

## Recommendations

All pregnant women, including those with diabetes or gestational diabetes (GDM), are encouraged to follow a healthy eating pattern such as those outlined in Eating Well with Canada's Food Guide. For more information on healthy eating during pregnancy refer to [Nutrition Guideline: Pregnancy](#).

Pregnant women with diabetes should be seen by a dietitian when possible.

Nutrition recommendations include:

- Aiming for consistent carbohydrate intake at meals and snacks to help optimize glycemic control.
- For women with pre-existing diabetes, individualizing timing and spacing of meals and snacks based on the stage of pregnancy, lifestyle preference, medications, and treatment goals.
- Encouraging women with GDM to eat 3 meals and 2 or more snacks per day.
- Choosing carbohydrate-containing foods that are low glycemic index and high in fibre most often.
- Vitamin and folic acid supplementation:
  - At least 3 months before conception and during the first 12 weeks of pregnancy, women with pre-existing diabetes is recommended to supplement with 1.0 mg of folic acid per day, either in addition to or as a part of a multivitamin.
  - For the second and third trimester, women with pre-existing diabetes and GDM are recommended to follow vitamin supplementation guidelines similar to pregnant women without GDM.

For more information about nutrition guidelines specific to diabetes management refer to [Nutrition Guideline: Adult Diabetes](#).

## Health Benefits

Appropriate nutrition therapy for pregnant women with type 1, type 2, and gestational diabetes (GDM) can help improve perinatal outcomes by:<sup>1</sup>

- supporting optimal glycemic control
- achieving appropriate maternal weight gain
- maintaining or improving nutritional health status without ketosis
- supporting a healthy pregnancy and optimal growth and development for the baby.

**For women with GDM**, nutrition therapy is the first step in treating hyperglycemia, and nutrition counselling from a dietitian during pregnancy is recommended [*Grade D, level 4*].<sup>1</sup> Postpartum women with GDM should receive counselling about active living and healthy eating to reduce their risk of type 2 diabetes, cardiovascular disease,<sup>2</sup> and developing GDM in subsequent pregnancies. [*Grade C, Level 3*]

For women with type 1 or type 2 diabetes, preconception planning and care during pregnancy from an interprofessional diabetes team, including a dietitian with expertise in diabetes and pregnancy, reduces the risk of adverse health outcomes for both mother and fetus. [Grade C, Level 3].<sup>1</sup>

The term *pre-existing diabetes* used throughout this document refers to pregnant women with type 1 or type 2 diabetes.

The topics covered in this document are exclusive to diabetes in pregnancy. For general nutrition and pregnancy information, including women at risk of GDM, refer to [Nutrition Guideline: Pregnancy](#).

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**Diabetes in Pregnancy**

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**What is gestational diabetes and how is it diagnosed?**

**Gestational diabetes mellitus (GDM)** refers to glucose intolerance with onset or first recognition during pregnancy.<sup>3</sup> Diabetes Canada recommends all pregnant women not known to have pre-existing diabetes are screened for GDM through oral glucose challenge tests (GCT) between 24 and 28 weeks gestation.<sup>1</sup>

The *Diabetes Canada 2018 Clinical Practice Guideline Committee* prefers a two-step approach (Table 1) for screening GDM.<sup>1</sup>

Step 1: Use a 50-gram GCT administered in the non-fasting state with blood glucose (BG) measured one hour postprandial.

Step 2: If BG is between 7.8 to 11.0 mmol/L from the 50-gram GCT, then proceed with a 75-gram oral glucose tolerance test (OGTT)

**Table 1. The Two-Step Screening Approach for the Diagnosis of GDM<sup>1</sup>**

Test	Blood Glucose	Indication
50 g GCT	7.8 to 11.0 mmol/L at 1 hour postprandial	Considered a positive screen and will be an <u>indication to proceed to the 75 g OGTT</u>
	≥11.1 mmol/L at 1 hour postprandial	Considered diagnostic of GDM and <u>does not require</u> a 75 g OGTT for confirmation
75 g OGTT	Fasting ≥ 5.3 mmol/L 1 hour ≥ 10.6 mmol/L 2 hours ≥ 9.0 mmol/L	Considered confirmation of GDM diagnosis if one or more BG values are attained

If multiple risk factors (see list below) for GDM or type 2 diabetes are present, screening should occur early in pregnancy and if negative, rescreening for GDM should occur at 24 to 28 weeks gestation.<sup>1</sup>

**Risk factors for GDM or Type 2 Diabetes<sup>1,4</sup>**

- previous diagnosis of GDM
- history of prediabetes
- age ≥35 years (for GDM); ≥40 years (for type 2 diabetes)
- BMI ≥30 kg/m<sup>2</sup>
- family history of type 2 diabetes
- polycystic ovarian syndrome (PCOS)
- acanthosis nigricans (darkened patches on the skin)
- corticosteroid use
- history of macrosomic infant (large for gestational age; > 4kg)
- member of a high-risk population (e.g. African, Arab, Asian, Hispanic, Indigenous, or South Asian descent)

**What do women with type 1 or type 2 diabetes require for preconception care?**

In women with pre-existing diabetes, preconception care is associated with better pregnancy outcomes.<sup>5-7</sup> It is recommended that women with pre-existing diabetes considering pregnancy be referred to an interprofessional diabetes team including a registered dietitian. [Grade C, Level 3]<sup>1</sup> Preconception nutrition care and education includes optimizing glycemic control, achieving a healthy body weight, and ensuring appropriate folic acid supplementation. Discontinuation of potentially harmful medications and screening for diabetes-related complications is also a part of medical care before conception in women with diabetes.<sup>1</sup>

**How can women with diabetes in pregnancy manage their blood glucose levels?**

Frequent blood glucose monitoring is essential for guiding diabetes management therapy decisions to avoid hyper- and hypoglycemia during pregnancy.

Persistent hyperglycemia during pregnancy poses the following risks:

Mother

- Increased need for operative or caesarian birth<sup>8</sup>
- Higher rates of preeclampsia<sup>9,10</sup>
- Progression of retinopathy (in women with pre-existing diabetes)<sup>11,12</sup>
- Development of metabolic syndrome and type 2 diabetes later in life (in women with GDM)<sup>13-15</sup>

Fetus

- Malformation and spontaneous abortion (due to hyperglycemia in the first trimester in pre-existing diabetes)<sup>16</sup>
- Fetal macrosomia and increased risk for infant shoulder dystocia during childbirth.<sup>8</sup>
- Neonatal metabolic instabilities including hypoglycemia and hyperbilirubinemia.<sup>8</sup>
- Stillbirth (increased risk for pre-existing diabetes and untreated GDM)<sup>16,17</sup>

**For women with GDM** following guidelines for healthy eating in pregnancy, keeping active, and gaining an appropriate amount of weight according to their pre-pregnancy body mass index (BMI) will assist with blood glucose control and better pregnancy outcomes.<sup>1</sup> According to the *2018 Diabetes Canada Clinical Practice Guidelines*, if women with GDM do not achieve glycemic targets (see Table 2) within 1 to 2 weeks through lifestyle interventions, medication should be initiated. Insulin therapy is recommended as first-line therapy. [Grade A, Level 1]<sup>1</sup> Metformin may also be used for glycemic management; however, women should be informed that metformin crosses the placenta, longer-term studies are not yet available, and the addition of insulin is necessary for approximately 40% of women who use metformin to achieve adequate glycemic control.<sup>1</sup> Glyburide may be considered as a last resort in women whom do not tolerate metformin and refuse to take insulin.<sup>1</sup>

Pregnancy is an opportune time to emphasize healthy eating and lifestyle habits that should persist after delivery to reduce the risk of developing type 2 diabetes later in life. If a woman with GDM requires medication, healthy eating to manage blood glucose and support a healthy pregnancy should continue to be reinforced.

For women with pre-existing type 1 or type 2 diabetes, it is very important prior to conception to obtain optimal glycemic control. A registered dietitian, as a part of an interprofessional team, can assist women with pre-existing diabetes to refine their carbohydrate counting skills, ensure the diet is supporting appropriate weight gain and fetal development, and assess for vitamin and mineral deficiencies, prior to and during pregnancy.

Blood glucose management is individualized in women with pre-existing diabetes, often through the use of intensive insulin therapy, to safely achieve blood glucose and A1C targets indicated in Table 2 and Table 3.<sup>1</sup>

**Table 2. Recommended Target Blood Glucose Values during Pregnancy\*<sup>1</sup>**

Testing Time	Blood Glucose Targets
Fasting BG	<5.3 mmol/L
1 hr postprandial	<7.8 mmol/L
2 hrs postprandial	<6.7mmol/L

\*In some cases blood glucose targets may need to be increased due to the risk of severe hypoglycemia. [Grade D, consensus]<sup>1</sup>

**Table 3. Recommended Target A1C for Women with Pre-existing Diabetes\*<sup>1</sup>**

Time	A1C Target
Pre-conception	≤ 7.0% (≤ 6.5% if possible <sup>‡</sup> )
During pregnancy	≤ 6.5% (≤ 6.1% if possible <sup>‡</sup> )

\*In some cases blood glucose targets may need to be increased due to the risk of severe hypoglycemia. [Grade D, consensus]<sup>1</sup>

<sup>‡</sup> Ideally lower A1C targets should be aimed for, especially during pregnancy, to reduce the risk of congenital malformations and stillbirth, but benefit must be weighed against the risk of hypoglycemia.

## Healthy Weight Gain

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### Why is a healthy weight gain during pregnancy important for women with diabetes?

A healthy rate of weight gain during pregnancy is recommended for women with diabetes and is the same recommendation as for the general pregnant population.<sup>1,18-20</sup> Excessive weight gain increases the risk of adverse neonatal outcomes, caesarean sections, large-for-gestational-age (LGA) babies, and retention of extra maternal weight after childbirth.<sup>19,21,22</sup>

The recommended weight gain during pregnancy is based on the pre-pregnancy BMI. Table 4 provides the recommended weight gain during pregnancy for a singleton pregnancy.

For information about weight gain for women carrying multiples refer to [Nutrition Guideline: Pregnancy: Multiples](#).

Table 5. Recommendations for Weight Gain During (singleton) Pregnancy<sup>18</sup>

Preconception BMI	Total Recommended Weight Gain Range During Pregnancy kg (lbs)	Recommended Weekly Rate Of Weight Gain In The 2 <sup>nd</sup> And 3 <sup>rd</sup> Trimesters* kg (lbs)
BMI <18.5 Underweight	12.5 – 18 (28 – 40)	0.5 (1.1)
BMI 18.5 – 24.9 Normal	11.5 – 16 (25 – 35)	0.4 (0.9)
BMI 25.0 – 29.9 Overweight	7 – 11.5 (15 – 25)	0.3 (0.6)
BMI ≥30 Obese	5 – 9 (11 – 20)	0.2 (0.5)

\* The above table assumes 1.1 – 4.4 lbs (0.5 – 2.0 kg) weight gain in the first trimester.

Weight loss during pregnancy is associated with babies born small for gestational age (SGA), and therefore, is not recommended.<sup>1,23</sup> For women with both GDM and overweight or obesity, under the guidance of a registered dietitian, individualized nutrition care plans aimed to slow the rate of weight gain during pregnancy and achieve the low end of weight gain guidelines may reduce the risk of poor maternal and fetal outcomes.<sup>21,23,24</sup>

## Healthy Eating to Manage Diabetes during Pregnancy

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### Why is healthy eating important for diabetes management during pregnancy?

A primary goal of nutrition therapy for pregnant women with diabetes is optimal blood glucose management while encouraging adequate nutrition and weight gain and minimizing the risk of developing ketosis or hypoglycemia.<sup>1,25</sup> No specific healthy dietary pattern has been identified as superior regarding maternal or newborn outcomes in women with GDM.<sup>26</sup> A low glycemic index (GI) diet appears to provide some benefits compared to conventional nutrition therapy for maternal glycemic control. Best practice nutrition therapy for GDM promotes a high-quality diet through following a healthy eating pattern such as Canada’s Food Guide<sup>27</sup> while emphasizing lower GI foods.<sup>28,29</sup> Refer to the [Fibre and Glycemic Index](#) section for more information.

Nutrition therapy during pregnancy is an opportunity to encourage improved eating habits that should persist after delivery. Teaching positive lifestyle behaviours can potentially instill lifelong changes that may reduce the risk of future health problems associated with having GDM, type 1 or type 2 diabetes, and have the potential to positively influence off-springs’ eating habits and activity levels.

Restriction of dietary intake in an attempt to achieve blood glucose targets is not recommended in women with GDM.<sup>1</sup> Over restriction can lead to starvation ketosis and potentially lead to negative consequences for the baby.<sup>30,31</sup>

### Why should pregnant women with diabetes eat regular meals?

It is recommended that timing and spacing of meals be individualized based on lifestyle preferences and treatment goals. Consuming meals that are consistent in carbohydrate and appropriately spaced over the day may help control blood glucose levels in people with GDM and type 2 diabetes.<sup>1,32</sup>

In women with pre-existing diabetes taking mealtime insulin, matching insulin to carbohydrate intake (i.e. using insulin to carbohydrate ratio) or maintain consistency in carbohydrate intake to match mealtime insulin dose is best practice.<sup>33,34</sup>

**What types of snacks are recommended for pregnant women with diabetes?**

For women with GDM consuming 2 or more snacks a day, that may include a bedtime snack, is recommended.<sup>1,25</sup> This helps to distribute carbohydrate intake over the day. Examples of smaller and larger healthy snacks for pregnant women with diabetes are provided in Tables 5 and 6 respectively.

For women with pre-existing diabetes recommendations for snacking depends on insulin regime, glycemic control, and weight gain. Increased snacking compared to pre-pregnancy eating patterns may be required between meals and/or at bedtime to spread carbohydrate over the day and prevent hypoglycemia and development of overnight ketosis.

**Table 5 Examples of Healthy Snacks for Pregnant Women with Diabetes – Smaller Snacks**

**Smaller Snacks** approximately 15 g available\* carbohydrate and 100 – 200 calories

- 1 piece of fruit [e.g. apple, pear, orange, ½ banana, 1 cup (250 mL) blueberries, or 2 cups (500 mL) raspberries, blackberries or strawberries]
- 3 cups (750 mL) of plain popcorn with 1 tsp (5 mL) non-hydrogenated margarine
- ¼ cup (60 mL) hummus with vegetable sticks; 2 to 3 whole grain crackers
- ½ whole wheat pita, with 1 ounce (30 g) cheese, vegetable sticks
- ¼ cup (60 mL) cottage cheese with ½ cup (125 mL) canned fruit, in water or own juice
- 1 slice whole grain bread, 1 boiled egg

**Table 6 Examples of Healthy Snacks for Pregnant Women with Diabetes – Larger Snacks**

**Larger Snacks** approximately 30 g available\* carbohydrate and 200 – 250 calories

- 1 piece of fruit and 2 - 3 rye crisps with 1 tbsp (15 mL) nut butter
- 1 cup (250 mL) blueberries with rye bread toasted and 1 tsp (5 mL) non-hydrogenated margarine.
- 1 cup (250 mL) milk and 1 small homemade muffin [1½ inch (4 cm) high and 2½ inches (6 cm) diameter]
- 1 boiled egg, whole grain toast with 1 tsp (5 mL) non-hydrogenated margarine, and 1 piece of fruit
- 1 cup (250 mL) cantaloupe or honeydew melon with ¾ cup (175 mL) plain yogurt.

\* Available carbohydrate is calculated by subtracting the fibre and sugar alcohol content of a food portion from the total carbohydrate amount in the food portion.

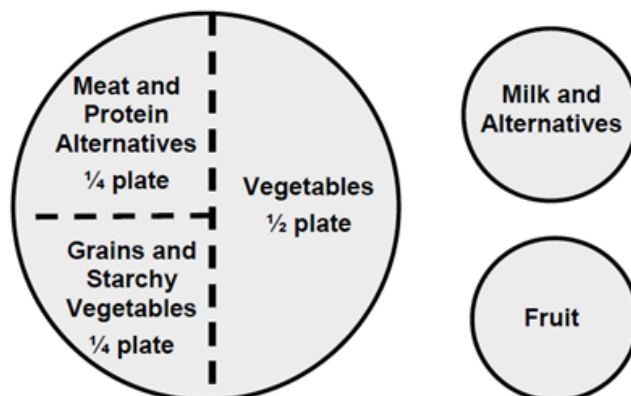
For more information about snacking, carbohydrate counting and calculating available carbohydrate refer to [Nutrition Guideline: Adult Diabetes](#).

**What should a woman just diagnosed with GDM know about the nutrition management of GDM?**

The diagnosis of GDM can be overwhelming for a woman. Ideally, women diagnosed with GDM are seen by a dietitian within one week of diagnosis and followed throughout the duration of their pregnancy.<sup>1</sup>

As part of the initial education, it is recommended to encourage 3 moderate sized meals and 2 or more snacks daily.<sup>1</sup> Balanced meals can be demonstrated using the *Diabetes Healthy Plate Model* shown in Figure 1 and used in Alberta Health Services diabetes nutrition education resource (refer to [Resources](#) section). Avoiding sugar-sweetened beverages and limiting or avoiding juice is also suggested. Hypocaloric or carbohydrate restriction below 175 grams per day is not recommended due to concerns regarding starvation ketosis and unknown effects to the baby.<sup>1</sup>

Figure 1: Diabetes Health Plate Model



## What are the special considerations for pregnant women with diabetes carrying multiples?

Considerations for all women with multiples in pregnancy include appropriate weight gain and greater amounts of calories and nutrition to support fetal growth and development. These nutrition recommendations are the same for pregnant women with diabetes. Considerations for folic acid supplementation and carbohydrate distribution are still needed for pregnant women with diabetes as outlined in this nutrition guideline.

For more information about nutrition for women carrying multiples refer to [Nutrition Guideline: Pregnancy: Multiples](#).

## Carbohydrates

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## What is the recommended carbohydrate intake for pregnant women with diabetes?

Dietary carbohydrate includes sugar, starch, and fibre. Both sugar and starch are digested and absorbed into the body as glucose, which provides energy to the brain, muscles, and cells. In pregnancy, carbohydrates are important for fetal development and to prevent maternal ketosis.<sup>35</sup> Major sources of carbohydrate include starchy vegetables, fruits, grain products, milk, yogurt, beans, lentils, and sugar (e.g. molasses, honey, and table sugar). Fibre is not digested and absorbed into the body, therefore, does not contribute to the glycemic load of the diet.

Carbohydrate intake is a major focus of nutrition therapy for diabetes in pregnancy due to the effect it has on postprandial blood glucose levels. Carbohydrate amount and distribution should be individualized based on clinical measurements such as weight gain and blood glucose levels. Although women can safely consume 45 to 60% of daily energy from carbohydrate, intake of carbohydrate at the upper end of this range may make postprandial blood glucose targets more difficult to achieve. A minimum of 175 g of carbohydrate per day is recommended for all pregnant women.<sup>35</sup> This amount helps ensure adequate overall nutrition and prevention of ketosis. Very low carbohydrate diets with the purpose of inducing ketosis are neither recommended nor safe in pregnancy.<sup>1</sup>



**Why is it important for pregnant women to spread carbohydrate intake over the day?**

A variety of carbohydrate foods need to be eaten daily to get enough calories (energy), fibre, vitamins and minerals in the diet. Due to the effect that carbohydrate-rich foods have on blood glucose levels, it is important to distribute carbohydrate foods evenly throughout the day in meals and snacks.

**For women with GDM** distributing carbohydrate into 3 small-to-moderate sized meals and 2 or more snacks is encouraged and should be individualized to treatment goals<sup>1</sup> (see example pattern in Table 7). If a woman observes elevated breakfast postprandial blood glucose, she may benefit from consuming less carbohydrate or choosing lower glycemic index and higher fibre carbohydrate-containing foods at breakfast.<sup>36</sup>

**Table 7. Example Meal Pattern Providing at Least 175 g Carbohydrate Distributed Over the Day as 3 Meals and 2 or More Snacks Per Day.**

Meal	Breakfast	Snack*	Lunch	Snack*	Supper	Snack*
Carbohydrate Choice (15 g per choice)	3	0 – 2	3 – 4	0 – 2	3 – 4	0 – 2
Carbohydrate Grams	45 g	0 – 30 g	45 – 60 g	0 – 30 g	45 – 60 g	0 – 30 g

\*Include 2 or more snacks per day based on individualized treatment goals. See [Tables 5 and 6](#) for snack examples.

For more information about counting carbohydrates and carbohydrate choices refer to [Nutrition Guideline: Adult Diabetes](#).

**Fibre and Glycemic Index**

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**Why is a high fibre and low glycemic index (GI) diet recommended for pregnant women with diabetes?**

A high fibre diet of 30 to 50 grams per day is recommended for all adults with diabetes to assist with blood glucose control and reduce the risk of cardiovascular disease.<sup>32</sup> This is higher than the general population and the 28 grams recommended for pregnant women.<sup>35</sup> A high fibre diet (e.g. 30 grams per day) and drinking adequate fluid (approximately 9 cups) can help prevent and manage constipation that is typically experienced during pregnancy.

For more information, refer to [Nutrition Guideline: Pregnancy](#).

The glycemic index (GI) is an evaluation of a carbohydrate-containing foods ability to raise blood glucose. Choosing low GI foods (55 or less) over high GI foods (70 or more) most often is recommended for all people with diabetes.<sup>32</sup>

For more information, refer to [Nutrition Guideline: Adult Diabetes](#).

**In women with GDM** choosing high fibre and low GI carbohydrate-containing foods most often may have beneficial effects on postprandial blood glucose, delay the need to initiate insulin, and reduce the risk of macrosomia and babies that are large for gestational age.<sup>37-39</sup> Table 8 provides examples of carbohydrate-containing foods that are higher fibre and lower GI. These foods can be offered as alternatives to lower fibre and higher GI foods such as refined and white grain products (breads, cereals, etc.), fruit juices, and high sugar snack foods.

**Table 8. Examples of High Fibre\*, Low, and Medium Glycemic Index Foods<sup>36</sup>**

Low Glycemic Index (55 or less)		
Grains, Breads and Cereals	Starchy Vegetables	Fruit
bread: spelt, heavy mixed grain	peas	apple
barley	chickpeas	orange
bulgur	kidney beans	pear
oat bran	lentils	peach
oats: steel cut	split peas	plum
pasta: whole wheat, al dente/firm	soybeans/edamame	pomegranate
quinoa	sweet potato	berries
tortilla: whole grain		
Medium Glycemic Index (56 to 69)		
Bread: pumpernickel, rye, whole grain, stone ground whole wheat	parsnip	cherries
oats: large flake, quick, instant	soup, split pea	kiwi
rice: brown or wild	soup, lentil	
rye crisp crackers		

\*All foods listed have at least 2 grams of fibre per carbohydrate food choice (15 g available carbohydrate)

For more information, refer to [Nutrition Guidelines: Adult Diabetes, Fibre](#)

**Sugars and Sugar Substitutes**

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**What sweeteners are safe for pregnant women with diabetes to use?**

Moderation is encouraged when consuming or recommending products sweetened with added sugars or sugar substitutes.<sup>40</sup>

**Added sugar** recommendations for pregnant women with diabetes are the same as with other types of diabetes and should be limited, especially in the form of sugar-sweetened beverages such as regular pop and speciality coffees.<sup>32</sup>

**Sugar substitutes** may be present in beverages, tabletop sweeteners, “diet” products, baking, desserts, spreads, salad dressings, and chewing gums. Sugar substitutes may help women with GDM or pre-existing diabetes maintain glycemic control while still enjoying other foods that could otherwise be high in added sugar. Moderate use of sugar substitutes (Table 9) during pregnancy is considered safe.<sup>40</sup> Excessive consumption of products containing sugar substitutes should be avoided since such foods could replace nutrient dense, energy-yielding foods.<sup>40</sup>

**Table 9. Sugar Substitutes and Common Brands<sup>41</sup>**

Safe in Moderate Amounts	Not Recommended in Pregnancy
Aspartame (NutraSweet®, Equal®) Sucralose (Splenda®) Acesulfame Potassium (Ace-K or Sunett®) Saccharin (Hermesetas®) Stevia	*Cyclamates (Sucaryl®, Sugar Twin®, Sweet N’Low®, Weight Watchers® Table-Top Sweetener)

\*Cyclamates:

- Alberta Health Services Nutrition Services does not recommend the use of cyclamates for pregnant or lactating women due to unknown risks associated with consumption above moderate levels (more than about 2 to 3 packages per day). The Canadian Food Inspection Agency requires a statement that the sweetener should be used only on the advice of a physician.<sup>42</sup>
- Diabetes Canada's resource *Sugars and Sweeteners* indicates cyclamates are "safe in pregnancy" but recommend caution in exceeding the acceptable daily intake (ADI). As an example, a woman needs to limit her intake to 2 packages of Sugar Twin<sup>®</sup> containing cyclamate per day to remain within this recommendation.<sup>43</sup>

**Sugar alcohols (polyols)** have little to no effect on blood glucose. Dosing rapid insulin to sugar alcohol content of food is not recommended. For women who are carbohydrate counting and dosing their insulin accordingly, sugar alcohols should be subtracted from the total carbohydrate amount.<sup>32</sup>

Refer to [Nutrition Guidelines: Adult Diabetes, Pregnancy, Food and Drinks High in Calories, Fat, Sugar or Salt](#)

### Vitamins and Mineral Supplementation

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**What is the recommended amount of folic acid supplementation for pregnant women with diabetes prior to and during pregnancy?**

The amount of folic acid consumed prior to pregnancy and in the early stages of pregnancy plays a role in preventing neural tube defects (NTD) and is associated with preventing other congenital abnormalities.<sup>44</sup>

**Women with pre-existing diabetes** are at moderate risk of having a pregnancy complicated by NTD.<sup>44</sup> Table 10 provides recommendations for folic acid supplementation doses for women with pre-existing diabetes prior to, during, and after pregnancy.

**Table 10. Folic acid supplementation doses for women with pre-existing diabetes.**<sup>1,44</sup>

For women with Pre-existing Diabetes (Type 1 and Type 2)	Daily Folic Acid Supplementation
At least 3 months before pregnancy, and for the first 3 months of pregnancy	1.0 mg (1000 mcg) in a multivitamin
For the last 6 months of pregnancy and as long as breastfeeding continues	0.4 – 1.0 mg (400 – 1000 mcg) in a multivitamin

**Women with GDM** can follow the same folic acid supplementation recommendations for women without diabetes, which is 0.4 mg daily as a part of a multivitamin before, during, and after pregnancy.<sup>44</sup>

Larger doses of folic acid supplementation are generally not recommended due to lack of studies to support this and concerns about risks associated with higher doses of folic acid.<sup>44</sup> Women with pre-existing diabetes and obesity, or previous bariatric surgery may require higher folic acid supplementation due to poor dietary intake and lower serum folate levels.<sup>1</sup>

**What vitamin and mineral supplements are recommended for pregnant women with diabetes?**

Aside from the above mentioned folic acid supplementation, pregnant women with diabetes have the same vitamin and mineral requirements as pregnant women without diabetes.<sup>28</sup> All pregnant women are encouraged to eat a well-balanced diet as recommended by Canada's Food Guide to meet their nutrition needs. A daily multivitamin is recommended to provide 16 – 20 mg of iron,<sup>45</sup> 0.4 mg (400 mcg) folic acid,<sup>46</sup> some vitamin B<sub>12</sub>, and a minimum of 400 international units (IU) of vitamin D daily.<sup>47</sup> Ideally, vitamin supplementation is initiated at least 3 months prior to pregnancy to ensure adequate amount of folic acid intake and continues throughout pregnancy and as long as the women is breastfeeding.<sup>46</sup>

Refer to [Nutrition Guideline: Pregnancy](#)

**Do women with GDM require higher doses of vitamin D supplementation?**

An association between GDM and low vitamin D status has been observed; however, the causality of this relationship is unclear.<sup>48</sup> Until further research is established, the general pregnancy recommendations from the Institute of Medicine (IOM) and Alberta Health Services – Nutrition Services are:

- The IOM's recommended daily allowance (RDA) of vitamin D is 600 IU/day for all pregnant and lactating women.<sup>47</sup>
- The 2004 Canadian Consumer Health Survey estimates a mean vitamin D intake from food alone to be 156 IU/day for people aged 19 – 30 and 208 IU/day for people aged 31 – 50.<sup>49</sup> Therefore, dietary intake is not usually adequate to meet the RDA.
- All women in their childbearing years, including pregnant and lactating women, should take a multivitamin containing a minimum of 400 IU/day of vitamin D.<sup>47</sup>
- Total vitamin D intake from food and supplements should not exceed the upper limit of 4,000 IU/day without medical supervision.<sup>47</sup>

**Who is at higher risk of not meeting vitamin and mineral recommendations?**

Supplementation recommendations may be especially important in women who:<sup>29</sup>

- do not typically consume a nutritionally adequate diet.
- are vegetarian and/or vegan.
- suffer from a prolonged period of severe nausea or vomiting.
- are at high risk for nutritional deficiencies: women carrying multiples, heavy cigarette smokers, or abuse alcohol and/or drugs.

Some women may not tolerate vitamin and mineral supplementation. Individual advice regarding nutrients of risk may be required. A registered dietitian may assist with these concerns.

Refer to [Nutrition Guideline: Pregnancy](#)

**Physical Activity**

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**What physical activity is recommended for pregnant women with diabetes?**

The *2018 Diabetes Canada Clinical Practice Guidelines* acknowledge that physical activity, in addition to a healthy diet, can improve blood glucose levels and assist with appropriate weight gain, and may result in lower rates of large-for-gestational-age births and pre-eclampsia in women with GDM.<sup>28,29,50</sup>

Unless there is a contraindication to activity, pregnant women with diabetes can be encouraged to participate in physical activity most days of the week to support glycemic control.<sup>29,51</sup> Physical activity should be individualized to the person's activity tolerance and preferences and balanced with considerations of the obstetric risks.<sup>28,51</sup>

Refer to [Nutrition Guideline: Physical Activity](#) and the Healthy Parents Healthy Children website for more information about physical activity during pregnancy. <http://www.healthyparentshealthychildren.ca>

**What needs to be considered when recommending physical activity to women with diabetes in pregnancy?**

Physical activity can lower blood glucose, and therefore, provides both benefits and risks.

- **In women with GDM**, physical activity may be helpful in managing the hyperglycemic effects of the meal.<sup>52</sup>
- **In women treated with insulin**, there is a higher risk of hypoglycemia due to exercise.<sup>53</sup> Strategies to reduce hypoglycemia risk, such as reducing insulin dose(s) or increasing carbohydrate intake, should be discussed with the patient. Frequent blood glucose monitoring is important to determine required adjustments based on blood glucose variations.

Absolute contraindications to physical activity may include:<sup>51,54</sup>

- Uncontrolled type 1 diabetes
- Pregnancy-induced hypertension
- Premature rupture of the membranes
- Intrauterine growth retardation
- Avoidance after 28 weeks gestation if preterm labour or history of preterm labour
- Incompetent cervix/cervical cerclage
- Persistent 2nd and 3rd trimester bleeding
- Carrying three or more fetuses
- Serious cardiovascular, respiratory, or systemic disorders

Other contraindications to physical activity may include:<sup>51,54</sup>

- Previous spontaneous abortion
- Previous preterm birth
- Mild/moderate cardiovascular disorder
- Mild/moderate respiratory disorder
- Anemia
- Malnutrition or eating disorder
- Avoid after 28 weeks gestation with multiples
- Other significant medical conditions

The *PARmed-X for Pregnancy* is a screening tool developed by the *Canadian Society for Exercise Physiology* and endorsed by the *Society of Obstetricians and Gynaecologists of Canada* and *Health Canada*. It is available at <http://www.csep.ca/CMFiles/publications/parq/parmed-xpreg.pdf>.

If contraindications for exercise are unclear, consult with the patient's physician, obstetrician, or another prenatal provider (nurse practitioner or midwife) regarding advice about what physical activity type, intensity, frequency, and duration is safe for the patient.

Refer to [Nutrition Guideline: Pregnancy](#)

## Breastfeeding and Postpartum Care

[Return to Key Questions](#)

### What are the benefits and risks of breastfeeding for women with diabetes or history of GDM?

There are many well-established benefits of breastfeeding, and for women with diabetes or a history of GDM, breastfeeding provides additional benefits:<sup>55</sup>

- Breastfeeding immediately after birth can prevent neonatal hypoglycemia [*Grade D, Consensus for GDM; Grade C, Level 3 for pre-existing*].<sup>1</sup>
- Longer term benefits of breastfeeding include reducing the infant's risk for of developing obesity [*Grade C, Level 3*]<sup>1</sup> and diabetes later in life [*Grade D, Level 4 for GDM; Grade C, Level 3 for pre-existing*].<sup>1</sup>
- For women with GDM, breastfeeding can reduce the risk of hypertension and future development of type 2 diabetes [*Grade C, Level 3*].<sup>1</sup>

Health Canada recommends that women be encouraged to breastfeed their baby exclusively for at least six months after birth and for 2 years or longer.<sup>55</sup> Diabetes Canada encourages women with GDM to breastfeed "immediately after delivery and for at least 4 months postpartum".<sup>1</sup> It is important that healthcare providers be sensitive to women who may not be able to breastfeed and provide support when possible.

The mother's consumption of adequate protein, carbohydrates and fluid is important to support breastfeeding, as these requirements are higher than during pregnancy and compared to the needs of women who are not breastfeeding.<sup>35</sup>

**Women with diabetes who take insulin post-pregnancy** are at risk of hypoglycemia due to breastfeeding and sudden drop in insulin requirements postpartum. These women require education regarding this risk and guidance about insulin dose adjustments and/or additional carbohydrate intake that may be needed.<sup>56,57</sup>

### What information do women with GDM require about postpartum care and follow up?

Having GDM increases a woman's risk of developing pre-diabetes or type 2 diabetes later in life;<sup>1</sup> therefore, these women should be encouraged and supported to adopt lifelong healthy eating and active living behaviours to reduce their long-term health risks.

A 75-gram oral glucose tolerance screening test (OGTT) between 6 weeks and 6 months postpartum is recommended for all women with GDM. [*Grade D, consensus*].<sup>36</sup> The uptake of postpartum screening and follow-up are poor, and healthcare providers can play an important role in endorsing appropriate screening and timely treatment of metabolic abnormalities.<sup>58</sup>

# Nutrition Guideline

## Diabetes in Pregnancy

*For Professional Reference Only*

Applicable to: Nurses, Physicians and Other Health Professionals

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Women with a history of GDM have a high risk of developing GDM in future pregnancies, therefore, they should be advised to obtain preconception care prior to future pregnancies.<sup>36</sup> Diabetes Canada recommends lifelong glucose screening for metabolic abnormalities at intervals of at least every 3 years for all people at risk of developing type 2 diabetes, including women with a history of GDM.<sup>4</sup>

Refer to [Nutrition Guidelines: Prediabetes, Adult Diabetes, Adult Weight Management, Breastfeeding](#)

### Resources

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#### What information is available to provide my patient about diabetes and pregnancy?

Options to obtain more information about nutrition and diabetes in pregnancy include:

1. Consult with a dietitian in your area.
2. Refer to approved provincial Alberta Health Services diabetes nutrition handouts to support patient education. Information on Alberta Health Services website can be found here <https://www.albertahealthservices.ca/nutrition/Page11115.aspx>  
For more information, contact [Nutrition.Resources@albertahealthservices.ca](mailto:Nutrition.Resources@albertahealthservices.ca)
3. Refer to the Diabetes Canada website at [www.diabetes.ca](http://www.diabetes.ca)

### Nutrition Guidelines

Access to referenced Nutrition Guidelines can be found at:

<https://www.albertahealthservices.ca/info/Page3505.aspx>

### Online Resources

- Diabetes Canada: [www.diabetes.ca](http://www.diabetes.ca)
- Healthy Eating Starts Here: Healthy Eating Resources  
<https://www.albertahealthservices.ca/nutrition/Page11115.aspx>
- Healthy Parents Healthy Children: <http://www.healthyparentshealthychildren.ca/>
- Glycemic Index: [www.glycemicindex.com](http://www.glycemicindex.com)
- Canadian Physical Activity Guidelines: [www.csep.ca/guidelines](http://www.csep.ca/guidelines)
- CSEP PARmed-X for Pregnancy: <http://www.csep.ca/CMFiles/publications/parq/parmed-xpreg.pdf>

### References

- (1) Feig DS, Berger H, Donovan L, Godbout A, Kader T, Keely E, et al. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: Diabetes and pregnancy. *Can J Diabetes*. 2018; 42(Suppl 1):S282.
- (2) Tobias DK, Stuart JJ, Li S, Chavarro J, Rimm EB, Rich-Edwards J, et al. Association of history of gestational diabetes with long-term cardiovascular disease risk in a large prospective cohort of US women. *JAMA Intern Med*. 2017 Dec 01; 177(12):1735-42.
- (3) American Diabetes Association. Gestational diabetes mellitus. *Diabetes Care*. 2004 Jan; 27(Suppl 1):88.
- (4) Ekoe MJ, Goldenberg R, Katz P. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: Screening for diabetes in adults. *Can J Diabetes*. 2018; 42(Suppl 1):S19.
- (5) Macintosh MC, Fleming KM, Bailey JA, Doyle P, Modder J, Acolet D, et al. Perinatal mortality and congenital anomalies in babies of women with type 1 or type 2 diabetes in England, Wales, and Northern Ireland population based study. *BMJ*. 2006; 333:177.
- (6) Ray JG, O'Brien TE, Chan WS. Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: A meta-analysis. York (UK): Centre for Reviews and Dissemination (UK); 2001.
- (7) McElvy SS, Miodovnik M, Rosenn B, Khoury JC, Siddiqi T, Dignan PS, et al. A focused preconceptional and early pregnancy program in women with type 1 diabetes reduces perinatal mortality and malformation rates to general population levels. *J Matern Fetal Med*. 2000 Jan-Feb; 9(1):14-20.
- (8) Kendrick JM. Screening and diagnosing gestational diabetes mellitus revisited: Implications from HAPO. *J Perinat Neonatal Nurs*. 2011 Jul-Sep; 25(3):234.
- (9) Hillesmaa V, Suhonen L, Teramo K. Glycaemic control is associated with pre-eclampsia but not with pregnancy-induced hypertension in women with type I diabetes mellitus. *Diabetologia*. 2000 Dec; 43(12):1534-9.
- (10) Hsu CD, Tan HY, Hong SF, Nickless NA, Copel JA. Strategies for reducing the frequency of preeclampsia in pregnancies with insulin-dependent diabetes mellitus. *Am J Perinatol*. 1996 Jul; 13(5):265-8.
- (11) Diabetes Control and Complications Trial Research Group. Effect of pregnancy on microvascular complications in the diabetes control and complications trial. The diabetes control and complications trial research group. *Diabetes Care*. 2000 Aug 1; 23(8):1084-91.
- (12) Rasmussen KL, Laugesen CS, Ringholm L, Vestgaard M, Damm P, Mathiesen ER. Progression of diabetic retinopathy during pregnancy in women with type 2 diabetes. *Diabetologia*. 2010 Jun; 53(6):1076-83.
- (13) Kousta E, Efstathiadou Z, Lawrence N, Jeffs J, Godsland I, Barrett S, et al. The impact of ethnicity on glucose regulation and the metabolic syndrome following gestational diabetes. *Diabetologia*. 2006 Jan; 49(1):36-40.
- (14) Bo S, Monge L, Macchetta C, Menato G, Pinach S, Uberti B, et al. Prior gestational hyperglycemia: A long-term predictor of the metabolic syndrome. *J Endocrinol Invest*. 2004 July; 27(7):629-35.
- (15) Morton S, Kirkwood S, Thangaratnam S. Interventions to modify the progression to type 2 diabetes mellitus in women with gestational diabetes: A systematic review of literature. *Curr Opin Obstet Gynecol*. 2014 Dec; 26(6):476-86.
- (16) Inkster ME, Fahey TP, Donnan PT, Leese GP, Mires GJ, Murphy DJ. Poor glycated haemoglobin control and adverse pregnancy outcomes in type 1 and type 2 diabetes mellitus: Systematic review of observational studies. *BMC Pregnancy Childbirth*. 2006 Oct 30; 6:30.
- (17) Tennant PWG, Glinianaia SV, Bilous RW, Rankin J, Bell R. Pre-existing diabetes, maternal glycated haemoglobin, and the risks of fetal and infant death: A population-based study. *Diabetologia*. 2014 Feb; 57(2):285-94.



- (18) Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. Weight gain during pregnancy: Reexamining the guidelines. Washington (DC): National Academies Press (US); 2009.
- (19) Siega-Riz AM, Viswanathan M, Moos M, Deierlein A, Mumford S, Knaack J, et al. A systematic review of outcomes of maternal weight gain according to the institute of medicine recommendations: Birthweight, fetal growth, and postpartum weight retention. *Am J Obstet Gynecol*. 2009 Oct; 201(4):14.
- (20) Siegel AM, Tita A, Biggio JR, Harper LM. Evaluating gestational weight gain recommendations in pregestational diabetes. *American Journal of Obstetrics & Gynecology*. 2015 Oct; 213(4):563.e5.
- (21) Gante I, Amaral N, Dores J, Almeida MC. Impact of gestational weight gain on obstetric and neonatal outcomes in obese diabetic women. *BMC Pregnancy Childbirth*. 2015 Oct 08; 15:249.
- (22) Viswanathan M, Siega-Riz AM, Moos M, Deierlein A, Mumford S, Knaack J, et al. Outcomes of maternal weight gain. : Agency for Healthcare Research and Quality (US); 2008.
- (23) Catalano PM, Mele L, Landon MB, Ramin SM, Reddy UM, Casey B, et al. Inadequate weight gain in overweight and obese pregnant women: What is the effect on fetal growth? *Am J Obstet Gynecol*. 2014 Aug; 211(2):7.
- (24) Rae A, Bond D, Evans S, North F, Roberman B, Walters B. A randomised controlled trial of dietary energy restriction in the management of obese women with gestational diabetes. *Aust N Z J Obstet Gynaecol*. 2000 Nov; 40(4):416-22.
- (25) Moreno-Castilla C, Mauricio D, Hernandez M. Role of medical nutrition therapy in the management of gestational diabetes mellitus. *Curr Diab Rep*. 2016 Apr; 16(4):22.
- (26) Yamamoto JM, Kellett JE, Balsells M, García-Patterson A, Hadar E, Solà I, et al. Gestational diabetes mellitus and diet: A systematic review and meta-analysis of randomized controlled trials examining the impact of modified dietary interventions on maternal glucose control and neonatal birth weight. *Diabetes Care*. 2018 07; 41(7):1346-61.
- (27) Health Canada. Canada's food guides. 2014; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/canada-food-guides.html> .
- (28) Dietitians of Canada. Gestational diabetes knowledge pathway. In: Practice-based evidence in nutrition [PEN]. 2018; [Cited: Sept 13 2018]. Available from: <http://www.pennutrition.com/KnowledgePathway.aspx?kpid=4236&trid=4210&trcatid=38> Access only by subscription.
- (29) Academy of Nutrition and Dietetics. Evidence analysis library: Executive summary of recommendations (2016) gestational diabetes (GDM). 2016; [Cited: 12 September 2018]. Available from: <https://www.andeal.org/topic.cfm?menu=3731&cat=5538> .
- (30) Rizzo T, Metzger BE, Burns WJ, Burns K. Correlations between antepartum maternal metabolism and intelligence of offspring. *N Engl J Med*. 1991 Sept; 325(13):911-6.
- (31) Camprubi Robles M, Campoy C, Garcia Fernandez L, Lopez-Pedrosa JM, Rueda R, Martin MJ. Maternal diabetes and cognitive performance in the offspring: A systematic review and meta-analysis. *PLoS ONE*. 2015 10(11):e0142583.
- (32) Sievenpiper JL, Chan CB, Dworatzek PD, Freeze C, Williams SL. Nutrition therapy. *Can J Diabetes*. 2018 Apr; 42 Suppl 1:S79.
- (33) Ásbjörnsdóttir B, Akueson CE, Ronneby H, Rytter A, Andersen JR, Damm P, et al. The influence of carbohydrate consumption on glycemic control in pregnant women with type 1 diabetes. *Diabetes Res Clin Pract*. 2017 May; 127:97-104.
- (34) Zagury RL, Rodacki M, Mello de Oliveira L, Saunders C, de Carvalho Padilha P, Zajdenverg L. Carbohydrate counting during pregnancy in women with type 1 diabetes: Are there predictable changes that we should know? *Ann Nutr Metab*. 2017 70(2):140-6.

- (35) Institute of Medicine: Food and Nutrition Board. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington (DC): Institute of Medicine of the National Academies; 2005.
- (36) Diabetes Canada. Glycemic index food guide. 2018; [Cited: Sept 13 2018]. Available from: <http://guidelines.diabetes.ca/docs/patient-resources/glycemic-index-food-guide.pdf> .
- (37) Hernandez TL, Anderson MA, Chartier-Logan C, Friedman JE, Barbour LA. Strategies in the nutritional management of gestational diabetes. Clin Obstet Gynecol. 2013 Dec; 56(4):803-15.
- (38) Viana LV, Gross JL, Azevedo MJ. Dietary intervention in patients with gestational diabetes mellitus: A systematic review and meta-analysis of randomized clinical trials on maternal and newborn outcomes. Diabetes Care. 2014 Dec; 37(12):3345-55.
- (39) Moses RG, Luebcke M, Davis WS, Coleman KJ, Tapsell LC, Petocz P, et al. Effect of a low-glycemic-index diet during pregnancy on obstetric outcomes. Am J Clin Nutr. 2006 Oct; 84(4):807-12.
- (40) Health Canada. The safety of sugar substitutes. 2008; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/healthy-living/your-health/food-nutrition/safety-sugar-substitutes.html> .
- (41) Health Canada. Sugar substitutes. 2004; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/food-additives/sugar-substitutes.html> .
- (42) Government of Canada, Canadian Food Inspection Agency. Sweeteners. 2013; [Cited: Oct 30, 2018]. Available from: <http://www.inspection.gc.ca/food/labelling/food-labelling-for-industry/sweeteners/eng/1387749708758/1387750396304?chap=3#s7c3> .
- (43) Diabetes Canada. Sugar and sweeteners. 2018; [Cited: Sept 13 2018]. Available from: <http://guidelines.diabetes.ca/docs/patient-resources/sugars-and-sweeteners.pdf> <http://guidelines.diabetes.ca/docs/patient-resources/sugars-and-sweeteners.pdf> .
- (44) Wilson RD, Wilson RD, Audibert F, Brock J, Carroll J, Cartier L, et al. Pre-conception folic acid and multivitamin supplementation for the primary and secondary prevention of neural tube defects and other folic acid-sensitive congenital anomalies. J Obstet Gynaecol Can. 2015 Jun; 37(6):534-52.
- (45) Health Canada. Prenatal nutrition guidelines for health professionals - iron contributes to a healthy pregnancy. 2009; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/reports-publications/nutrition-healthy-eating/prenatal-nutrition-guidelines-health-professionals-iron-contributes-healthy-pregnancy-2009.html> .
- (46) Health Canada. Prenatal nutrition guidelines for health professionals - folate contributes to a healthy pregnancy. 2009; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/reports-publications/nutrition-healthy-eating/prenatal-nutrition-guidelines-health-professionals-folate-contributes-healthy-pregnancy-2009.html> .
- (47) Institute of Medicine. Dietary reference intakes for calcium and vitamin D. 2010; [Cited: Feb 13 2017]. Available from: <http://www.nationalacademies.org/hmd/Reports/2010/Dietary-Reference-Intakes-for-Calcium-and-Vitamin-D.aspx/> .
- (48) Burris HH, Camargo CA. Time for large randomised trials of vitamin D for women with gestational diabetes mellitus to improve perinatal health outcomes. Diabetologia. 2014 Sep; 57(9):1746-8.
- (49) Health Canada. Canadian community health survey, cycle 2.2, nutrition focus - food and nutrition surveillance - health Canada. 2009; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/canadian-community-health-survey-cycle-2-2-nutrition-focus-food-nutrition-surveillance-health-canada.html> .

- (50) Muktabhant B, Lawrie TA, Lumbiganon P, Laopaiboon M. Diet or exercise, or both, for preventing excessive weight gain in pregnancy. *Cochrane Database Syst Rev*. 2015 Jun 15; (6):CD007145.
- (51) Davies GAL, Wolfe LA, Mottola MF, MacKinnon C. Joint SOGC/CSEP clinical practice guideline: Exercise in pregnancy and the postpartum period. *Can J Appl Physiol*. 2003 Jun; 28(3):330-41.
- (52) Harrison AL, Shields N, Taylor NF, Frawley HC. Exercise improves glycaemic control in women diagnosed with gestational diabetes mellitus: A systematic review. *J Physiother*. 2016 Oct; 62(4):188-96.
- (53) Segal RF, Armstrong MJ, Bacon SL, Boule NG, Dasgupta K, Kenny GP, et al. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: Physical activity and diabetes. *Can J Diabetes*. 2018; 42(Suppl 1):S63.
- (54) Canadian Society for Exercise Physiology. PARmed-X for pregnancy: Physical activity readiness medical examination. 2015; [Cited: Sept 13 2018]. Available from: <http://www.csep.ca/CMFiles/publications/parg/parmed-xpreg.pdf> .
- (55) Health Canada. Infant feeding. 2010; [Cited: Oct 30, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/infant-feeding.html> .
- (56) Riviello C, Mello G, Jovanovic LG. Breastfeeding and the basal insulin requirement in type 1 diabetic women. *Endocr Pract*. 2009 Apr; 15(3):187-93.
- (57) Sparud-Lundin C, Wennergren M, Elfvin A, Berg M. Breastfeeding in women with type 1 diabetes. 2011 Jan 1; 34(2):296-301.
- (58) Carson MP, Frank MI, Keely E. Original research: Postpartum testing rates among women with a history of gestational diabetes--systematic review. *Prim Care Diabetes*. 2013 Oct; 7(3):177-86.