



# مركز الحياة الطبي AL-HAYAT MEDICAL CENTER



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# Gestational Diabetes Mellitus



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## DISCLOSURE OF CONFLICT OF INTEREST

- I am a full-time Employee at Al-Hayat Medical Center.
- I have no financial relationships with members of pharmaceutical or medical supply companies.
- I do not hold any research grants funded by industry.
- I do not serve on any advisory board of any “**for-profit**” industry.





## OUTLINE:

- What is Gestational Diabetes Mellitus (GDM)?
- What are the risks associated with GDM?
- What is the recommended preconception care ?
- What is the optimal treatment guidelines?
- What is the proper management of GDM.
- Delivery guidelines for patients with GDM.

# Definitions:

- **Diabetes Mellitus:** Metabolic disorder of multiple etiology characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action or both.
  - **Type 1 Diabetes Mellitus:**
    - due to pancreatic islet beta-cell destruction
    - prone to ketoacidosis.
    - characterized by absolute insulin deficiency.
  - **Type 2 Diabetes Mellitus:**
    - This is the major form of diabetes,
    - defects in insulin secretion
    - insulin resistance.



# WHAT IS GESTATIONAL DIABETES MELLITUS ?

*Carbohydrate intolerance of variable severity with onset or first recognition during pregnancy that is not overt diabetes.*

## **? It includes women with:**

- Impaired glucose tolerance (IGT)
- Impaired fasting glucose (IFG).

# PREVALENCE

- Diabetes is the most common medical disorder associated with pregnancy.
- Prevalence: 4/1000 worldwide and 16.7% in Qatar.
- Most recent data estimates the prevalence of diabetes in pregnancy in Qatar to be 33.3%, two thirds of them had GDM.

## WHAT ARE THE RISKS ASSOCIATED WITH GESTATIONAL DIABETES ?

Mother	Fetus
Miscarriage	Congenital malformation ( two times higher)
Higher rate of cesarean section	Stillbirth and neonatal death (PMR 4 times higher)
Hypoglycemia, Hyperglycemia, Ketoacidosis.	Premature delivery (spontaneous or iatrogenic) 36%
Retinopathy, new onset or worsening of preexisting	Birth trauma (Sec. to macrosomia)
Nephropathy, new onset or worsening of preexisting.	Neonatal complications: Hypoglycemia, polycythemia, hypocalcemia, hyperbilirubinemia and cardiomyopathy.
Hypertension and preeclampsia	Birthweight > 4000 gm 21% and shoulder dystocia 7.9%



# Obstetrical Care Of Diabetic Patients

- Preconceptual care
- Antenatal care
- Intrapartum care
- Postnatal care.

# Preconceptual Care

- Review medical and obstetric history of the patient.
- Regular education and counseling regarding the impact of diabetes on pregnancy.
- Unplanned pregnancy should be avoided.
- HBA1C of  $\leq 6.5\%$  should be achieved prior to pregnancy.
- Women with HBA1C  $> 10\%$  should be advised strongly not to conceive at this level.
- 3-6 months of good glycemic control is advised prior to conception.

## Preconceptional Care (Cont.)

- Diet and weight loss prior to conception.
- All Oral Hypoglycemic medications, apart from Metformin, should be stopped.
- Insulin should not be discontinued prior to conception, in patients who are well controlled on it.
- Folic acid should be started.
- Screening for retinopathy and nephropathy.
- Review of patient medications.

# Diagnostic Criteria of GDM in Pregnancy

(based on 75 g OGTT)

Diagnosis is made when any of these glucose values are exceeded.

GDM	Fasting	1 hour	2 hours
	$\geq 5.1$ mmol/l (92 mg/dl)	$\geq 10.0$ mmol/l (180 mg/dl)	$\geq 8.5$ mmol/l (153 mg/dl)



# Diagnostic Criteria of Overt Diabetes

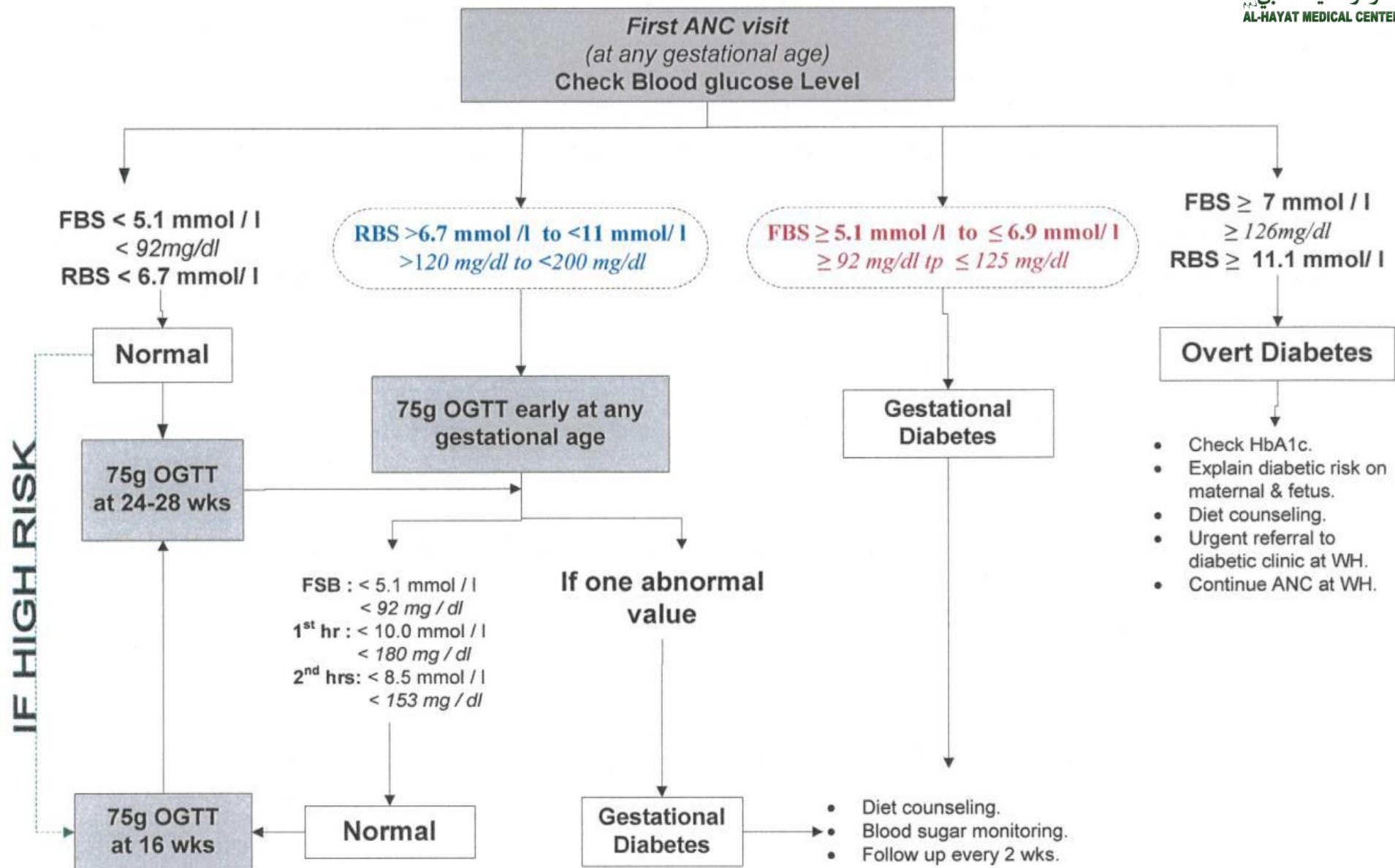
(Based on 75 g OGTT)

Diagnosis is made when any of these glucose values are exceeded.

	Using 75 g OGTT		Other criteria	
	Fasting	2 hours	HBA <sub>1</sub> C	RBS
Overt Diabetes	≥7.0 mmol/l (126 mg/dl)	≥ 11.1 mmol/l (200mg/dl)	≥ 6.5 %	≥ 11.1 mmol/l (200mg/dl) in symptomatic patients.



# Blood Glucose Screening during Pregnancy using 75g OGTT



# Patient Education

**All patients should receive information leaflet that explains the following:**

The role of diet, weight gain and exercise during pregnancy.

The increased risk of having a baby who is LGA, which increases the likelihood of birth trauma.

The importance of maternal glycemic control during labor and early feeding of the baby in order to reduce the risk of neonatal hypoglycemia.

# Patient Education (cont.)

The possibility of transient morbidity in the baby during the neonatal period, which may require admission to NICU.

The risk of the baby developing obesity and/or diabetes in later life.

Women with GDM should be advised to choose carbohydrates from low glycemic index sources.

Women with GDM whose pre-pregnancy BMI was  $> 27 \text{ kg/m}^2$  should be advised to restrict calorie intake to 25 kcal/kg/day or less.

In the absence of contraindications, exercise of 15-30 minutes per day should be encouraged.

# Home glucose monitoring and targets

- Every patient should have a glucometer at home
- Self-monitoring of blood glucose:
  - Multi-doses of Insulin: 6-7 times per day
  - Diet alone, metformin or single dose insulin: 4 times per day
- Glycemic targets :
  - FBS should be  $\leq 5.3$  mmol/l ( $\leq 95$  mg/dl).
  - 2 hours after meals should be  $\leq 6.7$  mmol/l ( $\leq 120$  mg/dl)
  - Patient on insulin: capillary blood glucose above 4 mmol/l
- HBA1C target is  $\leq 6.5\%$  .

# Management of GDM

Diet and exercise



Metformin



Insulin



# Management of Pre-conception and Overt Diabetes during pregnancy

## Hypoglycemia:

- ☞ All patients should be advised about the risks and treatment of hypoglycemia.
- ☞ Women with IDDM should always have available fast-acting form of glucose with them.
- ☞ Provide glucagon to pregnant women with type I DM for use if needed.

## Treatment:

- ☞ A multi-dose injection (MDI) regime is recommended for the majority of patients.
- ☞ Type 2 diabetes patients on Metformin could be continued on their treatment as usual.
- ☞ Patients should be empowered and taught how to adjust their own insulin doses.
- ☞ **The fall in insulin requirement in pregnancy could indicate placental insufficiency. Closer monitoring of the mother and the fetus is recommended.**

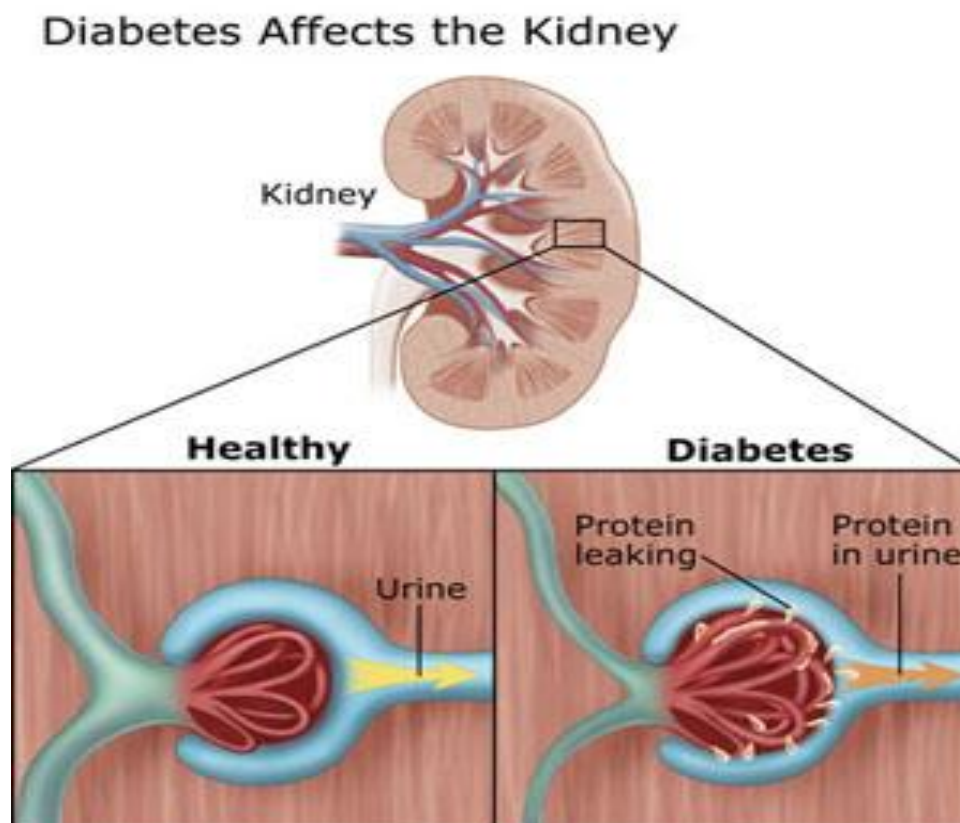
## Complications during pregnancy: Vomiting

- ❧ Patient with diabetes in pregnancy are prone to ketosis in the presence of recurrent vomiting.
- ❧ They should be instructed on how to cope with it and, in cases of severe vomiting, they should be hospitalized.
- ❧ Bolus doses of insulin could be given 15-20 minutes after food to avoid hypoglycemia in cases of recurrent vomiting.



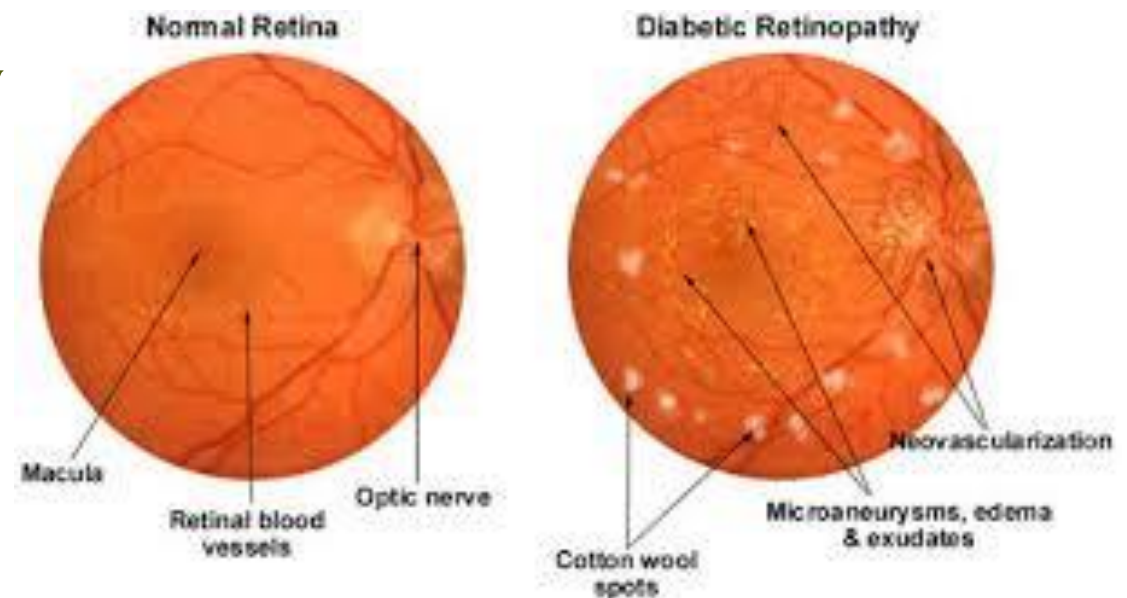
## Complications during pregnancy: Nephropathy

- Patients should be screened for albumin excretion at booking and/or in the first or second trimester.
- All women with nephropathy will need close monitoring prior to and during pregnancy.
- Referral to a nephrologist.

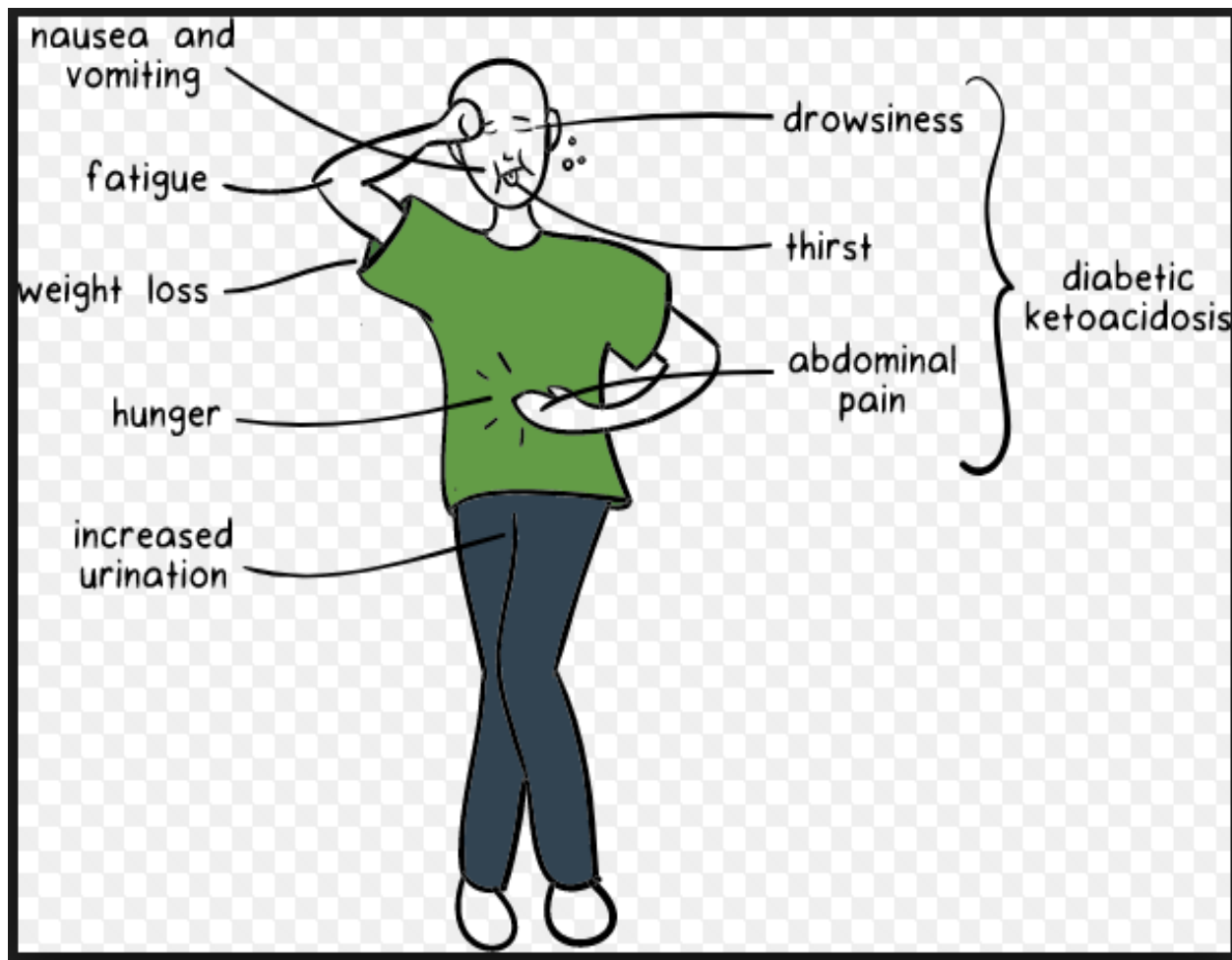


# Complications during pregnancy: Retinopathy

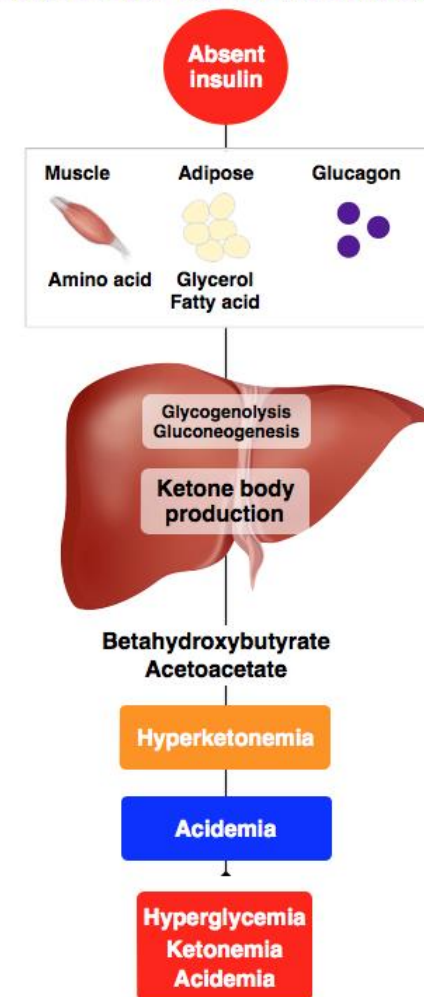
- ❧ Pregnancy is a risk factor for diabetic retinopathy.
- ❧ All women should undergo a retinal assessment by ophthalmologist in the first trimester and at 28 weeks.
- ❧ In case of retinopathy, close follow-up throughout pregnancy and for 1 year postpartum.
- ❧ Diabetic retinopathy is not a contraindication to vaginal delivery.



# Complications during pregnancy: Diabetic Ketoacidosis



## Diabetic Ketoacidosis





## Complications during pregnancy: Diabetic Ketoacidosis

- ❧ Euglycemic ketoacidosis is well recognized in pregnancy.
- ❧ Women who present with nausea, vomiting, abdominal pain and hyperglycemia should be investigated for DKA.
- ❧ Immediate delivery may not be necessary as fetal heart rate abnormalities may resolve with the correction of the metabolic state.

# Complications during pregnancy:

## Fetal Surveillance

- ❖ Early ultrasound.
- ❖ Anomaly scan at 18-20 weeks gestation.
- ❖ Third trimester ultrasound for fetal growth, amniotic fluid and fetal movements.
- ❖ Biophysical profile testing and doppler velocity to assess umbilical blood flow
- ❖ In the event of macrosomia a clear management and delivery plan should be put in place by a consultant obstetrician.
- ❖ Unexpected intrauterine death remains a significant contributor to perinatal mortality in pregnant women with diabetes.

# Diabetes in pregnancy:

## Driving

- Check blood glucose prior to starting a journey, do not drive till BG are  $>5.0$  mmol/l.
- Avoid long journeys or take frequent breaks.
- Always keep hypo treatment handy in the car.
- If you felt hypo; stop the car; take the switch off ; correct the hypo and do not start driving till 45 minutes after normalizing the blood glucose.



## DELIVERY OF DIABETIC PATIENTS IN PREGNANCY



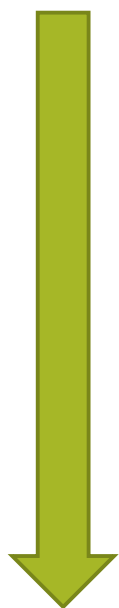
# Timing and mode of delivery

- ❏ Hospital delivery under a supervision of a consultant or a specialist and a neonatologist should be on alert.
- ❏ Women with type 1 or Type 2 DM + no other complications:
  - ❏ Elective birth by induction of labor, or C-Section if indicated, between 37+0 and 38+6 weeks of pregnancy.
- ❏ Women with type 1 or type 2 DM + metabolic or any other maternal or fetal complications:
  - ❏ Consider elective birth before 37+0 weeks.
- ❏ Women with GDM:
  - ❏ Delivery no later than 40+6 weeks.
  - ❏ Elective birth ( by induction, or by CS if indicated) if not delivered by that time.
- ❏ Diabetes is not a contraindication to VBACS.
- ❏ More frequency fetal monitoring if the pregnancy is allowed to progress.



# Timing and mode of birth

GDM

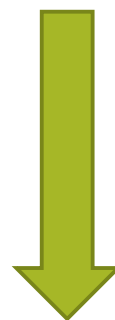


Delivery before 40<sup>6</sup> wks:  
- Induction of labor  
- Elective CS if indicated

Type I & II DM



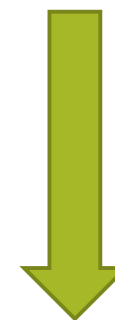
No other complications



Elective birth at 37<sup>0</sup> – 38<sup>6</sup> wks:  
- Induction of labor  
- Elective CS if indicated.



Fetal or maternal complications



Delivery before 37<sup>0</sup> wks

# Glycemic control During Labor

Hourly blood glucose monitoring: keep blood glucose between 4-7 mmol/l.

Once labor is established:

Patients on insulin (whether type 1, type 2 or GDM): variable rate insulin infusion (VRII), should be commenced.

Figure 2. Infusion pump



Patients who are on diet or Metformin: VRII should be started once the blood glucose is  $> 7$  mmol/l for two hours.

Patients should be allowed light diet if desired.

**Table 3:- Variable Intravenous Insulin Infusion Rate for intrapartum management of Diabetest.**

Blood glucose (mmol/l)	Protocol A Insulin rate (ml/hr)	Protocol B Insulin rate (ml/hr)	Protocol C Insulin rate (ml/hr)
< 4*	Stop and treat hypoglycaemia.	Stop and treat hypoglycaemia.	Stop and treat hypoglycaemia.
4.1-7.0	1	2	4
7.1-9.0	2	4	6
9.1-11.0	3	6	8
11.1-13	6	8	10
>13	8	10	12

† Prepare the infusion by adding 50 units of Actrapid to 50 mls of normal saline. Infuse Dextrose 5%/0.45 normal saline at a rate of 100 mls per hour.

\*For blood glucose < 4.0 mmol/l, stop glucose infusion for 15 minutes and treat hypoglycaemia , preferably orally, but otherwise with 50 mls of 50% dextrose or by temporary increasing the glucose infusion rate to 150 mls/min.

- If patients are not achieving normoglycaemia in protocol A for 2 consecutive hours, move to protocol B.
- If the same is happening with protocol B for 2 consecutive hours, move to protocol C.
- If still not achieving glycaemic control, contact the diabetes team oncall.

# Induction of Labor & Cesarean section

- ❏ All women should be admitted the night before the induction.
- ❏ Patients on insulin:
  - ❏ should receive their basal insulin as normal the night before
  - ❏ all insulin doses should be omitted the next morning.
- ❏ Start VRII at 8:00 am if the blood glucose is  $>7.0$  mmol/l in two consecutive readings.
- ❏ Patient on Metformin should omit the morning dose.
- ❏ Intra-operatively, blood glucose should be monitored at least once every 30-60 minutes from the time of induction till the patient is fully conscious.

# Pre-term labor and use of steroids

- Diabetes is not a contraindication for steroid use
- Infants of diabetic mothers are at increased risk of hyaline membrane disease.
- **Patients on insulin:** insulin doses should be increased by 30%.
- A sliding scale should be used to adjust for any hyperglycemia:
  - This need to continue for at least 24 h after the last dose of steroid.
  - The initial peak in blood glucose level is likely to occur 9-15 hours after injection. (50% increase in insulin dose may be required).
  - If the blood glucose level is  $> 12$  mmol/l, monitor fetus by CTG until normoglycemia achieved.

Table 4 Pre-meal, supplemental, subcutaneous, Insulin sliding scale.

<u>Blood glucose (mmol/l)</u>	<u>Pre-meal sliding scale for patients with insulin treated DM</u>	<u>Pre-meal Insulin sliding scale for GDM on Diet</u>
<u>&lt; 4</u>	<u>Treat hypoglycaemia then give 20% of usual insulin dose</u>	<u>No Insulin Required</u>
<u>4-8</u>	<u>Usual dose</u>	<u>No Insulin Required</u>
<u>8.1-10</u>	<u>Usual dose + 2 units</u>	<u>3 units</u>
<u>10.1-12</u>	<u>Usual dose + 4 units</u>	<u>5 units</u>
<u>12-14</u>	<u>Usual dose + 6 units</u>	<u>7 units</u>
<u>14-16</u>	<u>Usual dose + 8 units</u>	<u>9 units</u>
<u>&gt;16</u>	<u>Check Ketones + start IV insulin infusion</u>	<u>Check Ketones + start IV insulin infusion</u>

Only use Bolus insulin i.e. Aspart (Novorapid) OR Lispro (Humalog).

# Postpartum care: Insulin requirements

## Women with IDDM:

- For type 1 DM, a postpartum insulin regime should start immediately following the third stage of labor.
- For type 2 DM on Insulin, the doses of insulin should be discussed with the diabetologist.

## Women with pre-existing diabetes, or newly diagnosed overt diabetes not on insulin:

- These women may be switched from insulin therapy to oral agents (OHA's)
- Metformin, Glibenclamide and Insulin are compatible with breast feeding.
- Women with type 2 diabetes who intend to formula-feed their infant may recommence OHA therapy.

## Women with GDM :

- Insulin therapy should be discontinued immediately postpartum.
- Overt diabetes should be suspected and investigated if hyperglycemia persists



# Breast Feeding

- ❖ Should be encouraged in women with pre-existing diabetes
  - ❖ for the protective effects against type 2 diabetes in the off spring in later life.
- ❖ Women should be advised about the risk of hypoglycemia while breast feeding.
- ❖ Mothers may require less insulin due to the calories expended with breast feeding.
- ❖ Mothers may require a snack before or during breast feeding.
- ❖ Diabetes medications which were discontinued for safety reasons in the pre-conceptual or antenatal period should continue to be avoided during lactation.

# Health Education during postnatal period

## Pre-existing diabetes.

- Sustaining glycemic control.
- Referral to routine diabetes care clinic.

## GDM

- Stop insulin immediately after delivery.
- Women with GDM have a 35–50% chance of reoccurrence in future pregnancies.
- All women should have 75 g OGTT performed 6-13 weeks post-partum.
- Patients who missed the 6-13 weeks check should have HBA1c

## All:

- Advice on diet, physical activity, weight reduction, weight maintenance and lifestyle interventions (stop smoking and healthy eating).
- Methods of contraception should be discussed.

## Risk factors for developing T2DM include:

- Pre-pregnancy overweight/obesity
- High blood glucose levels at diagnosis of GDM
- High insulin requirements during pregnancy
- Early gestation at diagnosis of GDM
- The need for insulin treatment in pregnancy
- Pre-term delivery
- Post-partum OGTT results in keeping with pre-diabetes.

## Summary of ANC for Women with Diabetes in pregnancy.

- **Booking Appointment.**
  - Appointment should be arranged as early as possible.
  - Information about how DM will affect pregnancy, birth and early parenting should be discussed.
  - Review all medications and establish the extend of diabetes related complications..
  - *HbA1c* should be measured at booking.
  - Retinal assessment should be arranged in this appointment.
  - *Renal* assessment, including Urine Albumin-creatinine ratio and KFT should be arranged.
  - Obstetric Ultra-Sound-Scan for viability of pregnancy & NT scan (at 11-13 weeks).
  - Folic acid should continue till 12 weeks gestation.
- **20 weeks.**
  - Detailed anomaly scan & fetal cardiac echo in Fetal Medicine Unit-WH
- **28 weeks.**
  - Fetal growth scan and amniotic fluid volume.
  - Retinal assessment to all women with pre-existing diabetes
- **32 weeks.**
  - Fetal growth scan and amniotic fluid volume
- **34 weeks.**
  - Normal ANC in general ANC clinic for women with diabetes plus checking home BSS
- **36 weeks**
  - Offer fetal growth scan and amniotic fluid volume.
  - Provide information and advice about: Timing, mode and management of birth; analgesia and anaesthesia; changes to blood glucose-lowering therapy during and after labour, effect of breastfeeding on blood glucose control contraception and follow-up.
- **37<sup>+0</sup> to 38<sup>+6</sup> weeks.**
  - Offer induction of labour, or caesarean section if indicated, to women with type 1 or type 2 DM; otherwise await spontaneous labour.
- **39 weeks.**
  - Advise women with uncomplicated gestational diabetes to give birth no later than 40+6 weeks

# Any Questions ?

