University of Al Qadisiyah

Collage of pharmacy

Gestational Diabetes

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﴿وَقُل رَّبِّ زِدْنِي عِلْمًا﴾

Summary

Develops during pregnancy and is usually diagnosed at 24 to 28 weeks of gestation on the basis of elevated plasma glucose levels on glucose tolerance testing.Goal of therapy is to achieve maternal glucose levels that are as close to normal as possible in order to avoid fetal macrosomia and complications.Initial therapy for gestational diabetes is usually dietary modification. Insulin is started when acceptable glucose levels cannot be maintained with diet alone.Maternal postnatal testing for diabetes or impaired glucose tolerance is performed at least 6 weeks following delivery.The risk for recurrence of GDM in subsequent pregnancies or progression to type 2 diabetes is high.

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&

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Introduction

The term diabetes mellitus describes a metabolic disorder of multiple aetiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long– term damage, dysfunction and failure of various organs. Diabetes mellitus may present with characteristic symptoms such as thirst, polyuria, blurring of vision, and weight loss. In its most severe forms, ketoacidosis or a non–ketotic hyperosmolar state may develop and lead to stupor, coma and, in absence of effective treatment, death. Often symptoms are not severe, or may be absent, and consequently hyperglycaemia sufficient to cause pathological and functional changes may be present for a long time before the diagnosis is made.[1][2]

Classification:

Type 1 (beta–cell destruction, usually leading to absolute insulin deficiency)

1.*Autoimmune Diabetes Mellitus*	**2. *Idiopathic***
Insulin–dependent diabetes. Results from autoimmune mediated destruction of the beta cells of the pancreas. Commonly observed in children, but also may occur in adults. Present with ketoacidosis.[3]	have no known a etiology. Some of these patients have permanent insulinopenia and are prone to ketoacidosis. This form of diabetes is more common among individuals of African and Asian origin.[4]

Type 2 (insulin resistance with insulin deficiency or both). These individuals do not need insulin treatment to survive.The majority of patients with this form of diabetes are obese, and obesity itself causes or aggravates insulin resistance. Ketoacidosis is infrequent in this type of diabetes.The risk of developing Type 2 diabetes increases with age, obesity, and lack of physical activity . It occurs more frequently in women with prior GDM and in individuals with hypertension or dyslipidaemia.[5]

Other Specific Types

1- ***Genetic defects of beta–cell function*** :: associated with monogenic defects in beta–cell function, frequently characterized by onset of mild hyperglycemia at an early age (generally before age 25 years).

2- ***Genetic defects in insulin action::*** unusual causes of diabetes which result from genetically determined abnormalities of insulin action.

3- ***Diseases of the exocrine pancreas::*** Any process that diffusely injures the pancreas can cause diabetes,, include pancreatitis, trauma, infection,pancreatic carcinoma,and pancreatectomy.

4-***Endocrinopathies::*** Several hormones (e.g. growth hormone, cortisol, glucagon, epinephrine) antagonize insulin action. Diseases associated with excess secretion of these hormones can cause diabetes (e.g. Acromegaly, Cushing's Syndrome, Glucagonoma and Phaeochromocytoma) . These forms of hyperglycaemia typically resolve when the hormone excess is removed.

5- ***Drug– or chemical–induced diabetes*** Many drugs can impair insulin secretion. These drugs may not, by themselves, cause diabetes but they may precipitate diabetes in persons with insulin resistance. Examples include nicotinic acid and glucocorticoids .

6- ***Infections*** Certain viruses have been associated with beta–cell destruction. Cytomegalovirus and other viruses (e.g. adenovirus and mumps) have been implicated in inducing the disease .[6]

Gestational diabetes

It is carbohydrate intolerance resulting in hyperglycemia of variable severity with onset or first recognition during pregnancy. The definition applies irrespective of whether or not insulin is used for treatment or the condition persists after pregnancy. Women who become pregnant and who are known to have diabetes mellitus which antedates pregnancy do not have gestational diabetes but have "diabetes mellitus and pregnancy" and should be treated accordingly before, during, and

after the pregnancy. Between 5% to 8% of pregnant women will develop gestational diabetes and this usually occurs around the 24th to 28th week of pregnancy.

It may be appropriate to screen pregnant women belonging to high–risk populations during the first trimester of pregnancy in order to detect previously undiagnosed diabetes mellitus. testing for gestational diabetes is usually done between 24 and 28 weeks of gestation.Ethnic origin is the most important independent variable associated with an increased risk of developing GDM. [7]

Table 1. women at greatest risk of developing gestational diabetes mellitus (GDM)

1. Women in the following ethnic groups:
Indo-Asian, Afro-Caribbean, African, Arab Mediterranean or Hispanic
2. Older women (prevalence increases with age)
3.Women who are overweight
4.Women with a family history of diabetes
5.Women who have had previous GDM
6. Women who have had previous large babies
7.Women who have had previous unexplained stillbirth or neonatal death

Insulin sensitivity decreases as a result of raised levels of oestrogen, cortisol and other hormones produced by the placenta. These hormones begin to block the effects of insulin from around the 18th week of pregnancy. This reduction in maternal insulin sensitivity requires a threefold increase in maternal insulin secretion to maintain normal glucose tolerance by the third trimester of pregnancy. Women with insufficient beta cell reserve to cope with these demands become glucose intolerant.[8]

The most common obstetric **complications** of GDM are neonatal hypoglycemia and macrosomia.

Neonatal hypoglycaemia

Neonatal hypoglycaemia can occur postpartum in babies where high maternal blood glucose levels have stimulated the fetal pancreas to

secrete more insulin. After delivery, when the baby's own blood glucose levels are normal, it can take up to 24 hours before excess insulin levels are reduced, thus exposing the baby to the risk of hypoglycaemia.[9]

Macrosomia

Macrosomia is defined as a fetus growing above the 95th centile for gestational age. This condition begins to occur after 10–14 weeks gestation, when the fetal pancreas has developed and become sensitive to maternal blood glucose levels (since glucose crosses the placental barrier). If maternal blood glucose levels are high, the fetus produces more insulin. Fetal insulin stimulates somatic and skeletal growth of insulin-sensitive tissues, leading to macrosomia .Macrosomia may cause several problems. **First**, vaginal delivery may be difficult as a result of the large body size of the baby. **Secondly**, babies with macrosomia are more likely to be induced early, when their lungs are immature, increasing their risk of respiratory distress.[10]

Physiology of pregnancy

The endocrinology of human pregnancy involves endocrine and metabolic changes that result from physiological alterations at the boundary between mother and fetus, known as the feto-placental unit **(FPU),** this interface is a major site of protein and steroid hormone production and secretion. Many of the endocrine and metabolic changes that occur during pregnancy can be directly attributed to hormonal signals originating from the FPU .

During early pregnancy, glucose tolerance is normal or slightly improved and peripheral (muscle) sensitivity to insulin and hepatic basal glucose production is normal . These could be caused by the increased maternal estrogen and progesterone in early pregnancy which increase and promote pancreatic ß-cell hyperplasia (Expansion of beta-cell mass in response to pregnancy) causing an increased insulin release . This explains the rapid increase in insulin level in early pregnancy, in response to insulin resistance.

In the second and third trimester, the continuous increase in the feto-placental factors will decrease maternal insulin sensitivity, and this will stimulate mother cells to use sources of fuels (energy) other than glucose as free fatty acids, and this will increase supply of glucose to the fetus .

In the normal physiological conditions, the fetal blood glucose is **10-20% less** than maternal blood glucose allowing the transport of glucose in the placenta to the fetal blood by the process of simple diffusion and facilitated transport. **In general**, the resistance to insulin can be characterized as pre-receptor (insulin antibodies) as in autoimmune diseases, receptor(decreased number of receptors on the cell surface) as in obesity, or post-receptor (defects in the intracellular insulin signaling pathway). **In pregnancy,** the decreased insulin sensitivity is best characterized by a post-receptor defect resulting in the decreased ability of insulin to bring about SLC2A4 (GLUT4) mobilization from the interior of the cell to the cell surface . This could be due to increase in the

plasma levels of one or more of the pregnancy-associated hormones .[11]

Pathophysiology of GDM

In the pathophysiology of GDM we have to consider two main points.

1-Role of feto-placental unit . 2-Role of the adipose tissue.

1-Role of feto-placental unit in GDM.

Insulin resistance during pregnancy is mainly attributed to the increase in the levels of pregnancy-associated hormones as estrogen, progesterone, cortisol, and placental lactogen in the maternal circulation . As pregnancy progresses and the placenta grow larger, hormone production also increases and so does the level of insulin resistance. This process usually starts between 20 and 24 weeks of pregnancy.

1. Feto-placental unit:

The placenta synthesizes pregnenolone and progesterone from cholesterol. Some of the progesterone enters the fetal circulation and provides the substrate for the formation of cortisol and corticosterone in the fetal adrenal glands. Some of the pregnenolone enters the fetus ,is the substrate for the formation of dehydroepiandrosterone sulfate (DHEAS) and 16-hydroxydehydroepiandrosterone sulfate (16-OHDHEAS) in the fetal adrenal. Some 16-hydroxylation also occurs in the fetal liver. DHEAS and 16-OHDHEAS are transported back to the placenta, where DHEAS forms estradiol and 16-OHDHEAS forms estriol. The principal estrogen formed is estriol, and since fetal 16-OHDHEAS is the principal substrate for the estrogens, the urinary estriol excretion of the mother can be monitored as an index of the state of the fetus .

2.Diabetic action of steroid hormones (cortisol, estrogen, and progesterone):

These hormones are increased steadily with the advance of pregnancy. The anti-insulin action of these hormones is a well known fact since the last century. The fetus and the placenta interact in the formation of these steroid hormones. It has been shown that the **increase** in cortisol

level during pregnancy is considered as the main hormone which cause **decrease** in glucose tolerance in normal pregnancy.

While others considered that estrogen and progesterone which are elevated steadily during pregnancy are the main hormones which influence beta cell function in early pregnancy and insulin resistance especially in late pregnancy .Although some scientists have considered that human **chorionic gonadotropin (HCG)** may participates in the development of insulin resistance during pregnancy as it shows higher level in women with GDM in comparison with normal pregnancies .But, as we know from the normal changes during pregnancy, the main increase of HCG occurs during the first trimester, and this period is associated with an increase in insulin sensitivity and improvement of glucose tolerance. Therefore, we consider that HCG has no direct role as a cause of GDM.[12] [13]

2-Role of adipose tissue in GDM.

Adipose tissue produce numerous factors (adipocytokines), most of them act as hormones. These adipocyte-derived hormones have been implicated in the regulation of maternal metabolism and gestational insulin resistance. Adipocytokines, including leptin, adiponectin, tumor necrosis factor alpha, interleukin-6, as well as the newly discovered, visfatin, and apelin. [13]

Management

Treatment of GDM with diet and insulin reduces health problems mother and child. If a diabetic diet or G.I. Diet, exercise, and oral medication are inadequate to control glucose levels, insulin therapy may become necessary.

Lifestyle

Most women can manage their GDM with dietary changes and exercise. Self monitoring of blood glucose levels can guide therapy. Some women will need antidiabetic drugs, most commonly insulin therapy.Any diet needs to provide sufficient calories for pregnancy, typically 2,000 – 2,500

kcal with the exclusion of simple carbohydrates.The main goal of dietary modifications is to avoid peaks in blood sugar levels. This can be done by spreading carbohydrate intake over meals and snacks throughout the day, and using slow-release carbohydrate sources—known as the G.I. Diet. Since insulin resistance is highest in mornings, breakfast carbohydrates need to be restricted more.Ingesting more fiber in foods with whole grains, or fruit and vegetables can also reduce the risk of gestational diabetes.Regular moderately intense physical exercise is advised, although there is no consensus on the specific structure of exercise programs for GDM.[14]

Medication

1-Insulin is used as a medication to treat high blood sugar. The common side effect is low blood sugar. Other side effects may include pain or skin changes at the sites of injection, low blood potassium, and allergic reactions. Use during pregnancy is relatively safe for the baby.Types:

Fast-acting	Short-acting	Intermediate-acting	Long acting	Ultra-long acting
Aspart, lispro, and glulisine. These begin to work within 5 to 15 minutes and are active for 3 to 4 hours.	Regular insulin which begins working within 30 minutes and is active about 5 to 8 hours.	NPH insulin which begins working in 1 to 3 hours and is active 16 to 24 hours.	Glargine and Detemir, which begins working within 1 to 2 hours and continue to be active, without major peaks or dips, for about 24 hours, although this varies in many individuals.	Degludec, which begins working within 30–90 minutes, and continues to be active for greater than 24 hours.[31]

Combination insulin products: Includes a combination of either fast-acting or short-acting insulin with a longer acting insulin, typically an NPH insulin. The combination products begin to work with the shorter acting insulin (5–15 minutes for fast-acting, and 30 minutes for short acting), and remain active for 16 to 24 hours. There are several variations with different proportions of the mixed insulins (e.g. Novolog Mix 70/30 contains 70% aspart protamine [akin to NPH], and 30% aspart).[15]

2-Metformin:

marketed under the trade name Glucophage among others, is the first-line medication for the treatment of type 2 diabetes. This is particularly true in people who are overweight. It is also used in the treatment of polycystic ovary syndrome and Gestational diabetes · Limited evidence suggests metformin may prevent the cardiovascular disease and cancer complications of diabetes.It is not associated with weight gain. It is taken by mouth.[16]

Chapter Two

Material
&
Diagnosis

1-subjects:

The study include one group gestational diabetes . All samples were collected from September 2016 till may 2017. The work do in Gynecology and Paediatrics Hospital.

2-patient Group:

The study was performed on 25 gestational diabetes patient. The patient aged ranged between 20_30 years .

3-chemicals and apparatus:

Number	Name
1	**Glucose kit**
2	**Centrifuge**
3	**Syringes 5ml**
4	**Micropipette tips (different size)**
5	**Micropipettes different size**
6	**Spectrophotometer**

Diagnosis:

1-Postprandial glucose test

is a blood glucose test , in the blood after a meal. A 2-hour postprandial blood glucose test measures blood glucose exactly 2 hours.

Procedure

A home blood sugar test is the most common way to check 2-hour postprandial blood sugar levels.

The health professional taking a blood sample will:[1]

- Wrap a tourniquet around the upper arm to stop the flow of blood. This makes the veins below the band larger so it is easier to put a needle into the vein.
- Clean the needle site with 70% isopropyl alcohol.
- Put the needle into the vein at a 10-30 degree.
- Place the vacutainer tube into the vacutainer holder of the needle to fill it with blood.
- Remove the torniquet from the arm when the tube is almost filled.
- Apply a gauze pad or cotton ball over the needle site as the needle is removed.
- Apply pressure to the site and then a bandage.

Results are often ready in 1 to 2 hours. Glucose levels in a blood sample taken from the vein (called a blood plasma value) may differ a little from glucose levels checked with a finger stick.

Reference ranges

The American Diabetes Association recommends a postprandial glucose level under 140 mg/dl and a preprandial plasma glucose between 90-130 mg/dl. [17]

2-The Oral Glucose Tolerance Test

The oral glucose tolerance test (OGTT) is principally used for diagnosis blood glucose levels.

Preparation

The patient is instructed not to restrict carbohydrate intake in the days or weeks before the test. The test should not be done during an illness, as results may not reflect the patient's glucose metabolism when healthy. A full adult dose should not be given to a person weighing less than 42.6 kg (94 lb), or the excessive glucose may produce a false positive result. Usually the OGTT is performed in the morning as glucose tolerance can exhibit a diurnal rhythm with a significant decrease in the afternoon. The patient is instructed to fast (water is allowed) for 8–12 hours prior to the tests. The oral glucose load for adults is 75 grams and the child dose is 1.75 gm/kg of body weight up to a maximum of 75 grams.

Procedure:

1.A zero time (baseline) blood sample is drawn.

2.The patient is then given a measured dose (below) of glucose solution to drink within a 5-minute time frame.

3.Blood is drawn at intervals for measurement of glucose (blood sugar), and sometimes insulin levels. The intervals and number of samples vary according to the purpose of the test. For simple diabetes screening, the most important sample is the 2 hour sample and the 0 and 2 hour samples may be the only ones collected. A laboratory may continue to collect blood for up to 6 hours depending on the protocol requested by the physician.[18]

3-fasting blood sugar:

A range of 4 to 5.5 mmol/l (70 to 99 mg/dl) before a meal is normal. Continual fasting levels of 5.5 to 7 mmol/l (101–125 mg/dl) causes concern of possible prediabetes and may be worth monitoring. 7 mmol/l(126 mg/dl) and above means a risk of diabetes.

4-Glycated hemoglobin:

Glycated hemoglobin (hemoglobin A1c, HbA_{1c}, A1C, or Hb_{1c}; sometimes also referred to as being Hb1c or HGBA1C) is a form of hemoglobin that is measured primarily to identify the three-month average plasma glucose concentration. The test is limited to a three-month average

because the lifespan of a red blood cell is four months (120 days). However, since RBCs do not all undergo lysis at the same time, HbA1C is taken as a limited measure of 3 months. It is formed in a non-enzymatic glycation pathway by hemoglobin's exposure to plasma glucose , the American Diabetic Association (2009) added that HbA1c ≥6.5% is another criterion for the diagnosis of diabetes .[19]

5-Urinary glucose testing:

Women with GDM may have high glucose levels in their urine (glucosuria). Although dipstick testing is widely practiced, it performs poorly, and discontinuing routine dipstick testing has not been shown to cause underdiagnosis where universal screening is performed. Increased glomerular filtration rates during pregnancy contribute to some 50% of women having glucose in their urine on dipstick tests at some point during their pregnancy. The sensitivity of glucosuria for GDM in the first 2 trimesters is only around 10% and the positive predictive value is around 20%.[20]

Chapter Three

Result
&
Discussion

Results :

<table>
<tr><th>Treatment</th><th>Glucose level</th><th>History</th><th>Name of patient</th></tr>
<tr><td>Mixtard insuline</td><td>
<table>
<tr><th>RBS</th><th>Date</th></tr>
<tr><td>140 mg\dl</td><td>4\3</td></tr>
<tr><td>150mg \dl</td><td>8\3</td></tr>
<tr><td>110mg \dl</td><td>9\8</td></tr>
</table>
</td><td>G4P1A3
Age: 27 year
Pregnancy test in serum in 25\9
Time of GDM in 4\3
Time of delivery: 9\8
Type of delivery: caesarea</td><td>علياء حازم</td></tr>
<tr><td>Mixtard insuline</td><td>
<table>
<tr><th>RBS</th><th>Date</th></tr>
<tr><td>182 mg\dl</td><td>5\2</td></tr>
<tr><td>160mg \dl</td><td>20\2</td></tr>
<tr><td>120mg \dl</td><td>25\8</td></tr>
<tr><td>115mg \dl</td><td>26\8</td></tr>
</table>
</td><td>G5P2A3
Age: 32 year
Pregnancy test in serum in 11\3
Time of diagnosis GDM in 4\2
Time of delivery: 25\8
Type of delivery: caesarea</td><td>امال كاظم</td></tr>
<tr><td>Soluble insuline</td><td>
<table>
<tr><th>RBS</th><th>Date</th></tr>
<tr><td>170 mg\dl</td><td>2\1</td></tr>
<tr><td>160mg \dl</td><td>3\2</td></tr>
<tr><td>115mg \dl</td><td>6\6</td></tr>
<tr><td>110mg \dl</td><td>10\6</td></tr>
</table>
</td><td>G3P1A2
Age: 31 year
Pregnancy test in serum in 10\2
Time of diagnosis GDM in 25\12
Time of delivery: 6\6
Type of delivery: caesarea</td><td>شيماء ناظم</td></tr>
<tr><td>Novomix insuline</td><td>
<table>
<tr><th>RBS</th><th>Date</th></tr>
<tr><td>211 mg\dl</td><td>1\5</td></tr>
<tr><td>200mg \dl</td><td>2\6</td></tr>
<tr><td>150mg \dl</td><td>3\11</td></tr>
<tr><td>155mg \dl</td><td>5\11</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>G4P1A3
Age: 28 year
Pregnancy test serum in 11\3
Time of delivery: 3\11
Time of diagnosis GDM in 23\4
Type of delivery: caesarea</td><td>باسمة جاسم</td></tr>
</table>

فاطمة كامل	G2P0A2 Age:22 year Pregnancy test in serum in 12\3 Time of diagnosis GDM in 5\5 Time of delivery 11\12 type of delivery: caesarea	RBS / Date 140mg\dl / 7\5 138mg\dl / 8\6 118mg\dl / 11\12	Soluble insuline
شكرية علي	G2P1A1 Age:39 year Pregnancy test in serum in 11\2 Time of diagnosis GDM in 7\7 Time of delivery: 5\2 Type of delivery: caesarea	RBS / Date 163mg\dl / 8\7 158mg\dl / 10\8 115mg\dl / 5\2	Mixtard insuline
رواء حميد	G3p1A2 Age: 24 years Pregnancy test in serum: 24\8 Time of diagnosis GDM in 18\7 Time of delivery: 20\3 Type of delivery: Caesarea	RBS / Date 180 mg\dl / 18\7 157mg\dl / 20\7 145mg\dl / 20\3 140mg\dl / 23\3	Mixtard insuline
سجى نعمان	G4P1A3 Age: 23 years Pregnancy test in serum: 23\7 Time of diagnosis GDM in 25\2 Time of delivery: 27\8 Type of delivary: Caesare	RBS / Date 179 mg\dl / 25\2 160mg\dl / 1\3 110mg\dl / 27\8 100mg\dl / 28\8	Mixtard insulin
اميرة نومي	G4P1A3 Age: 36 years Pregnancy test in serum: 23\7 Time of diagnosis GDM in 3\10 Time of delivery: 5\5 Type of delivary: Caesarea	RBS / Date 152 mg\dl / 3\10 155mg\dl / 5\10 120mg\dl / 5\5 105mg\dl / 6\5	Mixtard insuline
فردوس محسن	G6P1A5 Age: 38 years Pregnancy test in serum: 24\7 Time of diagnosis GDM in 9\10 Time of delivery: 6\5 Type of delivary: Caesarea	RBS / Date 160 mg\dl / 9\10 152mg\dl / 15\10 120mg\dl / 6\5 115mg\dl / 7\5	Mixtard insuline

Mixtard insuline		**RBS** / **Date** **181 mg\dl** / **16\12** **170mg\dl** / **17\12** **117mg\dl** / **8\7** **108mg\dl** / **9\7**	**G3P1A2** **Age: 35 years** **Pregnancy test in serum: 26\7** **Time of diagnosis GDM in 16\12** **Time of delivery: 8\7** **Type of delivary: Caesarea**	اسماء حسين
Soluble insuline		**RBS** / **Date** **168 mg\dl** / **12\10** **162mg\dl** / **13\10** **114mg\dl** / **8\5** **105mg\dl** / **9\5**	**G2P0A2** **Age: 33 years** **Pregnancy test in serum: 25\6** **Time of diagnosis GDM in 12\10** **Time of delivery: 8\5** **Type of delivary: Caesarea**	صفاء عبد الساده
Soluble insuline		**RBS** / **Date** **162 mg\dl** / **21\12** **148mg\dl** / **23\12** **116mg\dl** / **9\7** **101mg\dl** / **10\7**	**G4P2A2** **Age: 32 years** **Pregnancy test in serum: 24\5** **Time of diagnosis GDM in 21\12** **Time of delivery: 9\7** **Type of delivary: Caesarea**	هدى شاكر
Novomix insuline		**RBS** / **Date** **185 mg\dl** / **25\1** **173mg\dl** / **26\1** **117mg\dl** / **2\7** **113mg\dl** / **3\7**	**G1P0A1** **Age: 28 years** **Pregnancy test in serum: 25\6** **Time of diagnosis GDM in 25\1** **Time of delivery: 2\7** **Type of delivary: Caesarea**	ايناس ثامر
Novomix insuline		**RBS** / **Date** **162 mg\dl** / **4\2** **153mg\dl** / **26\2** **119mg\dl** / **9\10** **110mg\dl** / **10\10**	**G3P1A2** **Age: 33 years** **Pregnancy test in serum: 25\6** **Time of diagnosis GDM in 4\2** **Time of delivery: 9\10** **Type of delivary: Caesarea**	رباب رشيد

جميلة عناد	G4P1A3 Age: 39 years Pregnancy test in serum: 27\6 Time of diagnosis GDM in 7\5 Time of delivery: 5\12 Type of delivary: Caesarea	RBS / Date 176 mg\dl — 7\5 175mg\dl — 10\5 130mg\dl — 5\12 132mg\dl — 6\12		**Soluble insuline**
زينب عودة	G3P1A2 Age: 35 years Pregnancy test in serum: 25\6 Time of diagnosis GDM in 30\11 Time of delivery: 22\6 Type of delivary: Caesarea	RBS / Date 178 mg\dl — 30\11 160mg\dl — 1\12 115mg\dl — 22\6 117mg\dl — 23\6		**Novomix insuline**
براء جردان	G5P2A3 Age: 36 years Pregnancy test in serum: 25\7 Time of diagnosis GDM in 22\2 Time of delivery: 5\10 Type of delivary: Caesarea	RBS / Date 156 mg \dl — 22\2 150mg\dl — 25\2 119mg\dl — 5\10 105mg\dl — 6\10		**Mixtard insuline**
سندس عامر	G2P0A2 Age: 28 years Pregnancy test in serum: 25\6 Time of diagnosis GDM in 11\4 Time of delivery: 5\12 Type of delivary: Caesarea	RBS / Date 173 mg\dl — 11\4 156mg\dl — 15\4 120mg\dl — 5\12 118mg\dl — 6\12		**Novomix insuline**
رحاب اشرف	G1P0A1 Age: 30 years Pregnancy test in serum: 25\7 Time of diagnosis GDM in 10\2 Time of delivery: 5\9 Type of delivary: Caesarea	RBS / Date 171mg\dl — 10\2 150mg\dl — 12\2 118mg\dl — 5\9 110mg\dl — 6\9		**Mixtard insulin**

Mixtard insuline	**RBS** / **Date** **170 mg\dl** / **29\9** **168mg\dl** / **1\10** **150mg\dl** / **25\4** **130mg\dl** / **26\4**	**G4P1A3** **Age: 36 years** **Pregnancy test in serum: 25\6** **Time of diagnosis GDM in 29\9** **Time of delivery: 25\4** **Type of delivary: Caesarea**	شيماء ميري
Insulin And **Amiryl** tab 2mg	RBS / Date **152**mg/dl / 2/8 **121**mg/dl / 2/14 **140** mg/dl / 3/31 **156** mg/dl / 4/3 **455** mg/dl / 5/6 **219** mg/dl / 5/14 **165** mg/dl / 9/6 **160** mg/dl / 10/6	**G**4**P**1**A**3 Age **::** 25 year Pregnancy test in serum in **26/9** Time of of GDM in **8/2** Time of delivery **::9/6** Type of delivery **::Caesarea** Baby weight ::**2.6**	مريم ذياب
NPH and **Soluble insulin** according to **RBS** every **8hr** 26 خابط 4 صافي *In morning* *** 4خابط 4 صافي *In evening*	RBS / Date **242** mg/dl / 3/5 **HbA1c=6.6** / 3/9 **HbA1c=6.4** / 5/9 **98** mg/dl / 7/5 **HbA1c=6.0** / 7/22 **99** mg/dl / 9/3 **141** mg/dl / 9/24 **100** mg/dl / 9/26 9/28 **230** mg/dl / 11:30AM **199** mg/dl / 1:30 PM	**G**1 **P**1 **A**0 **Age** :: 25 year Pregnancy test in serum in **11/1** Time of of diagnosis GDM in **12/1** Time of delivery ::**26/9** Type of delivery ::**Caesarea** Baby weight ::**2**	صابرين نعيم

	143 mg/dl 3;30 PM **111** mg/dl 5:30 PM **135** mg/dl 12:00AM6:00 AM **139** mg/dl		
Insulin خابط24 صافي10 In morning *** خابط8 صافي 8 In evening	RBS Date **174** mg/dl 8/12 **162** mg/dl 9/3 9/23 **104** mg/dl 11:00 **93** mg/dl 6:27 9/24 **145** mg/dl 10:00am **85** mg/dl 2:00pm **132** mg/dl 6:00pm **110** mg/dl 10:00pm **100** mg/dl 9/25	**G2P1A1** **Age::**22 years Pregnancy test in serum in **6/1** Time of diagnosis of GDM in **12/8** Time of delivery ::**24/9** Type of delivery:: **Caesarea** Baby weight ::**2.3**	زينب خضير
Insulin	RBS Date **100** mg/dl 8/30 **134** mg/dl 10/28 **Fasting=72** 11/11 **206** mg/dl 1/9 **179** mg/dl 1/27 **140** mg/dl 1/28 **150** mg/dl 1/29	**Pat has GDM,HT,Anemia** **Age::**24 years Pregnancy test in serum in **30/5**..Baby weight ::**2.5** Time of delivery ::**28/1** Time of diagnosis of GDM in **30/8** Type of delivery:: **Caesarea**	عذراء عبد الامير
	RBS Date **100** mg/dl 2/7	**G1P1A0** **Age::**21 years Pregnancy test in serum in **2/6**	

Insulin	**120** mg/dl **100** mg/dl **107** mg/dl **107** mg/dl **193** mg/dl	2/19 2/21 2:00 8:00 2/24 2/25	Time of diagnosis of GDM in **10/11** Time of delivery ::**21/2** Type of delivery:: **Caesarea**	حنين حيدر
Mixtard insulin	RBS **120** mg/dl **107** mg/dl **140** mg/dl **104** mg/dl **139** mg/dl	Date 3/4 3/20 4/15 6/9 7/10	**G3P1A2** **Age**: 27 year Pregnancy test in serum in **25\9** Time of GDM in **4\3** Time of delivery: **9\7** Type of delivery: **Caesarea**	سحر حازم

Approximately 5 % of all pregnancies are complicated by GDM, which increases both maternal and perinatal morbidity. In treating women with this condition, many have advocated minimizing fluctuations in blood glucose concentrations to avoid maternal hyperglycemia and thus decrease the risk of fetal hyperglycemia and its consequences, fetal hyperinsulinemia and excess fetal growth.In a retrospective pilot study comparing the outcomes of pregnancy among women with gestational diabetes who were followed with preprandial or postprandial glucose measurements, we found that the women's glycosylated hemoglobin values were lower and that there was less macrosomia (defined as a birth weight greater than 4000 g) among their infants when treatment was based on the results of postprandial measurements.

Abstract: Seventy-two patients with gestational diabetes were randomly treated with insulin (20 units NPH and 10 units regular) and diabetic diet, diet alone, or neither. Of the 27 patients treated with insulin and diet, 2 (7%) had babies weighing more than 81/2 pounds. Of the 11 patients treated with diet alone, 4 (36.4%) had babies weighing more than 81/2 pounds. Of the 34 patients treated with neither diet nor insulin, 17

(50%) had babies weighing more than 81/2 pounds. These data support the hypothesis that treatment of the gestational diabetic with insulin will reduce the incidence of fetal macrosomia.

DISCUSSION

The results of this study support the hypothesis that postprandial glucose monitoring, in combination with fasting blood glucose measurements, can significantly improve the outcomes of pregnancy in women with gestational diabetes who require insulin therapy. Previous studies of combined preprandial and postprandial glucose monitoring found an association between fetal macrosomia and suboptimal glycemic control. In one study, blood glucose monitoring before meals in women with insulin-dependent diabetes mellitus did not provide an adequate indication of metabolic control or of the risk of macrosomia; the authors therefore recommended postprandial glucose monitoring in order to optimize glycemic control. In another study, macrosomia was related to postprandial but not to fasting blood glucose values.

We found that compliance among patients was similar for both blood-glucose–monitoring plans. Although the adjustment of insulin doses may be simpler when preprandial glucose monitoring is used, we found that more stringent glycemic control could be achieved with postprandial monitoring. The hypoglycemic episodes during gestation that have been described in women who have insulin-dependent diabetes mellitus before pregnancy rarely occur in women with gestational diabetes, because of their hyperinsulinemic, insulin-resistant state after meals. Women in whom preprandial monitoring is used have their blood glucose concentrations measured only at times when they are least likely to be hyperglycemic.

Measurements of glycosylated hemoglobin have proved to be a useful index of long-term (four-to-six-week) glycemic control during pregnancy, and elevated values have been linked to fetal macrosomia. Our results indicate that with tighter glycemic control, a significant decrease in the frequency of neonatal macrosomia can be achieved. Moreover, postprandial glucose values may be a more sensitive indicator of

carbohydrate intolerance than fasting or preprandial values, potentially allowing more aggressive insulin treatment.[21]

Large-for-gestational-age infants are delivered in 15 to 45 percent of pregnancies complicated by diabetes. Gestational diabetes is strongly associated with maternal obesity, and considerable controversy exists as to whether macrosomia is attributable to maternal obesity, poor glycemic control, or both. Despite the similar body-mass indexes and weight gains during pregnancy in our study groups, significantly fewer infants who were large for gestational age or weighed more than 4000 g were born to the women in the postprandial-monitoring group. Since maternal weight was similar in the two groups, the differences are most readily attributable to differences in the degree of glycemic control. Infants with macrosomia who are born to women with diabetes have a disproportionately increased fetal trunk and shoulder size. The decreased incidence of cesarean section for cephalopelvic disproportion, of shoulder dystocia, and of maternal perineal lacerations in the postprandial-monitoring group is thus not surprising.

Neonatal complications, including hypoglycemia, hyperbilirubinemia, and respiratory compromise, have been described in infants born to women with gestational diabetes who require insulin therapy, particularly those in whom glycemic control was poor. The decreased incidence of neonatal hypoglycemia in the infants born to the women in the postprandial-monitoring group is consistent with the better glycemic control documented in this group. There was also a trend toward a lower rate of hyperbilirubinemia in the infants of women in the postprandial-monitoring group.

Some limitations of this study must be considered. First, the women were predominantly Hispanic. Race or ethnic group has been reported to have an independent influence on birth weight and on the prevalence of gestational diabetes, with Hispanics at higher risk for both. Second, some of the women probably had previously undiagnosed non-insulin-dependent diabetes mellitus, because their diabetes was identified in early pregnancy. Third, the exclusion of women who started insulin therapy after 30 weeks of gestation increased the likelihood that we would find a difference in perinatal outcome between the groups. Fourth, since this was a nonblinded study and some members of the health care team were aware of the hypothesis, bias in the clinical management and the assessment of perinatal outcomes could have been introduced. However, many of the physicians involved believed

that preprandial glucose monitoring was as effective as postprandial glucose monitoring.[22]

Chapter four

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