

# Diabetes and Pregnancy

---

Mohsen Eledrisi, MD, FACE, FACP

Department of Medicine

Hamad Medical Corporation

Doha, Qatar

[www.eledrisi.com](http://www.eledrisi.com)

# Session objectives

- Explain preconception care in patients with diabetes
- Recognize the screening criteria and available testing for gestational diabetes
- Discuss the management of gestational diabetes during pregnancy and postpartum period
- Describe the management of type 2 and type 1 diabetes in pregnancy

# Case 1

- A 33-year-old lady with type 2 DM and hypertension for 3 years
- She is on Metformin, Sitagliptin, Enalapril, Simvastatin
- BP is controlled
- Examination: BMI 28.4. Otherwise, normal exam
- A1c 6.7%, kidney function and UACR normal
- **How would you manage?**
- **You should address family planning**

# Preconception counseling

No pregnancy attempts  
till glucose is controlled

Use of contraception  
(any form is acceptable)

Change non-insulin  
medications to insulin

Management of comorbidities  
(HTN, Retinopathy,...)

Folate supplement

# Preconception care: glycemic targets

- ◆ Pre-prandial glucose: <5.3 mmol (95 mg)
- ◆ Post-prandial glucose:
  - 1-hour <6.7 mmol (120 mg)
  - or
  - 2-hour <7.8 mmol (140 mg)
- ◆ A1c <6.5%

# Preconception care: glucose-lowering drugs

- Stop non-insulin glucose-lowering medications (not well studied)
- Some centers continue using Metformin in pregnancy
- Switch to insulin (Basal + Meal)
- Regular, Aspart, Lispro, NPH, Detemir can be used
- NICE guidelines: NPH is 1<sup>st</sup> choice. Can continue detemir and glargine if good control before pregnancy
- Endocrine Society recommends rapid-acting insulin over regular insulin

# Preconception care: screening for complications

- There is a risk of development or progression of diabetic retinopathy
- **Dilated eye examination:**
  - Before pregnancy or in first trimester
  - Then during every trimester
  - Then for 1 year postpartum and as recommended by the eye specialist
- **Kidney function:**
  - Serum creatinine, eGFR, UACR

# Preconception care: vitamins

- Start 3 months before stopping contraception
- ADA recommends a prenatal vitamin that contains at least 400 micrograms of folic acid and 150 micrograms of potassium iodide daily



# Preconception care: Managing comorbidities

- **Hypertension:**

- Target B.P. <130/80
- Stop ACEI & ARB
- Can use: Methyldopa, Labetalol, Hydralazine,  
Diltiazem, Nifedipine, Clonidine

- **Lipid-lowering agents:**

- Stop statins & fibrates

# Case 2

- A 32-year-old lady presents in her 3<sup>rd</sup> month of pregnancy
- She had 2 previous pregnancies with no complications
- Family history is noncontributory
- Physical examination: only remarkable for a BMI of 28
- **Should she be screened for gestational diabetes ?**
- **If yes, why? how? when?**

# **Gestational Diabetes Mellitus (GDM) screening**

**Who to screen?**

**How to screen?**

**When to screen?**

# The guidelines

## **American Diabetes Association**

Diabetes Care 2024;47 (suppl 1):S20

## **NICE guideline (updated 2020)**

[www.nice.org.uk](http://www.nice.org.uk)

## **Endocrine Society**

J Clin Endocrinol Metab 2013;98:4227

**GDM:  
Who to screen?**

**Everybody**

# **GDM: when to screen?**

**24-28 weeks gestation**

# **GDM: How to screen?**

**There are 2 approaches:**

**1) One step approach**

**OR**

**2) Two step approach**

# 1-step approach to screen for GDM

- Recommended by the American Diabetes Association, International Association of Diabetes and Pregnancy Study Group & Endocrine Society
- Using the 75-gram oral glucose tolerance test
- Plasma glucose: fasting, 1,2 hours



# 75-gram OGTT [0, 1, 2 hours]

## Criteria for GDM

- ◆ Fasting :  $\geq 5.1$  mmol (92 mg)
- ◆ 1 hour :  $\geq 10$  mmol (180 mg)
- ◆ 2 hour :  $\geq 8.5$  mmol (153 mg)

**GDM = any of the above**

# 2-step approach to screen for GDM

- Recommended by the American College of Obstetrics & Gynecology
- Start with the 50-gram glucose loading test
  - No need for fasting
  - Plasma glucose after 1 hour
  - Abnormal if glucose  $\geq 140$  mg (7.8 mmol) [some use 130 mg (7.2 mmol)]
- If abnormal, do the 100-gram OGTT (0, 1, 2, 3 hours)

# 100-gram OGTT

## [0, 1, 2, 3 hours]

### Criteria for GDM

- ◆ Fasting :  $\geq 5.3$  mmol (95 mg)
- ◆ 1 hour :  $\geq 10$  mmol (180 mg)
- ◆ 2 hour :  $\geq 8.6$  (155 mg)
- ◆ 3 hour :  $\geq 7.8$  mmol (140 mg)

**GDM = 2 of the above**

# Screening for GDM : professional guidelines

- **American Diabetes Association (ADA):**
  - The 1-step approach is associated with improved pregnancy outcomes
  - The 1-step approach is recommended
- **Endocrine Society:**
  - Recommends the 1-step approach
- **American College of Obstetrics & Gynecology (ACOG)**
  - Recommends the 2-step approach

American Diabetes Association. Diabetes Care 2024;47 (suppl 1):S20

American College of Obstetrics & Gynecology. Obstet Gynecol 2017; 130:e17

Endocrine Society. J Clin Endocrinol Metab 2013;98:4227

# Screening for type 2 DM in pregnancy

- ADA recommends screening all women for diabetes before 15<sup>th</sup> week of gestation
- Same criteria for DM in non-pregnants:
  - ◆ **Fasting glucose**:  $\geq 7$  mmol (126 mg)
  - ◆ **HbA1c**:  $\geq 6.5\%$

# Abnormal glucose metabolism in pregnancy

- American diabetes association recommends the following criteria:
  - ◆ **Fasting glucose:** 6.1-6.9 mmol (110-125 mg)
  - ◆ **HbA1c:** 5.9-6.4%
- This is associated with:
  - High risk of adverse pregnancy and neonatal outcomes
  - High risk of a later GDM
  - High chance of requiring insulin treatment
- Perform screening for GDM at 24-28 weeks gestation

# Management of abnormal glucose metabolism in pregnancy

- The benefits of treatment are not clear at this time
- Dietary advice & glucose monitoring are recommended
- Treatment may be considered if fasting glucose is still  
>6.1 mmol (110 mg)

# Case 3

- A 29-year-old lady primigravida
- She has no complaints
- Physical examination is unremarkable
- She is screened for GDM in 24<sup>th</sup> week of gestation
- A 75-gram oral glucose tolerance test showed gestational diabetes
- **How would you approach?**



# **GDM: effects on the mother**

- Preeclampsia
- Need for cesarean section
- Long term:
  - GDM in future pregnancies
  - Type 2 DM

# **GDM: effects on the fetus**

- Macrosomia
- Birth trauma
- Shoulder dystocia
- Neonatal hypoglycemia and hyperbilirubinemia
- Long term: obesity, type 2 DM

# Benefits of treatment of GDM

- U.S. Preventive Services Task Force and National Institutes of Health
- Systematic review and meta-analysis showed:
  - ↓ Risk of preeclampsia
  - ↓ Risk of macrosomia
  - ↓ Risk of shoulder dystocia

# Management of GDM

- Lifestyle modifications including:
  - Nutritional therapy
  - Physical activity
  - Weight management
- Monitor home glucose:
  - Fasting & postprandial
- A trial for **1-2 weeks**

# GDM: dietary intervention

- The optimum dietary plan is not known
- Reduced carbohydrate intake (to 35-45%) of total calories is recommended, distributed in 3 small- to moderate-sized meals & 2 to 4 snacks
- The food plan should provide adequate calorie intake to promote fetal and maternal health, achieve glycemic goals, and promote weight gain according to Institute of Medicine recommendations (next slide)

# Weight gain during pregnancy

| Prepregnancy BMI             | <b><u>Rates of weight gain in 2<sup>nd</sup> &amp; 3<sup>rd</sup> trimesters</u></b> |                |
|------------------------------|--|----------------|
|                              | Range, kg/week   | Range, lb/week |
| Underweight<br>( $<18$ )     | 0.44-0.58  | 1-3            |
| Normal weight<br>(18.5-24.9) | 0.35-0.5   | 0.8-1          |
| Overweight<br>(25-29.9)      | 0.23-0.33  | 0.5-0.7        |
| Obesity<br>( $\geq 30$ )     | 0.17-0.27  | 0.4-0.6        |

# GDM: the role of exercise

- A program of moderate exercise is recommended if no medical or obstetrical contraindications
- Exercise led to improvement in glucose and reductions in need to start insulin or insulin dose
- Aim for 30 minutes of moderate-intensity aerobic exercise at least 5 days a week or a minimum of 150 minutes per week
- Simple exercise such as walking for 10–15 minutes after each meal can lead to improved glycemic control

# Glucose targets in GDM

- **Capillary glucose of:**

- Fasting  $<5.3$  mmol (95 mg)

and either

- One-hour postprandial  $<7.8$  mmol (140 mg)

**or**

- Two-hour postprandial  $<6.7$  mmol (120 mg)



**For post-meal monitoring:  
when does the timing start?**

**From the start of the meal**

# Metformin in GDM

- Less hypoglycemia compared to insulin
- Less maternal weight gain compared to insulin
- Less effective compared to insulin (25-45% were uncontrolled)
- Possibly associated with prematurity
- Intrauterine growth restriction and higher BMI in childhood
- Crosses placenta (umbilical cord levels as or higher than maternal levels)
- Not approved by US-FDA for GDM

American Diabetes Association. Diabetes Care 2024;47 (suppl 1):S282

Rowan JA, et al. BMJ Open Diabetes Res Care 2018;6:e000456

Balsells M, et al. BMJ 2015;350:h102; Jiang Y-F, et al. J Clin Endocrinol Metab 2015;100:2071

# Glyburide (Glibenclamide) in GDM

- Moderately effective (23% didn't achieve glucose control)
- ↑ risk of macrosomia, neonatal hypoglycemia and increased neonatal abdominal circumference compared to insulin or metformin
- Crosses placenta
- No long-term safety data
- Not approved by US-FDA for GDM

# Guidelines on the use of medications for GDM

- ADA & ACOG recommend insulin as first line
- **ADA: Metformin & glyburide should not be used as 1<sup>st</sup> line**
- Metformin may be considered for:
  - Patients who cannot use insulin due to cost, language barriers, comprehension, cultural influences or safety
  - Patients who refuse insulin
- Since Metformin can cause growth retardation/acidosis it should not be used in women with hypertension, preeclampsia, or at risk for intrauterine growth restriction

# Insulin in GDM

## ◆ Meal insulin:

- Regular insulin: FDA-approved (category B)
- Rapid-acting: Lispro & Aspart: FDA-approved (category B)
- No difference in outcomes using regular or rapid-acting insulins
- Endocrine society recommends rapid-acting insulin over regular insulin
- Glulisine: not FDA-approved (category C)

# Insulin in GDM

## ◆ Basal insulin:

- NPH & Detemir: FDA-approved (category B)
- Detemir led to less hypoglycemia compared to NPH
- NPH costs less than Detemir
- Glargine: not FDA-approved (category C)
- Glargine appears to be safe (uncontrolled studies)

# Choice of insulin regimen in GDM

- The choice depends on home glucose values

## **1) If only postprandial glucose is high:**

- Use meal insulin only

## **2) If both fasting and postprandial glucose are high:**

- Use both basal & meal insulin

## **3) If only fasting glucose is high (not common):**

- Use basal insulin only

# Starting insulin doses in GDM

- **Meal insulin:**
  - Usual starting dose is 4-8 units depending on glucose levels
  - Many physicians will start 4 units
- **Basal insulin:**
  - Usual starting dose is 4-8 units depending on glucose levels
  - Some physicians start 0.1 units/kg/day at bedtime
- Adjust insulin doses every 3 days (phone, SMS, visit)



# Case 3: follow up

- The patient was referred for dietary advice
- Follow up after 2 weeks
- Home glucose (fasting & 2 hours after meals):

Fasting

78  
88  
90  
70  
72

Post-BF

155  
-  
160  
144  
116

Post-lunch

-  
130  
152  
136  
118

Post-dinner

92  
98  
108  
104  
122

# **CASE 3:**

## **assessment & plan**

- Fasting glucose is normal
- Post-breakfast glucose is high
- Post-lunch glucose is high
- Post-dinner glucose is normal
- Start meal insulin at breakfast & meal insulin at lunch
- No need for basal insulin as fasting glucose is normal

# CASE 3: follow up plan

- Meal insulin (regular, aspart or lispro)
- Start by 4 units
- Home glucose (before and after meals)
- Follow up every 3 days (phone, SMS or clinic)
- May need increased doses as pregnancy advances
- Follow up with obstetrician

# Case 4

- A 33-year-old lady with history of gestational diabetes that was managed with insulin
- She had an uneventful vaginal delivery
- She is to be discharged from the hospital
- She has no complaints
- Fasting capillary glucose is normal
- **How would you approach?**
- **What is the future plan?**

# GDM: care after delivery

- Stop glucose-lowering medications immediately after delivery
- Monitor glucose 1-3 days after delivery to rule out
- Counseling on lifestyle measures to reduce the risk of type 2 diabetes, the need for future pregnancies to be planned and the need for regular diabetes screening, especially before any future pregnancies

# Breastfeeding

- Breastfeeding decreased the incidence of maternal type 2 DM among women with a history of GDM
- Breastfeeding is recommended for women with a history of GDM

# Screening for diabetes after GDM

## 75-gram OGTT

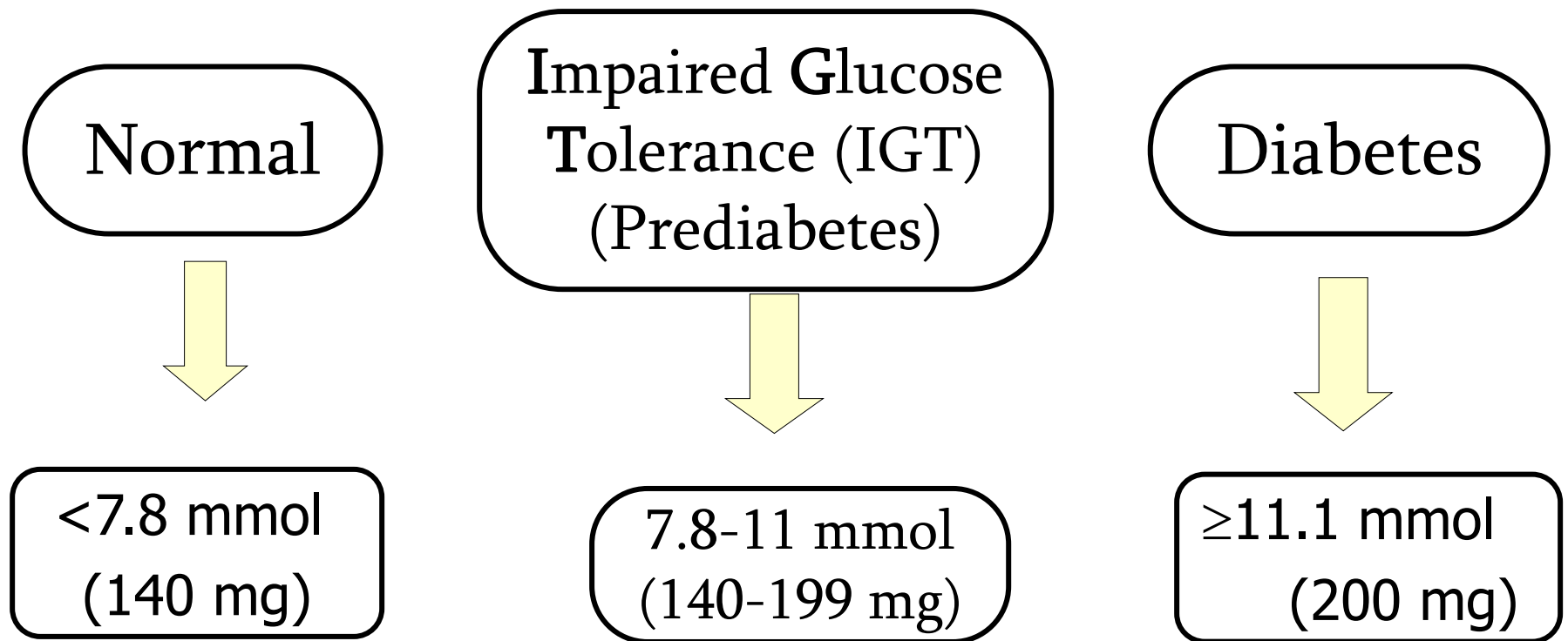
- To be done 4-12 weeks after delivery
- Fasting and 2-hour plasma glucose
- A1c is not recommended (can be falsely low)

# Fasting plasma glucose

- **Normal:**
  - <5.6 mmol (100 mg)
- **Diabetes:**
  - $\geq 7$  mmol (126 mg)
- **Impaired fasting glucose (IFG) [Prediabetes]:**
  - 5.6 to 6.9 mmol (100-125 mg)



# 75-gram OGTT: 2-hour plasma glucose interpretation



# GDM: long term f/u

- Future risk of type 2 DM: up to 50-60%
- Lifelong screening for the development of diabetes or prediabetes **every 1-3 years** using fasting glucose, A1c or 75-gram OGTT
- Lifestyle changes (healthy weight, physical activity)
- Women found to have prediabetes should receive intensive lifestyle interventions and/or Metformin to prevent diabetes

# Case 5

- A 35-year-old lady with type 2 DM is on Metformin, Glyburide and Sitagliptin
- She has no reported diabetes complications
- She missed her last menstrual period by 2 weeks
- A pregnancy test done yesterday was positive
- Physical examination is normal
- A1c 6.8%, kidney and liver function tests are normal
- **How would you approach?**

# Management of type 2 diabetes in pregnancy

- Stop non-insulin glucose-lowering medications (not well studied, not FDA-approved, lack of safety data)
- Some centers use Metformin in pregnancy
- Follow up with educator and dietitian
- Recommended weight gain:
  - For overweight women: 6.8-11.3 kg (15-25 lb)
  - For obese women: 4.5-9 kg (10-20 lb)
  - No data on optimal weight gain versus weight maintenance in women with BMI >35

# Metformin: NICE guidelines

- Women with diabetes **may be** advised to use metformin as an adjunct or alternative to insulin in the preconception period and during pregnancy, when the likely **benefits** from improved blood glucose control **outweigh** the potential for **harm**

# Glucose management of type 2 diabetes in pregnancy

- Insulin is the preferred agent
- Initial insulin dose: 0.5-0.7 units/kg/day
- Insulin requirement increases as pregnancy advances
- Basal + meal regimen is recommended (or insulin pump)
- Regular, Aspart, Lispro, NPH, Detemir can be used
- Endocrine society: **“Glargine may be continued in pregnancy”**
- NICE guidelines: NPH is 1<sup>st</sup> choice; detemir & glargine can be used

# Type 1 diabetes in pregnancy

- Enhanced insulin sensitivity occurs in early pregnancy and leads to lower insulin requirements and higher risk of hypoglycemia
- Around 16 weeks, insulin resistance increases and total daily insulin doses will need to be increased as pregnancy advances
- Insulin requirement increases significantly (can reach doubling of pre-pregnancy insulin doses by 3<sup>rd</sup> trimester)

# Glucose targets for DM 1 & DM 2 in pregnancy

- Preprandial glucose: 70- 95 mg (3.9-5.3 mmol)
- Postprandial glucose:
  - 1-hour : 110-140 mg (6.1-7.8 mmol)
  - or** 2-hour: 100-120 mg (5.6-6.7 mmol)
- HbA1c:
  - < 6% if it can an be achieved without significant hypoglycemia
  - Can be relaxed to <7% if necessary to avoid hypoglycemia



# Management of type 1 diabetes in pregnancy

- Continuous glucose monitoring (CGM) is recommended (in addition to blood glucose monitoring)
- Studies are available for persons with type 1 DM
- The following targets are recommended:
  - Target range 63-140 mg (3.5-7.8 mmol): TIR, goal >70%
  - Time above range [ $>140$  mg (10 mmol)], goal <25%
  - Level 1 time below range [ $<63$  mg (3.5 mmol)], goal <4%
  - Level 2 time below range [ $<54$  mg (3.5 mmol)], goal <1%

# Diabetes in pregnancy: screening for complications

- **Dilated eye examination:**
  - In the first trimester
  - Then in every trimester
  - For 1 year postpartum as recommended by the eye care provider
- **Kidney function** (serum creatinine, UACR, eGFR)

# Management of preexisting hypertension in pregnancy

- Start treatment if BP  $\geq$ 140/90
- Adjust therapy if BP  $\geq$ 140/90
- Limited data on optimal BP level
  - ADA: target BP 110-135/85
- Stop ACEI & ARB prior to planned pregnancy
- Stop ACRI & ARB as soon as pregnancy is confirmed
- Can use: Methyldopa, Labetalol, Hydralazine, Nifedipine, Diltiazem, Clonidine, Prazosin
- Stop lipid-lowering agents (statins & fibrates)

# Aspirin in pregnancy

- Aspirin for patients with type 1 DM and those with type 2 DM is suggested to lower the risk of preeclampsia
- ADA recommends a dose of 100–150 mg/day starting at 12 to 16 weeks of gestation

# Type 1 diabetes: post-delivery care

- Monitor glucose
- Insulin requirements decrease (reduce dose initially by 50%) then adjust according to home glucose monitoring
- Encourage breastfeeding
- Medications during breastfeeding:
  - Insulin is safe
  - Endocrine society: “Metformin & Glyburide can be used”
  - NICE: “can use Metformin”
    - But Metformin & Glyburide are not approved by the FDA
- Discuss and implement a contraception plan

# Summary: key points

- Family planning for ladies at reproductive age
- Preconception care for DM is important
- Universal screening for GDM at 24-28 weeks gestation
- Most use 75-g OGTT (0, 1, 2 hours) for GDM screening
- If GDM is uncontrolled on lifestyle changes, use insulin
- Diabetes in pregnancy: insulin, eye and kidney care