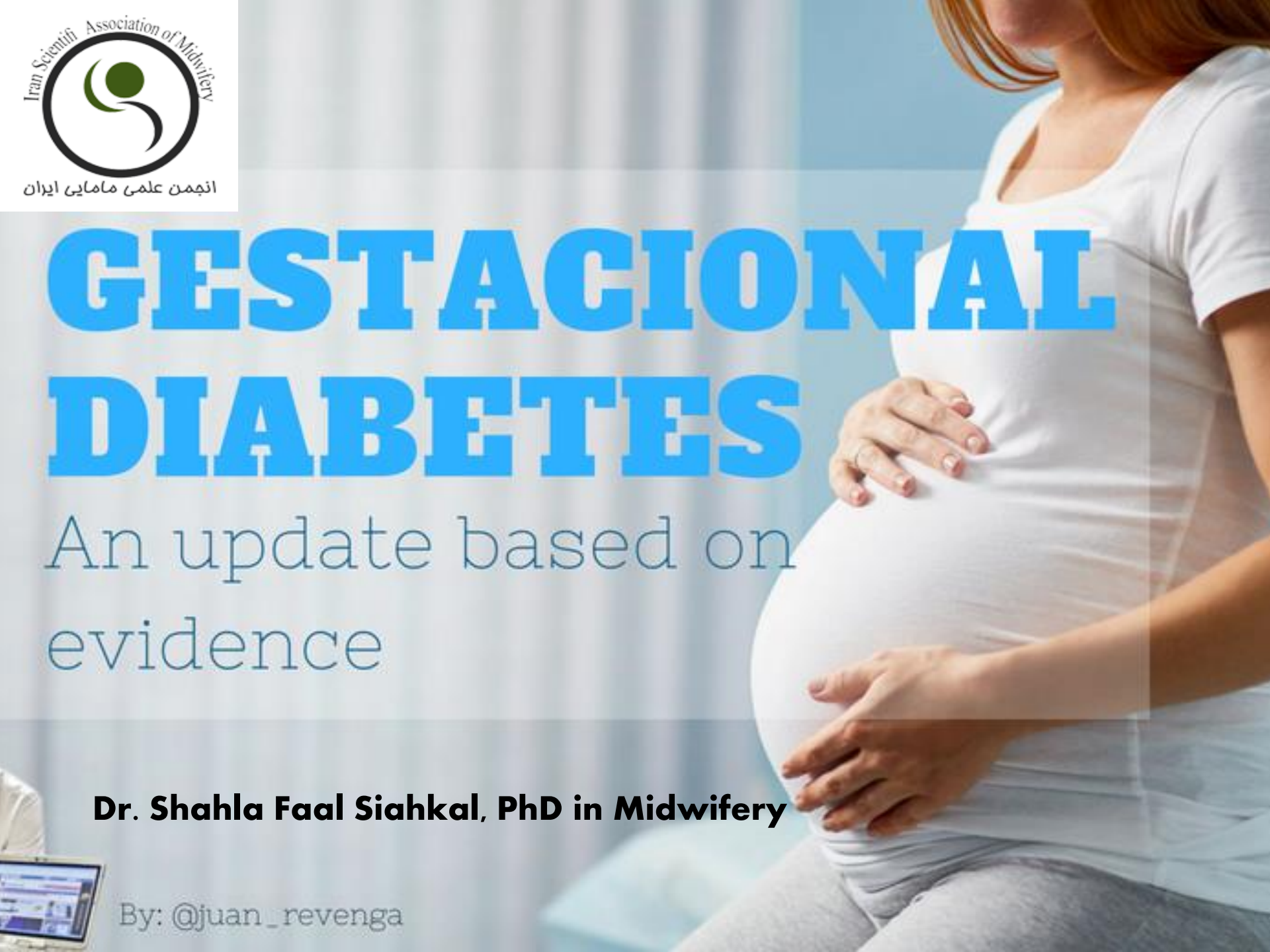

Iran Scientific Association of Midwifery
انجمن علمی مامایی ایران
GESTACIONAL DIABETES
An update based on evidence
Dr. Shahla Faal Siahkal, PhD in Midwifery
By: @juan_revenga

- Pregnancy is accompanied by insulin resistance, mediated primarily by placental secretion of diabetogenic hormones including growth hormone, corticotropin-releasing hormone, placental lactogen (chorionic somatomammotropin), prolactin, and progesterone.
- Gestational diabetes mellitus develops during pregnancy in women whose pancreatic function is insufficient to overcome the insulin resistance associated with the pregnant state.

Prevalence

- The prevalence of gestational diabetes mellitus as traditionally defined is approximately 6 percent of pregnant women in the United States.
- The prevalence varies worldwide (2 to 38 percent).
- Prevalence also varies because of differences in screening practices, population characteristics (eg, average age and body mass index [BMI] of pregnant women), testing method, and diagnostic criteria.
- Prevalence has been increasing over time, likely due to increases in mean maternal age and weight, particularly increasing obesity.

Prevalence

- Bases on the International Association of Diabetes research (2021) the global prevalence of GDM was reported to be 14.0% around the world. The prevalence of GDM in low-, middle- and high-income countries were 12.7% , 9.2% and 14.2% , respectively.
- According to a systematic review (2023), the prevalence of GDM in Iran has been reported to be 10%. The prevalence of gestational diabetes is reported to be 11.5% in Tehran, 18% in Hamadan and 3.3% in Yazd.

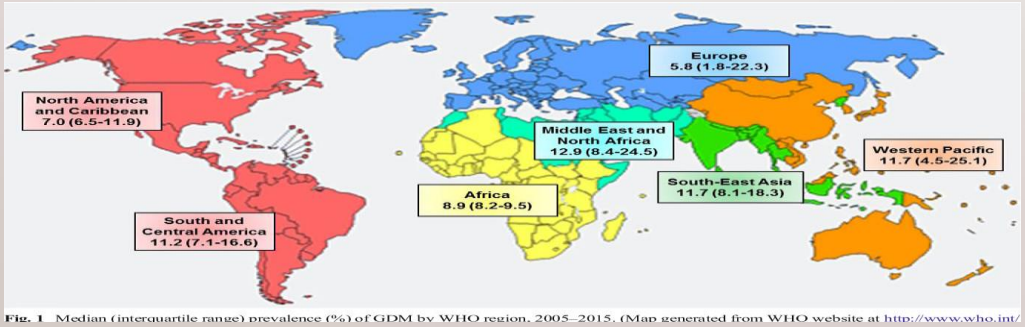


Fig. 1 Median (interquartile range) prevalence (%) of GDM by WHO region, 2005–2015. (Map generated from WHO website at http://www.who.int/

Several adverse outcomes

- Preeclampsia, gestational hypertension
- Polyhydramnios
- Macrosomia and large for gestational age infant
- Maternal and infant birth trauma
- Operative delivery (cesarean, instrumental)
- Perinatal mortality
- Fetal/neonatal hypertrophic cardiomyopathy
- Neonatal respiratory problems and metabolic complications (hypoglycemia, hyperbilirubinemia, hypocalcemia, polycythemia)
- increased risk of developing type 2 diabetes as well as cardiovascular disease

Several adverse outcomes

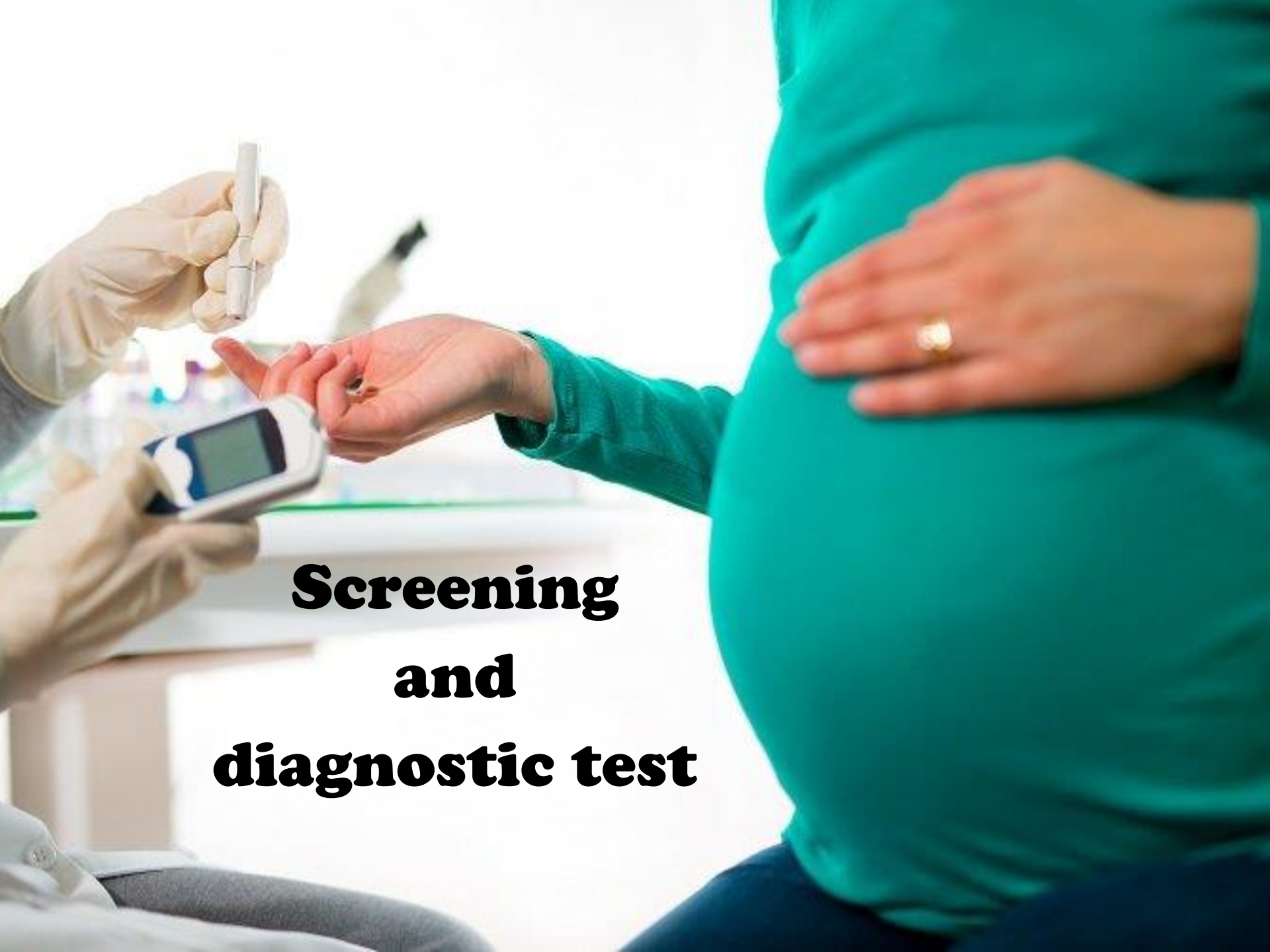
- Their adolescent and adult offspring appear to be at risk of long-term sequelae, such as obesity, abnormal glucose tolerance, hypertension, or metabolic syndrome. In addition, both gestational and pregestational (preexisting) diabetes mellitus have been associated with an increased risk of autism and other adverse neurodevelopmental outcomes in offspring, but it is not clear that these associations are causal. Shared environmental and genetic factors may play a role.

Risk factors

- Personal history of impaired glucose tolerance, A1C ≥5.7 percent, impaired fasting glucose, or gestational diabetes mellitus in a previous pregnancy.
- Hispanic American, African American, Native American, South or East Asian, Pacific Islander.
- Family history of diabetes, especially in first-degree relatives .
- Pre-pregnancy weight ≥110 percent of ideal body weight or BMI >30 kg/m2, significant weight gain in early adulthood and between pregnancies , or excessive gestational weight gain during the first 18 to 24 weeks.
- Older maternal age (>25 or 30 years of age).
- Previous unexplained perinatal loss or birth of a malformed infant.
- Glycosuria at the first prenatal visit.

Risk factors

- Previous birth of an infant ≥4000 g (approximately 9 pounds).
- High density lipoprotein <35 mg/dL (0.90 mmol/L), triglyceride >250 mg/dL (2.82 mmol/L).
- Medical condition/setting associated with development of diabetes, such as metabolic syndrome, polycystic ovary syndrome, current use of glucocorticoids, hypertension or cardiovascular disease, acanthosis nigricans.
- Multiple gestation.


Screening
and
diagnostic test

Screening and diagnostic test

- Women who are hyperglycemic in early pregnancy are at increased risk of having a child with a congenital anomaly, and they may have unrecognized complications (nephropathy, retinopathy) from diabetes.
- If these women are identified early in pregnancy, they could benefit from receiving the diagnostic and therapeutic interventions routinely provided to women with pre-gestational diabetes mellitus.
- Both the American Diabetes Association (ADA) and the American College of Obstetricians and Gynecologists (ACOG) suggest early pregnancy testing for undiagnosed type 2 diabetes in women who are overweight or obese and/or have one or more additional risk factors for diabetes.

American Diabetes Association®

ACOG
The American College of Obstetricians and Gynecologists

- **The ADA and ACOG define women at increased risk of overt diabetes based on:**
- **Body mass index** (BMI) ≥25 kg/m2 (≥23 kg/m2 in Asian Americans) plus one or more of the following:
- Gestational diabetes mellitus in a previous pregnancy.
- Glycated hemoglobin ≥5.7 percent
- First-degree relative with diabetes.
- High-risk race/ethnicity (eg, African American, Latino, Native American, Asian American, Pacific Islander).
- History of cardiovascular disease.
- Hypertension (≥140/90 mmHg) or on therapy for hypertension.
- High-density lipoprotein cholesterol level <35 mg/dL (0.90 mmol/L) and/or a triglyceride level >250 mg/dL.
- Polycystic ovary syndrome.
- Physical inactivity.
- Other clinical condition associated with insulin resistance (eg, severe obesity, acanthosis nigricans).
- Previous birth of an infant weighing ≥4000 g.
- age≥ 40 years .

هفته ۱۰- ۶ بارداری	تشخیص	اقدام
FBS بیشتر و مساوی ۱۲۶	دیابت آشکار	- تکرار آزمایش یک هفته بعد - در صورت غیر طبیعی بودن نتیجه: ارائه مراقبت ها مطابق پروتکل
FBS بین ۹۳ تا ۱۲۵	پره دیابت	- ارائه توصیه های تغذیه ای - توصیه به ورزش و فعالیت بدنی - تکرار آزمایش FBS و قند دو ساعت پس از غذا در دو هفته بعد. در صورت طبیعی بودن نتیجه آزمایش (FBS کمتر از ۹۳ و قند دو ساعت پس از غذا کمتر از ۱۲۰)، ادامه مراقبت های معمول و در غیر این صورت اقدام مطابق پروتکل
هفته ۲۸- ۲۴ بارداری	**تشخیص**	**اقدام**
FBS مساوی یا بیشتر از ۹۲ یا OGTT ساعت اول مساوی یا بیشتر از ۱۸۰ یا OGTT ساعت دوم مساوی یا بیشتر از ۱۵۳	دیابت بارداری	درمان و ارائه مراقبت ها مطابق پروتکل

SCREENING AND DIAGNOSTIC TESTING

- The purpose of screening is to identify asymptomatic individuals with a high probability of having or developing a specific disease.
- **Two-step approach –**
- The two-step approach is the most widely used approach for identifying pregnant women with gestational diabetes mellitus in the United States. The first step is a 50 gram one-hour glucose challenge test (GCT) without regard to time of day/previous meals. Glucose concentration should be measured in venous plasma using an accurate and precise enzymatic method. The following thresholds have been proposed to define a positive screen: **≥130 mg/dL, ≥135 mg/dL, or ≥140 mg/dL** . Screen-positive patients go on to the second step, a 100 gram, three-hour oral glucose tolerance test (GTT), which is the diagnostic test for gestational diabetes mellitus.
- For women with **50 gram one-hour glucose results ≥200 mg/dL** (11.1 mmol/L), the author makes a presumptive diagnosis of gestational diabetes mellitus, unless the patient prefers to undergo a GTT for definitive diagnosis. The GTT can be performed safely, as the 100 gram glucose load would not lead to diabetic ketoacidosis in women with gestational diabetes mellitus or unrecognized type 2 diabetes.

SCREENING AND DIAGNOSTIC TESTING

- **One-step approach –**
- The one-step approach omits the screening test and simplifies diagnostic testing by performing only a 75 gram, two-hour oral GTT but requires an overnight fast.
- There is no consensus regarding use of the one-step versus the two-step approach among national and international organizations.
- .

GDM Diagnosis

2 Approaches for Diagnosing GDM	
AACE- and ADA-recommended	1-step 75-g 2-hour OGTT
ACOG-recommended	2 steps: a 50-g 1-hour GCT, followed by a 100-g 3-hour OGTT (if necessary)

GDM Diagnostic Criteria for OGTT Testing		
	75-g 2-hour*	100-g 3-hour†
Fasting plasma glucose (FPG)	≥92 mg/dL (5.1 mmol/L)	≥95 mg/dL (5.3 mmol/L)
1-hour post-challenge glucose	≥180 mg/dL (10.0 mmol/L)	≥180 mg/dL (10.0 mmol/L)
2-hour post-challenge glucose	≥153 mg/dL (8.5 mmol/L	≥155 mg/dL (8.6 mmol/L)
3-hour post-challenge glucose		≥140 mg/dL (7.8 mmol/L)

*A positive diagnosis requires that test results satisfy any one of these criteria.
†A positive diagnosis requires that ≥2 thresholds are met or exceeded.

AACE, American Association of Clinical Endocrinologists; ACOG, American College of Obstetrics and Gynecology; ADA, American Diabetes Association; GCT, glucose challenge test; GDM, gestational diabetes mellitus; OGTT, oral glucose tolerance test.

Handelsman YH, et al. *Endocr Pract*. 2015;21(suppl 1):1-87.
ADA. *Diabetes Care*. 2015;38(suppl 1):S77-S79.
Committee on Obstetric Practice. ACOG. 2011;504:1-3.

Candidates for screening/testing

- In the United States, universal screening or testing appears to be the most practical approach because 90 percent of pregnant women have at least one risk factor for glucose impairment during pregnancy.
- Furthermore, as many as 20 percent of women diagnosed with gestational diabetes mellitus have no risk factors.
- On the other hand, risk factors were poor predictors of women who had an abnormal GTT .

Timing of screening/testing

- the American Diabetes Association (ADA) and American College of Obstetricians and Gynecologists (ACOG) have provided risk assessment criteria for estimating diabetes risk.
- In the absence of early testing or if early testing is negative, universal screening is performed at 24 to 28 weeks of gestation.

Screening

TABLE 57-12. Fifth International Workshop-Conference on Gestational Diabetes: Recommended Screening Strategy Based on Risk Assessment for Detecting Gestational Diabetes (GDM)

GDM risk assessment: should be ascertained at the first prenatal visit

Low Risk: Blood glucose testing not routinely required if all the following are present:

- Member of an ethnic group with a low prevalence of GDM
- No known diabetes in first-degree relatives
- Age < 25 years
- Weight normal before pregnancy
- Weight normal at birth
- No history of abnormal glucose metabolism
- No history of poor obstetrical outcome

Average Risk: Perform blood glucose testing at 24 to 28 weeks using either:

- Two-step procedure: 50-g oral glucose challenge test (GCT), followed by a diagnostic 100-g OGTT for those meeting the threshold value in the GCT
- One-step procedure: diagnostic 100-g OGTT performed on all subjects

High Risk: Perform blood glucose testing as soon as feasible, using the procedures described above, if one or more of these are present:

- Severe obesity
- Strong family history of type 2 diabetes
- Previous history of GDM, impaired glucose metabolism, or glucosuria
- If GDM is not diagnosed, blood glucose testing should be repeated at 24 to 28 weeks' gestation or at any time symptoms or signs suggest hyperglycemia

OGTT = oral glucose tolerance test.

Modified from Metzger, 2007.

جدول ۱۲-۵۷ : راهکار غربالگری توصیه‌شده براساس ارزیابی خطر برای تشخیص دیابت حاملگی[1] (GDM)

رزیابی خطر GDM : باید در اولین ویزیت پره‌ناتال انجام شود.

کم‌خطر : در صورت وجود تمام موارد زیر، سنجش گلوکز خون به‌طور روتین ضرورت ندارد:

- فرد جزو یکی از گروههای نژادی است که شیوع GDM در آن کم است.
- فقدان دیابت شناخته‌شده در بستگان درجهٔ اول
- سن کمتر از ۲۵
- وزن طبیعی قبل از حاملگی
- وزن طبیعی در هنگام زایمان
- فقدان سابقهٔ متابولیسم غیرطبیعی گلوکز
- فقدان سابقهٔ پیامد نامطلوب «مامایی»

خطر متوسط : انجام تست گلوکز خون در هفته‌های ۲۸-۲۴ حاملگی با استفاده از یکی از روشهای زیر:

- روش دومرحله‌ای: تست رویارویی با ۵۰ گرم گلوکز خوراکی (GCT) و سپس تست تشخیصی تحمل گلوکز با ۱۰۰ گرم گلوکز خوراکی، در زنانی که در GCT دارای میزان آستانه‌ای بوده‌اند.
- روش یک‌مرحله‌ای: انجام تست تشخیصی تحمل گلوکز با ۱۰۰ گرم گلوکز خوراکی در تمام افراد.

پرخطر : در صورت وجود یک یا چند مورد از موارد زیر، در سریعترین زمان ممکن بررسی گلوکز خون با استفاده از روشهای مذکور در فوق صورت می‌گیرد:

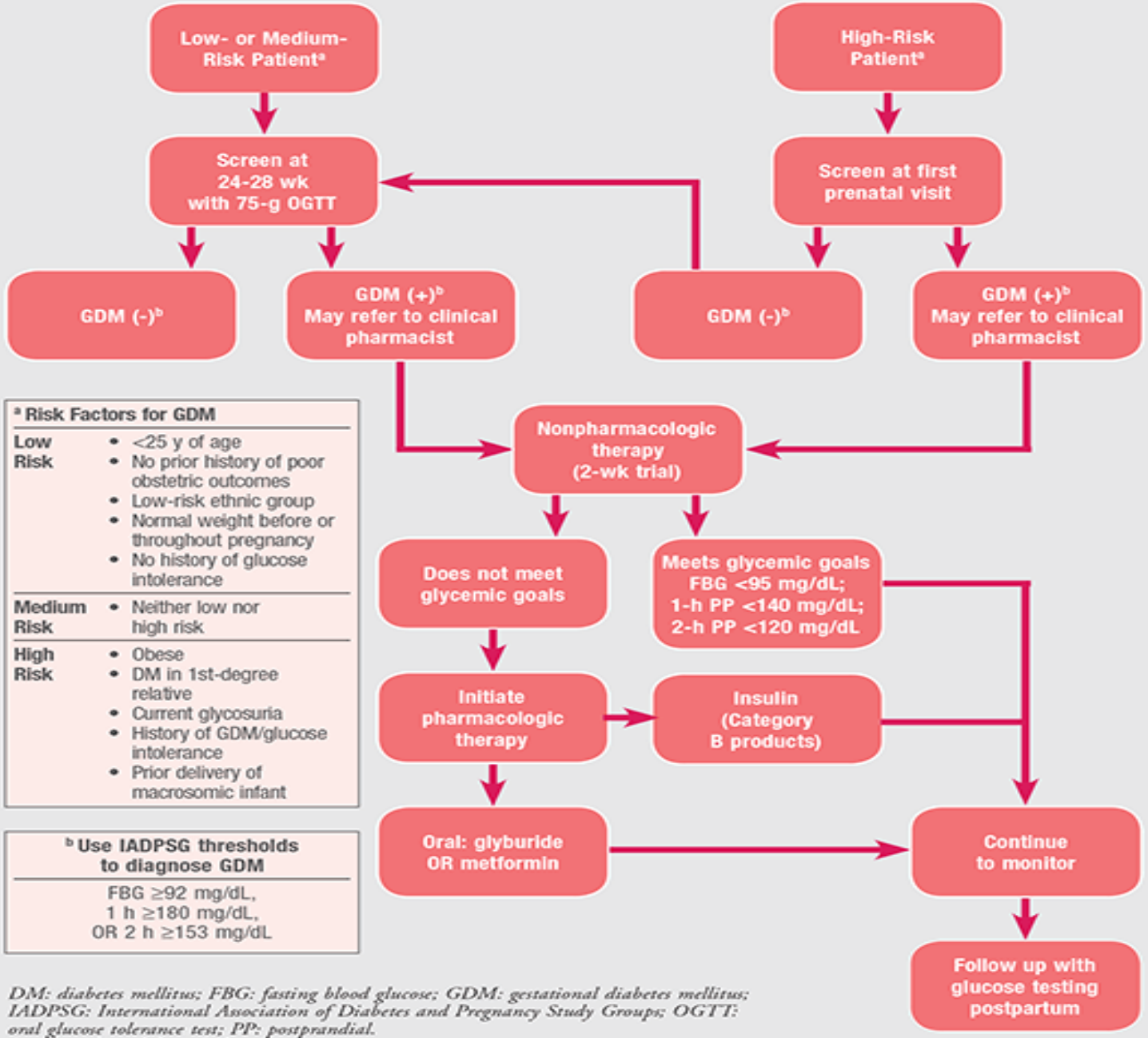
- چاقی شدید
- سابقهٔ خانوادگی قوی دیابت نوع دو
- سابقهٔ قبلی GDM، اختلال متابولیسم گلوکز یا گلوکوزوری

در صورت عدم تشخیص GDM، سنجش گلوکز خون باید در هفته‌های ۲۸-۲۴ حاملگی و یا در هر زمانی که علایم و نشانه‌ها مؤید هیپرگلیسمی باشند، تکرار شود.

Repeat testing

- In most protocols, a negative GTT at 24 to 28 weeks is not repeated later in pregnancy. However, several studies have shown that repeating the test after an initially normal GTT will identify additional cases in 4 to 29 percent of cases, depending on the timing and indication for repeat testing. Repeat GTT can be considered on an individualized basis in women with sonographic findings suggestive of a diagnosis of gestational diabetes, such as fetal overgrowth or polyhydramnios, or in those with a past history of gestational diabetes

Figure 2. Proposed Algorithm for Management of GDM



DM: diabetes mellitus; FBG: fasting blood glucose; GDM: gestational diabetes mellitus; IADPSG: International Association of Diabetes and Pregnancy Study Groups; OGTT: oral glucose tolerance test; PP: postprandial.
Source: Adapted from Reference 8.

RECOMMENDATIONS OF NATIONAL AND INTERNATIONAL ORGANIZATIONS

- American College of Obstetricians and Gynecologists (ACOG, two-step approach)
- International Association of Diabetes and Pregnancy Study Groups (IADPSG, one-step approach
- American Diabetes Association (ADA, one-step or two-step approach)
- World Health Organization (WHO, one-step approach)
- Canadian Diabetes Association (CDA, two-step [preferred] or one-step approach)
- The Endocrine Society (one-step approach)
- Australasian Diabetes in Pregnancy Society (WHO approach)
- National Institute for Health and Care Excellence (NICE, United Kingdom, one-step approach)
- International Federation of Gynecology and Obstetrics (FIGO, one-step approach)

Management of GDM during pregnancy

A1 GDM with good glucose control

(FBS<105, BS< 120 mg/dl)

- Women who are euglycemic with nutritional therapy alone (ie, class A1 GDM) and who have no other pregnancy complications (eg, no macrosomia, preeclampsia, growth restriction, polyhydramnios, or oligohydramnios) do not appear to be at increased risk of stillbirth; therefore, omitting antenatal fetal surveillance (non-stress test [NST] and amniotic fluid index, biophysical profile [BPP]) is a reasonable approach for these women.
- If the practitioner chooses to order NSTs or BPPs, the tests can be begun closer to term than 32 weeks (eg, 36 weeks) since no increased risk of stillbirth has been demonstrated in this population.
- For women with A1 gestational diabetes mellitus (GDM) that is well controlled with nutritional medical therapy alone, we suggest no antenatal fetal testing (Grade 2C)

We manage these patients expectantly until up to 41+0 weeks of gestation. We offer them induction at 39+0 weeks of gestation and recommend induction by 41+0 weeks of gestation (Grade 1C).

A2 GDM or A1 GDM with suboptimal glucose control

- We obtain twice weekly NSTs plus an amniotic fluid index beginning at 32 weeks of gestation in women who need insulin or an oral anti-hyperglycemic agent to achieve good glycemic control and in all women with suboptimal glycemic control.

Monitoring fetal growth

- We perform a single third-trimester ultrasound examination at 36 to 39 weeks to estimate fetal weight in all women with GDM, regardless of degree of metabolic control or requirement for insulin or oral anti-hyperglycemic agents. Identification of accelerated fetal growth before delivery may be useful to identify maternal-fetal pairs who may benefit from scheduled cesarean delivery to avoid trauma from shoulder dystocia.

A2 GDM or A1 GDM with suboptimal glucose control

- For women with A2 GDM and women with A1 GDM with suboptimal glucose control, we suggest induction of labor at 39+0 to 41+0 weeks of gestation (**Grade 2C**).
- Potential benefits include lower rates of macrosomia and large for gestational age infants, lower rates of shoulder dystocia, and lower rates of cesarean delivery.
- If a concomitant medical condition (eg, hypertension) is present or glycemic control is suboptimal on pharmacologic therapy, delivery should be undertaken as clinically indicated prior to 39+0 weeks of gestation.

A2 GDM or A1 GDM with suboptimal glucose control

- Scheduled cesarean delivery to avoid birth trauma is typically offered at 39+0 weeks to women with GDM and estimated fetal weight ≥4500 grams. Such women should be counseled about the poor predictive ability of ultrasound estimates of fetal weight and the risks and benefits of cesarean delivery in the current and future pregnancies.

مراقبت هاي بارداري

- هر روز قند خون در چهار نوبت با گلوکومتر اندازه گیری شود: صبح ناشتا، ۲ ساعت بعد از صبحانه، ۲ ساعت بعد از ناهار و ۲ ساعت بعد از شام)لازم است هر 3-2 هفته یکبار در آزمایشگاه با خون وریدی قند خون کنترل شود
- HbA1cهر سه ماه اندازه گیری شود.
- اگر در طول بارداری قند خون کنترل نباشد, بیمار باید بستری شده و با مشاوره متخصص غدد، نوع تغذیه و انسولین دریافتی تنظیم گردد.
- دقت شود بیمار حداقل وزن گیری را در طول بارداری داشته و کاهش وزن پیدا نکند.
- - اگر مادر سابقه مرگ داخل رحمی در بارداری قبلی دارد، از زمان وقوع مرگ در بارداری قبلی، سلامت جنین ارزیابی شود.

نیمه اول بارداري

- مشاوره تغذیه و ورزش؛
- ارزیابی عملکرد کلیه با اندازه گیری کلیرانس کراتینین، BUN ,Crپروتئینوری 24 ساعته و در صورت لزوم تکرار آن در طول بارداری؛
- سونوگرافی و تعیین سن بارداری؛
- انجام غربالگری ناهنجاری جنین؛
- - مصرف آسپیرین برای جلوگیری از پره اکلامپسی در بیمارانی که تحت رژیم دارویی هستند، از هفته 36 تا 12 بارداری قبل از خواب؛
- انجام سایر مراقبتهای دوران بارداری.

نیمه دوم بارداري

- سونوگرافي دقيق جهت بررسي نقص لوله عصبي و ساير آنومالي های جنيني و اگر شک به آنومالي قلبي وجود دارد يا در سونوگرافي عروق بزرگ ديده نشود **اکوکاردیوگرافي قلب جنين در هفته 22-20 بارداری؛**

- توصيه به مادر برای شمارش حرکات جنين

- تخمين وزن جنين در هفته 39-37بارداری

در صورت بارداري بدون مشکل و کنترل قند خون با دارو:

- ✓ انجام اکوکاردیوگرافي جنين در هفته 18 بارداری؛
- ✓ ارزيابي سلامت جنين از هفته 32 بارداری با انجام NST و AFI يک بار در هفته؛
- ✓ سونوگرافي جهت ارزيابي رشد جنين از هفته 32 بارداری و تکرار آن هر 3-2هفته يکبار؛
- ✓ بررسي از نظر احتمال بروز پره اکلامپسي از هفته 28 بارداری.

در صورت بارداري بدون مشکل و کنترل قند خون با تغذيه به تنهايي:

- ارزيابي سلامت و رشد جنين مطابق افراد غير ديابتي.

در صورت بارداری با قند خون کنترل نشده:

- ارزیابی سلامت جنین از هفته 32 بارداری با انجام NST دو بار در هفته؛

  AFI یک بار در هفته

- سونوگرافی جهت ارزیابی رشد جنین از هفته ۳۲ بارداری یک بار در هفته؛

- بررسی از نظر احتمال بروز پره اکلامپسی از هفته ۲۸ بارداری.

زمان ختم بارداری

شرایط بارداری	ختم بارداری
بارداری بدون مشکل و کنترل قند خون با تغذیه به تنهایی	تا ۴۰هفته
بارداری بدون مشکل و کنترل قند خون با دارو	۳۹ هفته
بارداری با قند خون کنترل نشده	۳۸ هفته

در صورت وزن ۴۰۰۰ گرم یا بیشتر ختم بارداری به روش سزارین

INTRAPARTUM MANAGEMENT

- **Glucose monitoring** — Capillary blood glucose measurements are convenient and reasonably accurate over the normal range of blood glucose concentrations.
- Overt hypoglycemia (<50 mg/dL [2.8 mmol/L]) or hyperglycemia (>180 mg/dL [10 mmol/L]) detected in capillary blood should be treated promptly, before confirmation has been obtained.
- **During the latent phase of labor**, we monitor capillary glucose levels before and after meals in women who are eating. In the absence of significant oral intake, we check glucose levels no more frequently than **every four to six hours**, which is as efficacious as hourly assessment when the goal is to avoid neonatal hypoglycemia

Glucose target

- The ideal intrapartum target glucose level to reduce the risk of adverse neonatal hypoglycemia is not clear.
- In the absence of proven goals, **a reasonable target range for intrapartum glucose levels is >70 and <126 mg/dL (>3.9 and <7.0 mmol/L)**, as this range has not been associated with clinically important neonatal hypoglycemia in insulin-requiring women.
- Intrapartum glucose levels **above 140 to 180 mg/dL** (7.8 to 10.0 mmol/L) have been shown to be associated with neonatal hypoglycemia.

Guidelines for insulin management

- ACOG recommends intravenous insulin infusion for intrapartum glycemic management. We individualize management, considering the woman's medical regimen prior to labor.
- Clinicians managing women with diabetes who are in labor must be experienced in euglycemic medical management and be able to adjust regimens to meet changing intrapartum needs.

Rotating fluids protocol

Maternal plasma glucose	Intravenous insulin (units/hour)* [1]	Intravenous solution
"Rotating fluids." For use in women with gestational diabetes. This protocol should not be used in women with type 1 or type 2 diabetes mellitus.		
≤100 mg/dL (5.6 mmol/L)	Hold	D5NS at 125 mL/hour to achieve CBG of 100 mg/dL (5.6 mmol/L)
101 to 140 mg/dL (5.6 to 7.8 mmol/L)	Hold	Lacted Ringers or normal saline at 125 mL/hour to achieve CBG of 100 mg/dL (5.6 mmol/L)
>140 mg/dL (7.8 mmol/L)	Short- or rapid-acting insulin infusion titrated to achieve CBG of 100 mg/dL (5.6 mmol/L)	Lacted Ringers or normal saline at 125 mL/hour to achieve CBG of 100 mg/dL (5.6 mmol/L)

CBG: capillary blood glucose; D5NS: 5 percent dextrose normal saline.
* Mix 25 units regular insulin in 250 mL normal saline (1 unit:10 mL).

Reference:

1. *Jovanovic L, Peterson CM. Management of the pregnant, insulin-dependent diabetic woman. Diabetes Care 1980; 3:63.*

Data from: Rosenberg VA, Eglinton GS, Rauch ER, Skupski DW. Intrapartum maternal glycemic control in women with insulin requiring diabetes: a randomized clinical trial of rotating fluids versus insulin drip. Am J Obstet Gynecol 2006; 195:1005.

Intrapartum glycemic management of women with type 1 and type 2 diabetes

Maternal plasma glucose mg/dL (mmol/L)	Glucose management using subcutaneous rapid-acting insulin (units) *	Intravenous solution and comments		Alternative approach to glucose management using intravenous insulin (units/hour) ¶
≤120 (6.6)	0	5% dextrose in 0.45% NS[Δ]		0
121 to 140 (6.7 to 7.7)	1			1
141 to 160 (7.8 to 8.8)	2	0.45% NS[Δ]		2
161 to 180 (8.9 to 9.9)	3		Check ketones	3
181 to 200* (10 to 11.1)	4			4
≥200 (11.1)	4 units subcutaneously plus a short-acting or regular insulin by intravenous push starting at 2 units		Check ketones and intensive monitoring	4 units/hour intravenously plus a short-acting or regular insulin intravenous push starting at 2 units

In pregnant women with type 1 or type 2 diabetes managed prepartum with multiple daily insulin injections, intrapartum glucose control can be achieved using either intermittent subcutaneous insulin or continuous intravenous insulin infusion. The doses in the table are effective in many women but should be adjusted if glucose targets are not met.

If induction is scheduled, the night before induction the patient should take her usual evening/bedtime dose of intermediate-acting insulin, short- or rapid-acting insulin, oral antihyperglycemic medication, or continuous insulin infusion. Patients using long-acting insulins should decrease their evening/bedtime dose by 50%. The morning of induction, the patient should take 50% of her morning intermediate- or long-acting insulin dose to decrease the amount of insulin infusion needed during induction. Women who are not eating or drinking are given 5% dextrose with 0.45% NS intravenous infusion for glucose levels <140 mg/dL (7.7 mmol/L).

CBG: capillary blood glucose; NS: normal saline.

* Check glucose every 2 hours in patients receiving insulin subcutaneously.

درمان با انسولین در جریان لیبر و زایمان

- دوز معمول انسولین متوسط اثر در هنگام خواب تجویز می شود.
- دوز صبحگاهی انسولین حذف می شود.
- انفوزیون داخل وریدی نرمال سالین آغاز می شود.
- پس از آغاز لیبر فعال و یا کاهش میزان گلوکز به کمتر از ۷۰ میلی گرم در دسی لیتر، انفوزیون از سالین به دکستروز ۵٪ تغییر داده می شود و با سرعت ۱۵۰-۱۰۰ میلی لیتر در ساعت تجویز می شود تا میزان گلوکز در حد تقریباً ۱۰۰ میلی گرم در دسی لیتر به دست آید.
- میزان گلوکز هر ساعت با گلوکومتر کنترل می شود تا بتوان میزان انفوزیون انسولین یا گلوکز را تنظیم کرد.

Induction of labor

- Ideally, induction is scheduled for early morning.
- The patient should maintain her usual nighttime dose of intermediate-acting insulin, short- or rapid-acting insulin, oral anti-hyperglycemic medication, or continuous insulin infusion on the night before induction.
- If she uses a long-acting insulin at night the dose needs to be decreased by 50 percent or switched to NPH insulin at one-third of the long-acting nightly dose.
- The morning of induction, ask the woman to eat a light breakfast (half of her usual breakfast intake) and reduce her insulin dose (NPH and short- or rapid-acting insulin) by 50 percent.
- Continued oral intake (at 50 percent of daily intake, 1000 to 1200 kcal) is permitted during cervical ripening/latent phase when this period is anticipated to exceed 8 to 12 hours and there is a low risk of emergency operative delivery (eg, reassuring fetal heart rate tracing, stable maternal condition).

Guidelines for intrapartum management of women previously receiving oral antihyperglycemic agents

- Metformin and glyburide are commonly used as primary treatment in pregnant women with gestational diabetes. If the woman will be fasting after midnight for a planned cesarean delivery or induction of labor, her nighttime dose of metformin or glyburide should be given and the morning dose withheld.
- If cervical ripening is planned and oral intake will be permitted during this process, she should take 50 percent of her morning dose of metformin or glyburide.

NURSE STUDY GUIDES | MATERNAL & CHILD HEALTH NURSING

Postpartum Care

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Postpartum Care

- Diabetes medications should be stopped after delivery in women with gestational diabetes.
- Some authors advocate assessing fasting glucose 24 to 72 hours after delivery to check for overt diabetes (**fasting glucose ≥126 mg/dL** [7.0 mmol/L]).
- If overt diabetes is not diagnosed while the patient is in the hospital after delivery, she should be screened or tested for diabetes 4 to 12 weeks after delivery to establish glucose status.
- Some authors have suggested performing a glucose tolerance test two days postpartum in circumstances in which postpartum follow-up is thought to be challenging, given that a majority of women do not return for postpartum diabetes screening and normal results are reliable for excluding type 2 diabetes.
- Breastfeeding — Women with type 1, type 2, and gestational diabetes are strongly encouraged to breastfeed for its health benefits for mother and newborn.
- Insulin, glyburide, and metformin enter milk in small amounts that are unlikely to cause hypoglycemia; nevertheless, the infant should be observed for signs of low glucose levels if the mother is taking these drugs.

Women with type 1 diabetes

- Women with type 1 diabetes have markedly reduced insulin requirements for the first 24 to 48 hours after delivery and need frequent monitoring of glucose levels to avoid hypoglycemia.
- Postoperative patients should receive a 5 percent dextrose (0.45 normal saline) solution with no more than half of their basal insulin until adequate oral intake is resumed. Glucose levels should be checked every four to six hours.
- After approximately 24 to 48 hours, standard diabetes management can be resumed with calculated total daily dose of insulin at 0.6 units/kg postpartum weight or approximately 50 percent of the insulin dose prior to delivery.
- Marked hyperglycemia (eg, random glucose ≥180mg/dL [10.0 mmol/L]) should be avoided as hyperglycemia is associated with an increased risk of postoperative infection

Women with type 1 diabetes

- Women delivering vaginally generally resume normal oral intake after delivery. They can be restarted on their multiple daily dosing regimen but require:
- one-third to one-half of their pre-delivery long-acting or intermediate-acting insulin dose to meet postpartum basal needs,
- and one-third to one-half of their predelivery short- or rapid-acting insulin pre-meal doses.

بررسی خطر بروز دیابت آشکار بعد زایمان

زمان	تست	هدف
بعد از زایمان (۳-۱ روز)	گلوکز ناشتا یا تصادفی پلاسما	تشخیص دیابت پابرجا و آشکار
اوایل دورهٔ بعد از زایمان (۱۲-۶ هفته)	OGTT دوساعتهٔ ۷۵ گرمی	تقسیم‌بندی متابولیسم گلوکز، بعد از زایمان
یک سال بعد از زایمان	OGTT دوساعتهٔ ۷۵ گرمی	بررسی متابولیسم گلوکز
هر ساله	گلوکز ناشتای پلاسما	بررسی متابولیسم گلوکز
هر سه سال یک بار	OGTT دوساعتهٔ ۷۵ گرمی	بررسی متابولیسم گلوکز
قبل از حاملگی	OGTT دوساعتهٔ ۷۵ گرمی	تقسیم‌بندی متابولیسم گلوکز

تقسیم‌بندی انجمن دیابت آمریکا (۲۰۱۳)

طبیعی	اختلال گلوکز ناشتا یا اختلال تحمل گلوکز	دیابت شیرین
ناشتا کمتر از ۱۱۰mg/dL	۱۱۰-۱۲۵mg/dL	مساوی یا بالای ۱۲۶mg/dL
دوساعته کمتر از ۱۴۰mg/dL	دوساعته مساوی یا بالای ۱۴۰ تا ۱۹۹ mg/dL	دوساعته مساوی یا بالای ۲۰۰mg/dL
هموگلوبین A_{1c} کمتر از ۵/۷ درصد	۵/۷-۶/۴ درصد	مساوی یا بالای ۶/۵ درصد

Preventive approaches for risk reduction

Pre-pregnancy weight loss

- In a population-based cohort study, obese women who lost at least 10 pounds (4.5 kg) between pregnancies trended toward decreased risk of gestational diabetes mellitus relative to women whose weight changed by less than 10 pounds (relative risk [RR] 0.63, 95% CI 0.38-1.02, adjusted for age and weight gain during each pregnancy).
- Women who gained 10 pounds (4.5 kg) or more between pregnancies significantly increased their risk of gestational diabetes mellitus (RR 1.47, 95% CI 1.05-2.04)

Pre-pregnancy weight loss

- In a study that compared the incidence of gestational diabetes mellitus in 346 women who delivered before bariatric surgery with the incidence in 354 women who delivered after bariatric surgery, the incidence of gestational diabetes mellitus was lower after bariatric surgery (8 versus 27 percent, odds ratio 0.23, 95% CI 0.15-0.36). Bariatric surgery also induces hormonal changes that may lower the risk of gestational diabetes mellitus independent of weight loss.

Preventive approaches for risk reduction

- **Pre-pregnancy and early pregnancy exercise**

- In particular, beginning a modest exercise program in the second trimester appears to be inadequate to impact risk of gestational diabetes mellitus.

- Exercise should be started before pregnancy or soon thereafter, performed three to four times per week for 30- to 60-minute sessions, and continued until delivery (and ideally thereafter for general health benefits). In one trial in which overweight and obese pregnant women participated in this type of exercise program, the exercise group had a significantly lower incidence of gestational diabetes mellitus (22.0 percent versus 40.6 percent with usual care)

Exercise recommendations and precautions for pregnant women*

Type of program	Duration, frequency¶	Optimal intensity	To be avoided
Low-impact aerobic exercise			
Walking, aerobic dancing, stationary cycling, jogging (in previously active women), or swimming	20 to 30 minutes, 3 to 5 days/week	Moderate as ideally controlled via heart rate (≤80% HR_{max}), rate of perceived exertion (ie, 13 to 14 on the Borg scale$^{\Delta}$), or the more practical talk test	High-intensity (>90% HR_{max}) strenuous exercise; long-distance running; exercises with risk of falls or impact of the body against the ground or hard surfaces (jumping or quick changes of direction), or physiological danger (eg, diving)
Strength exercise (toning)			
Resistance bands, dumbbells, body weight exercises involving large muscles	15 to 20 minutes, 3 to 5 days/week	Light to moderate loads (eg, 1 to 2 sets of 10 to 15 repetitions using 1- to 3-kg dumbbells)	Isometric exercises, Valsalva maneuver, frequent heavy weight lifting, hot yoga or pilates, supine position exercises
Pelvic floor muscle training (Kegel)	10 to 15 minutes, 3 to 5 days/week	Approximately 100 repetitions	
Combination of the low-impact aerobic and strength exercises (highly recommended)			
Low-impact aerobic and strength exercises combined (eg, aerobic dancing followed by use of dumbbells)	45 to 65 minutes, 3 to 4 days/week	Same as for low-impact aerobic and strength exercises	Same as for low-impact aerobic and strength exercises

HR_{max}: age-predicted maximum heart rate (= 220 minus age).
* Duration of exercise over pregnancy indicates the end of the first trimester (approximately week 12) to end of pregnancy (week 38 to 39) for all programs.
¶ Each session must include an initial warm-up and a final cool down period (approximately 5 minutes each).

Safe and unsafe recreational exercises in pregnancy

Examples of safe and unsafe physical activities during pregnancy*
The following activities are safe to initiate or continue*:
▪ Walking ▪ Swimming ▪ Stationary cycling ▪ Low-impact aerobics ▪ Yoga, modified¶ ▪ Pilates, modified ▪ Running or jogging$^{\Delta}$ ▪ Racquet sports$^{\Delta\diamond}$ ▪ Strength training$^{\Delta}$ ▪ Pelvic floor muscle training (Kegel)
The following activities should be avoided:
▪ Contact sports (eg, ice hockey, boxing, soccer, and basketball) ▪ Activities with a high risk of falling or otherwise hitting the abdomen against a hard surface (eg, downhill snow skiing, water skiing, surfing, off-road cycling, gymnastics, and horseback riding) ▪ Scuba diving ▪ Sky diving ▪ "Hot yoga" or "hot pilates"

* In women with uncomplicated pregnancies in consultation with an obstetric care provider.

¶ Yoga positions that result in decreased venous return and hypotension should be avoided as much as possible.

Δ In consultation with an obstetric care provider, running or jogging, racquet sports, and strength training may be safe for pregnant women who participated in these activities regularly before pregnancy. Moderate intensity is optimal (eg, ≤80% age predicted maximum heart rate, rate of perceived exertion 13 or 14 on the Borg scale, or ability to converse while exercising). High intensity strenuous exercise should be avoided (>90% age predicted maximum heart rate).

◇ Racquet sports wherein a pregnant woman's changing balance may affect rapid movements and increase the risk of falling should be avoided as much as possible.

Preventive approaches for risk reduction

- **Type of diet, smoking**

- Few studies on the role of dietary factors in the development of gestational diabetes mellitus have been performed. There is limited evidence (none from randomized trials) that a diet favoring fruit, vegetables, whole grains, and fish and low in red and processed meat, refined grains, and high-fat dairy reduces the risk of developing gestational diabetes mellitus

- However, a healthy diet can promote weight loss before pregnancy and reduce excessive weight gain during pregnancy, which is beneficial for women who are overweight or obese.

- Smoking cessation should be encouraged in all patients, and may reduce gestational diabetes mellitus risk.

Preventive approaches for risk reduction

- **Supplements**

➢ **Myo-inositol** is a naturally occurring sugar in fruits, beans, grains, and nuts that can improve insulin resistance.

➢ Randomized trials of antenatal myo-inositol supplementation during pregnancy have reported discordant findings regarding a reduction in the incidence of gestational diabetes mellitus. Before this intervention can be recommended, large multicenter, blinded, randomized trials are needed to confirm safety and demonstrate improvement in clinically important maternal and/or neonatal outcomes.

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Review

The psychosocial challenges associated with gestational diabetes mellitus: A systematic review of qualitative studies

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Psychosocial Challenges of women with GDM

A) Impaired individual integrity

Most women struggled with being diagnosed with diabetes and complained about being left alone with problems and lack of time to take care of them-selves. Women were challenged in terms of their capabilities, self-confidence, adaptation, and coping with the existing conditions

B) Fear and worry at the time of diagnosis and during pregnancy

Fear of complications in the mother or the fetus, fear of being blamed, fear of cesarean section, feeling of failure, and fear of facing social and economic stressors were among the cases mentioned.

C) Difficulty and dissatisfaction

Due to the coexistence of diabetes and pregnancy, the women found it difficult and exhausting to take care of themselves and their families, and they experienced a great deal of stress. It was difficult to prepare two types of food for themselves and their family at each meal, to set small meals more often, to control eating regularly, and to control eating when going to parties and restaurants

Social challenges

- **Family:**

Most women believed that they need family support to properly manage their illness. Some considered family as a facilitator of disease management where as some considered their family as an obstacle to the full implementation of treatment protocols. Spouse support was described as very important in providing healthy food, proper exercise, and adequate emotional support

- **Community:**

the unavailability of child care during visits or physical activity, nutritional problems in religious ceremonies and celebrations, lack of social support, discrimination and stigma by people in the community because of the women's overeating or giving birth to a large baby, poor socioeconomic status, and having a criticizing culture in society

Cultural challenges

- The women's challenges in this category included going to a traditional healer, using traditional medicines, believing in evil spirits that cause illness, fasting to get rid of illness, feeling guilty about leaving children at home in order to exercise in the club due to conflict with the cultural image of a good mother, family pressure and habit of eating traditional cuisines despite being unsuitable for illness, and the desire for and habit of eating traditional foods

Information challenges:

- These challenges include the need for information on gestational diabetes and the nutritional value of the specific foods of their culture, conflicting information about breastfeeding and maternal nutrition during breastfeeding, and the need for information on proper exercise and diet during pregnancy in the form of individual or group training, booklet, or poster

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