxiety questionnaire scores in the mixed methods approach.

This study is the first one in the literature that reported women with GDM on insulin treatment tended to experience more dietary management related stress compared to those on diet treatment only. This finding has not been reported in the literature before and it contradicts another study that reported women considered insulin was “an easy way out”. This finding may also alert some health care professionals who tend to evaluate the success of GDM management on achieving tighter blood glucose control but neglect the negative emotional impact that comes with the intensified regime.

This study is an exploratory study. It provided understandings of nutrition behaviors of a group of women with GDM with a majority that have college education. Future research could focus on ways of overcoming barriers found in this study as well as a focus on different socio-economic groups to complement the results from this study.

Anderson and Funnell pointed out, “Unlike the treatment of acute illnesses, the most important choices affecting the health and well-being of people with diabetes are made by themselves and not by their physician or any other health professional. Every day they need to make a series of choices with regards to eating and physical activity that are very important in regulating their blood glucose levels and overall health”. [10] The writer hopes that the results of this thesis might help to decrease the gap of dietary information delivery and the knowledge application in women’s everyday life.

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Appendices

Appendix A. Certificates of Ethical Approval from the University of Manitoba Research Ethics Board



UNIVERSITY | Ethics
OF MANITOBA | Office of the Vice-President (Research)

CTC Building
208 - 194 Dafoe Road
Winnipeg, MB R3T 2N2
Fax (204) 269-7173
www.umanitoba.ca/research

APPROVAL CERTIFICATE

May 31, 2010

(Advisor - G. Sevenhuijsen)

TO: Amy Leung Hui
Principal Investigator
FROM: [REDACTED]

Re: Protocol #J2010:057
“Understanding Nutrition Behaviours of Women with Gestational Diabetes”

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement. This approval is valid for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- if you have funds pending human ethics approval, the auditor requires that you submit a copy of this Approval Certificate to Eveline Saurette in the Office of Research Services, (e-mail eveline_saurette@umanitoba.ca, or fax 261-0325), including the Sponsor name, before your account can be opened.
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/ors/ethics/ors_ethics_human_REB_forms_guidelines.html) in order to be in compliance with Tri-Council Guidelines.



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RENEWAL APPROVAL

March 23, 2011

TO: Amy Leung Hui
Principal Investigator
[REDACTED]

FROM: [REDACTED]

Re: Protocol #J2010:057
"Understanding Nutrition Behaviours of Women with
Gestational Diabetes"

Please be advised that your above-referenced protocol has received approval for renewal by the **Joint-Faculty Research Ethics Board**. This approval is for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Appendix B. Research Recruitment Poster



If you have gestational diabetes in this pregnancy

Our study is looking at food choice and eating habits of women who have gestational diabetes. This will help us to make treatment plans more effective.

 A photograph of a pregnant woman sitting and eating a variety of colorful vegetables from a plate.	<p>We only need an hour from you for a food related conversation.</p> <p>Everything discussed will be confidential.</p> <p>Location will be arranged for your convenience</p>
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Please contact Amy at **228-5535** or **amyhui@shaw.ca**

We provide incentives to our participants

This study has been reviewed by, and received ethics approval by the

Health Research Ethics Board, University of Manitoba

Amy 228-5535 amyhui@shaw.ca					
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Appendix C. Research Study Consent Form

Understanding Nutrition Behaviours of Women with Gestational Diabetes



UNIVERSITY
OF MANITOBA

Faculty of Human Ecology
Department of Human Nutritional Sciences

209 Human Ecology
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Consent Form

Nutrition and Women with Gestational Diabetes

Researcher: Amy Leung Hui
Reference No. _____

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

As researcher from the department of Human Nutritional Science at the University of Manitoba I am conducting a study of nutrition and health-related behavior among women with gestational diabetes. The Outpatient Endocrinology Clinic at St. Boniface General Hospital (SBGH) is helping the study and you are asked to participate as a follow-up patient.

The study will lead to a better understanding of food choice behavior, and possible barriers in following nutrition recommendations, can affect the health of women with gestational diabetes. The study results will be used to formulate practice recommendations for health professionals who support women with gestational diabetes and they will be used in a PhD thesis of the University of Manitoba. You can request a copy of the summary of results.

You will have the choice to complete the interview at my home or at another location of your choice. Before the interview you will be asked to complete a demographic questionnaire and a questionnaire that relates to any experience of stress during pregnancy. The interview will be approximately 40 minutes long. You will receive \$20 to compensate your time or transportation costs.

Your interview and questionnaire data are kept strictly confidential and no person in the clinic will have access to your data. The interview conversation will be audio taped and only the researcher has the access to the interview tape. My university supervisor will not know your name, but he has access to the data.

Oct.6, 2010, Page 1 of 2
Initial _____

Understanding Nutrition Behaviours of Women with Gestational Diabetes

There is no risk associated with participating. The demographic data, participant consent forms, survey questionnaires, and the digital interview data will be locked in separate filing cabinets. The interview data will not be labeled with the participant's name to ensure confidentiality. The data will be destroyed two years after the publication of the result. Only the principal investigator has access to the raw data and the list of participants. No identifying information will be used in any publications. The University of Manitoba Research Ethics Board and St. Boniface General Hospital may review research-related records for quality assurance purposes. Medical records that contain your identity will be treated as confidential in accordance with the Personal Health Information Act of Manitoba.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

Researcher: Amy Leung Hui
Supervisor: Dr. Gustaaf Sevenhuijsen

Tel: 204-228-5535
Tel: 204-474-9704

This research has been approved by the University of Manitoba Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122. A copy of this consent form has been given to you to keep for your records and reference.

I _____, the undersigned, agreed to participate in the study above.
(print name)

Participant's signature _____ Date _____

Researcher's Signature _____ Date _____

Signature _____

Oct. 6, 2010, Page 2 of 2
Initial _____

Appendix D. Food Choice Map Interview Guide

Food Choice

Have you changed the amount or type of foods you eat?
Did the amount increase or decrease, and by how much? Why?
Are you planning to change the amount of any food you eat? Which ones? Why?
Where do you get the information on the best buys, what is in the food, how healthy is it?
Where do you buy your food?
Do you share the money for the foods/meals? With whom? Who contributes?
Who decides what foods will be purchased?

Food Preparation

Where is the meal prepared?
Do you prepare meals alone or do you have help?
How often do you prepare meals each day?

Nutrition Management

What nutrition information did you receive from the Dietitian?
Do you receive nutrition information from anyone else? If so, what did they say?
Have you made any changes on food choices after the diagnosis of gestational diabetes?
Do you follow the nutrition information that you receive from the dietitian?
How do you feel about eating healthy and managing your blood sugar at the same time?

Stress

Do you feel confident on making decisions on eating for your health and your baby's health?
Is there any fear that your food choices might complicate your blood sugar?
Are you afraid that your eating might harm the baby? In what way?
Do you feel comfortable on buying the foods that are recommended by the dietitian?

Appendix E. Perceived Stress Scale

The following questions ask about after your nutrition consultation, how did you feel in the last month.

1. How often have you been upset because of something that happened unexpectedly?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

2. How often have you felt that you were unable to control the important things in your life?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

3. How often have you felt nervous and “stressed”?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

4. How often have you felt confident about your ability to handle your personal problems?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

5. How often have you felt that things were going your way?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

6. How often have you found that you could not cope with all the things that you had to do?

<i>Never</i>	<i>Almost never</i>	<i>Sometimes</i>	<i>Fairly often</i>
<i>Very often</i>			

7. How often have you been able to control irritations in your life?

Never *Almost never* *Sometimes* *Fairly often*
Very often

8. How often have you felt that you were on top of things?

Never *Almost never* *Sometimes* *Fairly often*
Very often

9. How often have you been angered because of things that were outside of your control?

Never *Almost never* *Sometimes* *Fairly often*
Very often

10. How often have you felt difficulties were piling up so high that you could not overcome them?

Never *Almost never* *Sometimes* *Fairly often*
Very often

Appendix F. Pregnancy - Related Anxiety Scale

The questions in this scale ask you about your feelings and thoughts during pregnancy with gestational diabetes. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

1. I am confident of having a normal childbirth.

Never *Sometimes* *Fairly often* *Very often*

2. I think my labor and delivery will go normally.

Never *Sometimes* *Fairly often* *Very often*

3. I have a lot of fear regarding the health of my baby.

Never *Sometimes* *Fairly often* *Very often*

4. I am worried that the baby could be abnormal.

Never *Sometimes* *Fairly often* *Very often*

5. I am afraid that I will be harmed during delivery.

Never *Sometimes* *Fairly often* *Very often*

6. I am concerned (worried) about how the baby is growing and developing inside me.

Never *Sometimes* *Fairly often* *Very often*

7. I am concerned (worried) about losing the baby.

Never *Sometimes* *Fairly often* *Very often*

8. I am concerned (worried) about having a hard time or difficult labor and delivery.

Never *Sometimes* *Fairly often* *Very often*

9. I am concerned (worried) about taking care of a new baby.

Never *Sometimes* *Fairly often* *Very often*

10. I am concerned (worried) about developing medical problems during my pregnancy.

Never *Sometimes* *Fairly often* *Very often*

Appendix G. State Trait Anxiety Scale - Trait

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Almost never	Sometimes	Often	Almost always
1	I feel pleasant	1	2	3	4
2	I tired quickly	1	2	3	4
3	I feel like crying	1	2	3	4
4	I wish I could be as happy as others seem to be	1	2	3	4
5	I am losing out on things because I can't make up my mind soon enough	1	2	3	4
6	I feel rested	1	2	3	4
7	I am "calm, cool, and collected"	1	2	3	4
8	I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
9	I worry too much over something that really doesn't matter.	1	2	3	4
10	I am happy	1	2	3	4
11	I am inclined to take things hard	1	2	3	4
12	I lack self-confidence	1	2	3	4
13	I feel secure	1	2	3	4
14	I try to avoid facing a crisis or difficulty	1	2	3	4
15	I feel blue	1	2	3	4
16	I am content	1	2	3	4
17	Some unimportant thoughts runs through my mind and bothers me	1	2	3	4
18	I take disappointments so keenly that I can't put them out of				

	my mind	1	2	3	4
19	I am a steady person	1	2	3	4
20	I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Appendix H. Demographic Questionnaire

Please answer the following questions.

Age: _____ Gender: _____

Pre-pregnancy weight: _____ Height: _____

Current weight: _____ Gestational weeks_____

Marital Status: Single Married/Common law Divorced/Separated

Date of first visit to the dietitian _____

Number of people living with you (including yourself) _____

Number of children under age of 18 living with you _____

Level of education

Grade 8 or less	Some high school
Completed high school	Some college training
College certificate or diploma	Some university
Completed university	Post-graduate
Other _____	

Employment status:

Employed	Self-employed
Student	Home maker
Unemployed	Other _____

Household income category:

Under \$20,000	\$20,000 - \$39,999
\$40,000 - \$59,999	\$60,000 and over

Appendix I. Food Choice Map – Example

FOOD CHOICE MAP							RESPONDENT #:	LOCATION:						
							4	Home						
							DATE:							
							INTERVIEWER:	Amy Hui						
							© Northern Technical Data Inc.							
TIME	1x / Week	2x / Week	3x / Week	4x / Week	5x / Week	6x / Week	7x / Week							
EARLY (1)														
SERVING SIZE	110	115	120	125	130	135	140	145	150	155	160	165	170	
SNACK 1 (2)														
SERVING SIZE	210	215	220	225	230	235	240	245	250	255	260	265	270	
MID DAY (3)														
SERVING SIZE	310	315	320	325	330	335	340	345	350	355	360	365	370	
SNACK 2 (4)														
SERVING SIZE	410	415	420	425	430	435	440	445	450	455	460	465	470	
END OF DAY (5)														
SERVING SIZE	510	515	520	525	530	535	540	545	550	555	560	565	570	
LATE (6)														
SERVING SIZE	610	615	620	625	630	635	640	645	650	655	660	665	670	