Gestational Diabetes

Educational material of project
Gestational Diabetes Care in Upper Egypt
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Gestational Diabetes

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**Introduction**

There is no doubt that health awareness and education play an important role in preserving health and preventing diseases as it was said in the past that "prevention is better than treatment."

Endocrinology and Diabetes Unit, Assiut University sought to publish this booklet, the meaningful brochures and scientific methods in order to promote health awareness among women with gestational diabetes with the aim of raising awareness about and preventing this disease and its grave consequences and complications for both the mother and the child when its treatment is neglected or its diagnosis is delayed. Also the booklet targets the health care professionals, General practitioners who deal with pregnant women in primary care center.

This booklet is considered one of the activities of the Gestational Diabetes Care Project in Upper Egypt, on which the Endocrinology and Diabetes Unit, Assiut University, is based under the supervision of the World Diabetes Foundation (WDF). This project aims at early detection of gestational diabetes in order to avoid its complications.

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This booklet deals with several main points such as the definition of gestational diabetes, the risk factors causing this disease, the methods of its diagnosis, and the modern methods of its treatment.

I appreciate all those who worked on this project and I thank God for making this project to get benefit for every doctor, nurse, and gestational diabetics and reduces its complications that can be avoided by increasing awareness about this disease and its treatment.

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Diabetes Mellitus

Diabetes is a chronic and common disease that can lead to high levels of glucose in the blood. It occurs when the body cannot secret an adequate amount of insulin (a hormone secreted by Beta Cells of Pancreas) or when the natural amount of insulin is not effective or when its action antagonized by different body cells. Insulin works as a key to the entrance of glucose into the body cells to be used as a source of energy. If there is insufficient insulin or ineffective insulin (resistance) thus resulting in an increase in the glucose level in the blood instead of entering it into the body cells and it is excreted with urine when the amount of glucose exceeds 180mg/dl.

Current statistics indicate that there are more than 415 million diabetics in the world, and this figure will increase to 642 million by 2040 (IDF Atlas, 2015), 80% of whom live in developing countries.

Diabetes can be divided into the following types:

**Type 1 Diabetes:**
This type is dependent on insulin treatment. It is usually occurred in children and young adults below the age of 20, And characterized by sever insulin deficiency.

**Type 2 Diabetes:**
Type 2 Diabetes is the most common type as it represents about 90% of all diabetics. This type is called noninsulin dependent diabetes, which is the most prevalent type among adults who are over 40 or suffer from overweight and obesity.

**Gestational Diabetes:**
This type is the subject matter of discussion in this booklet.

In addition, there is

**Secondary Diabetes:**
This type of diabetes results from the use of drugs as steroids or disorders of endocrine functions.
What is Gestational Diabetes?

It is a type of diabetes that occurs during the period of pregnancy, usually in the **sixth or seventh month** of pregnancy (between the **24th and the 28th week** of gestation) due to the resistance of the placental hormone to insulin action, so the body cannot metabolize sugar in the blood as required and, as a result, the level of blood sugar increases and the cells cannot use it as energy.

It usually affects >12 % of all pregnant women. Therefore, this type of diabetes is regarded as one of the most common health problems for pregnant women. Gestational diabetes often disappears after delivery, but the possibility of its recurrence with another pregnancy in the future is high. Researches have proved that the recurrence of this disease increases the possibility of its later development into Type 2 Diabetes for both the mother and her offspring.

The rate of gestational diabetes is increasing throughout the world. According to the report of the International Diabetes Federation (IDF), one out of every 7 pregnant women has gestational diabetes.

**1 in 7 births is affected by gestational diabetes**
**Risk factors of gestational diabetes:**

Risk Factors that Contribute to occurrence of Gestational Diabetes:

- Overweight and obesity BMI $\geq 25$ kg/m$^2$.
- Rapid increase of weight during the first trimester of pregnancy.
- Family history of diabetes (father – mother - siblings).
- Mother age is over 25 years old.
- If a woman suffers from polycystic ovary syndrome.
- If a woman has previously given birth to a child who weighs over 4.5 kg.
- If a woman has previously given birth to a dead or deformed fetus.
- If a woman has previously suffered from gestational diabetes.
- If a woman suffers from an increase in the amniotic fluid.

Women who have gestational diabetes may not have any of the above-mentioned causes.

**Symptoms of Gestational Diabetes**

A woman usually does not suffer from any symptoms or she may suffer from the following:

- Thirst (polydypsia)
- Increased urinating (polyuria)
- Loss of weight despite increased appetite
- Exhaustion
- Nausea and repeated vomiting
- Recurrent genitourinary and skin infections.
- Blurred vision
Diagnosis of Gestational Diabetes

There isn't specific global consensus on the diagnosis of gestational diabetes (table 1). Women who are at risk for gestational diabetes have to be subjected to a blood glucose test as soon as she knows that she is pregnant. If the result of the test is negative, the woman should have the test again between 24-28 weeks of pregnancy, while other women should have the test between 24-28 weeks. Blood sugar is tested in all pregnant women after 2 hours of taking 75 gm of glucose and if the result is high or if the glucose level is more than 140 mg/dl, the mother will be regarded as a gestational diabetic according to the report of the World Health Organization (1999).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Fasting</th>
<th>1-hour</th>
<th>2-hour</th>
<th>3-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA/NDDG(^{1999})</td>
<td>105*</td>
<td>190</td>
<td>165</td>
<td>145</td>
</tr>
<tr>
<td>ADA(^{2000-2010})</td>
<td>95</td>
<td>180</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>ADIPS</td>
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<td>144</td>
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<td>95</td>
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<td></td>
</tr>
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<td>WHO(^{1990})</td>
<td>140</td>
<td>Not measured</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>WHO(^{1999})</td>
<td>126</td>
<td>Not measured</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>IADPSG</td>
<td>92</td>
<td>180</td>
<td>153</td>
<td></td>
</tr>
</tbody>
</table>

* Values in mg/dl

Other Important Tests

HbA1c test is performed if the blood glucose level is over 200 mg/dl after taking 75gm of glucose to detect pre-gestational diabetes.

In addition, blood urea and serum creatinine, TSH, thyroxin, and ultrasound tests can be used to estimate the period of pregnancy and to make sure that the fetus does not have any congenital defects.

When eclampsia (toxemia of pregnancy) is expected to occur, the albumin/creatinine ratio of urine should be estimated, kidney function and uric acid should be performed. Other tests, like Doppler Ultrasound, should be performed in order to evaluate the status of the fetus.
Complications of Gestational Diabetes:

Complications of Gestational Diabetes for the Mother:
A considerable number of women who suffer from gestational diabetes have a miscarriage. The occurrence of miscarriage is associated with the degree to which blood sugar is regulated.

- Preterm labor.
- Increased number of cesarean sections.
- Eclampsia (Toxemia of pregnancy).
- Urinary tract infection due to the high level of glucose in the urine.
- Risk of developing diabetes, either type 2 diabetes or gestational diabetes or metabolic syndrome in the future.
- Complications of chronic diabetes such as coronary artery diseases, cerebro-vascular diseases, and kidney diseases, increase when there is no suitable treatment to control the blood glucose.

Complications of Gestational Diabetes for the Fetus:
We have to reassure the mother who suffers from gestational diabetes that her fetus will have no congenital deformities (in the heart or the nervous system as in pre-existing type 1, type 2 diabetes, which may occur to the diabetic mother before pregnancy, especially in cases of high blood glucose level before and during pregnancy. However, the fetus may be vulnerable to the following:

- Overweight of the fetus ( Macrosomia).
- An increase in the number of red blood cells (polycythemia) due to a decrease in the oxygen level of the fetus's blood.
- Low blood glucose level of the fetus (hypoglycemia).
- An increase in perinatal bilirubin (e.g. jaundice), and a decrease in blood glucose level, shortness of breath, and polycythemia.
- An increase in obstetric traumas (such as shoulder dystocia, and brachial plexus trauma).
- Low calcium level in the newborn.
- An increase in breathing problems in the newborn baby such as respiratory distress syndrome.
- Accelerated growth due to the increased storage of fats during gestational period which may extend in most cases to the baby's life in childhood and puberty.
- The baby may develop the metabolic syndrome during childhood which includes obesity, high blood pressure, high level of harmful fats in the blood, and type 2 diabetes during adolescence later in life.

Effect of maternal hyperglycemia
Treatment of Gestational Diabetes:

The aim of treatment is to keep blood glucose level within the normal level throughout pregnancy in order to secure the health of the mother and fetus through:

1. Medial nutritional therapy

Following balanced healthy diet that provide the necessary nutrition for the pregnant women and fetus, with aim to avoid severe high and low levels of blood sugar; this can be achieved by medical nutritional therapy. Fortunately, a high percentage of gestational diabetes is regulated by diet and changing lifestyle without having to take insulin or other oral drugs to regulate sugar.

Following a balanced system of nutrition:

- The diet must contain the required calories for the pregnant woman, usually between 1800-2000 calories.
- Then division of meals into three main meals (Breakfast-Lunch-Dinner) and two or three snacks daily.
- The meal must be balanced and contain all nutritional elements.
- Having a small breakfast followed by a similar snack after 2 hours. The glucose level in women who suffer from gestational diabetes is usually high in the morning; therefore, breakfast must contain an appropriate amount of carbohydrates which is much less that taken in lunch and dinner.
- For instance, breakfast may contain a cup of skimmed milk, one fourth of a loaf of bread, and one boiled egg.
- Not skipping meals.
- Having the permissible quantities of carbohydrates daily (consulting a dietitian). Carbohydrates must account for 40%-45% of the total calories taken in daily so that main breakfast and the snack that is taken before going to bed contain 15-30gm of carbohydrates.

- Choosing food that is rich in fibers such as bread made from whole grain-flour), macaroni, rice, fruits, and vegetables. A pregnant woman must have from 20-35gm of fibers every day.

- Fats must be less than 40% of the daily calories, especially saturated fats (butter) which must be less than 10%.

- Eating protein products and meat that contain little fat such as skinned chicken, fish, and meat free of fats, and avoid eating processed meat as luncheon, hamburger, meatballs, sausage, hotdog, and pastrami.

- Removing fats in meat and the skin of chicken.

- Using cooking methods that reduce the use of fats such as grilling, boiling, steam cooking.

**Example of healthy breakfast for GDM.**
• Avoiding frying food with oil or butter. If it is necessary, a small amount of oil could be used with the help of kitchen utensils that depend on less quantities of oil.

• Drinking milk, especially skimmed milk, as it is the most important source of calcium.

• Avoiding having sweetened beverage and add sugar to juices and it is better to have the specified quantity of fruit in later periods (Avoid fruits at breakfast).

• Reducing sweets, ice-cream, pies, cakes, and biscuits.

• Drinking 8 cups of water daily.

• Eating three to four portions of fruit rich in full vitamins and minerals daily.

**Simply, a healthy plate could be used!**

It helps us divide the food that we eat into different and balanced components and control the amount of carbohydrates and food stuff necessary for the body.
2. Physical exercise:

Exercising is one of the bases of controlling gestational diabetes as it reduces blood glucose level by burning calories and decreasing body resistance to insulin.

Moderate exercising is recommended after meals for a better control of blood sugar such as walking for 10 to 15 minutes after every meal. A pregnant woman should eat one piece of fruit or 15gm of carbohydrates if she exercised for 30 minutes, but if the pregnant woman exercises 2 or more hours after having a meal, she will have to take a snack before exercising.

Exercises like moving the upper part of the body or swimming and joining sport classes are recommended for pregnant women.

Among the most important precautions that must be followed before starting any sport program during pregnancy is consulting the doctor to make sure that there are no contraindications or harm to her pregnancy.

Doing regular exercises at least three times a week
3. Insulin therapy:

Your doctor may have to resort to the use of insulin medication if blood glucose level cannot be controlled through exercising and diet. This treatment could be started within a week or 10 days after changing the dietary and behavioral style and when blood glucose doesn’t reach the required level (as shown in table 2).

<table>
<thead>
<tr>
<th>Monitoring time</th>
<th>Diabetes Mellitus (mg/dl)</th>
<th>Gestational Diabetes (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>60 – 100</td>
<td>60 - 90</td>
</tr>
<tr>
<td>1 hour postprandial</td>
<td>100 – 140</td>
<td>&lt; 140</td>
</tr>
<tr>
<td>2 hours postprandial</td>
<td>&lt; 140</td>
<td>&lt; 120</td>
</tr>
<tr>
<td>At bed time</td>
<td>100 – 120</td>
<td></td>
</tr>
<tr>
<td>At 02:00 – 06:00 AM</td>
<td>60 - 120</td>
<td></td>
</tr>
</tbody>
</table>

The most common medication plan includes two kinds of insulin, regular (R) and intermediate acting (N) insulin, by taking 2 to 4 subcutaneous injections per day (by physician instructions).

Regular insulin starts its action 30-60 minutes after injection. This kind of insulin reaches the peak of its action after 2-3 hours. It also continues for 8-10 hours, which increases the possibility of a decrease in blood glucose levels, while intermediate acting insulin is taken 2 times a day before breakfast and before bed. The insulin dose is determined by the doctor and the doses are usually fewer than those needed for a woman with pre-gestational diabetes, (usual starting dose is 0.1 -0.2 u/kg/day).

New types of insulin:

In recent years, a new insulin treatment plan, which simulates the action of natural insulin, has begun to be used for better control of the glucose level during pregnancy. This plan includes two types of insulin: rapid-acting insulin (Aspart – Lispro – Apidra) that is taken immediately before meals, and long-acting insulin (Glargine – Detemir). However, because they are new, only some of them have been approved for use during pregnancy.
**Treatment of hypoglycemia:**

During treatment with insulin the mother could be liable to a decrease in blood glucose level (hypoglycemia), especially when she exerts effort or delays meals, so that she has to be aware of the symptoms of hypoglycemia which includes:

- Shaking
- Sweating
- Anxious
- Dizziness
- Hunger
- Fast heartbeat
- Impaired vision
- Weakness and Fatigue
- Headache
- Irritable

We can make sure of this by performing a blood glucose test using Glucometer (glucose is less than 70 gm/dl). The pregnant woman should take rapid-acting sugars such as: a spoonful of honey or three spoonfuls of sugar added to a half cup of water, or what is equivalent to 15 gm of glucose. Then after 15 minutes another blood glucose test is performed. The treatment may need to be repeated again if there is no response.

**Oral Drugs for the Treatment of Gestational Diabetes**

Metformin and Glibenclamide could be used for the treatment of gestational diabetes during pregnancy especially in the last months of pregnancy without any harm. However, we still need more research and insulin is still the first, safe, and internationally agreed-upon choice for the treatment of gestational diabetes.
4. Monitoring the Blood Glucose Level:

This is done through measuring the blood glucose level four times a day (before breakfast and 2 hours after every meal) or before every meal and 2 hours after every meal (we may have to turn to this method if it is difficult to control the blood glucose level).

**Chick blood glucose regularly.**

It is necessary to bring a reading table in every visit. You can make a table similar to the one shown below by yourself.

<table>
<thead>
<tr>
<th>Date</th>
<th>Before breakfast</th>
<th>2h After breakfast</th>
<th>Before lunch</th>
<th>2h After Lunch</th>
<th>Before Dinner</th>
<th>2h After Dinner</th>
<th>At bed time</th>
</tr>
</thead>
<tbody>
<tr>
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</table>
5. Weight Monitoring:

Normal increase in weight during pregnancy is a good sign of the fetus's health and indicates that it takes its nutritional needs and that it is growing in a proper way. Overweight during pregnancy depends on weight before pregnancy and the number of fetuses in the uterus. Overweight is usually obvious during the last two-trimesters of pregnancy.

It is not necessary to eat for two persons (the mother and the fetus) during pregnancy. A pregnant woman should consume 200-300 calories more than what she used to consume before pregnancy in order to meet the fetus's needs.

If a pregnant woman has average weight, then she has to put on weight during pregnancy as follows: 2.7-1.4 kg during the first three months of pregnancy and a half kilogram every week after that. The following table illustrates the necessary increase in weight during pregnancy.

<table>
<thead>
<tr>
<th>Weight status</th>
<th>Weight gain (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>BMI &lt; 18.5</td>
</tr>
<tr>
<td>Normal weight</td>
<td>BMI 18.5 – 24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>BMI 25 – 29.9</td>
</tr>
<tr>
<td>Obese</td>
<td>BMI &gt; 30</td>
</tr>
<tr>
<td>Twins</td>
<td></td>
</tr>
</tbody>
</table>

6. Postpartum Period:

Pregnancy may be a cause for the detection of diabetes. Therefore, gestational diabetics should continue treatment after delivery and follow the following steps:

- Losing weight through a dieting or exercising.
- Giving up smoking because it causes insulin resistance.
- Encouraging breastfeeding (and not eating too much food) in order to help her lose weight and regulate blood glucose.
- Oral Glucose Tolerance Test should be performed 6-12 weeks after delivery because the mother remains vulnerable to type 2 diabetes.
- A blood glucose test should be checked once a year if the result of the Glucose Tolerance Test is normal.
7. Patient and Health Education:

Patient education is considered a main pillar in maintaining the blood glucose level. The glucose level in a woman with gestational diabetes is almost near to that of healthy ones. Responding to treatment depends upon the patient's understanding of some matters like the consequences of gestational diabetes on the mother and fetus.

Education can be presented by a team of trained nurses who are specialized in gestational diabetes, nutrition, and a diabetes health education.

Gestational diabetes care team can provide help during the postpartum period through encouraging breastfeeding, planning healthy diet, support adequate sleep, and regulating blood glucose.

8. Family Support:

The family's role during pregnancy has the greatest effect on the mother's physical and mental health. All precautions must be taken to reduce tension and anxiety. A pregnant woman needs family support in order to monitor and control the blood glucose level on a regular basis and by a healthy life system free of stress.

Wishing recovery and health for all.
References

- IDF GDM MODEL OF CARE. IMPLEMENTATION PROTOCOL GUIDELINES FOR HEALTHCARE PROFESSIONALS. International Diabetes Federation 2015.

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