

Gestational Diabetes

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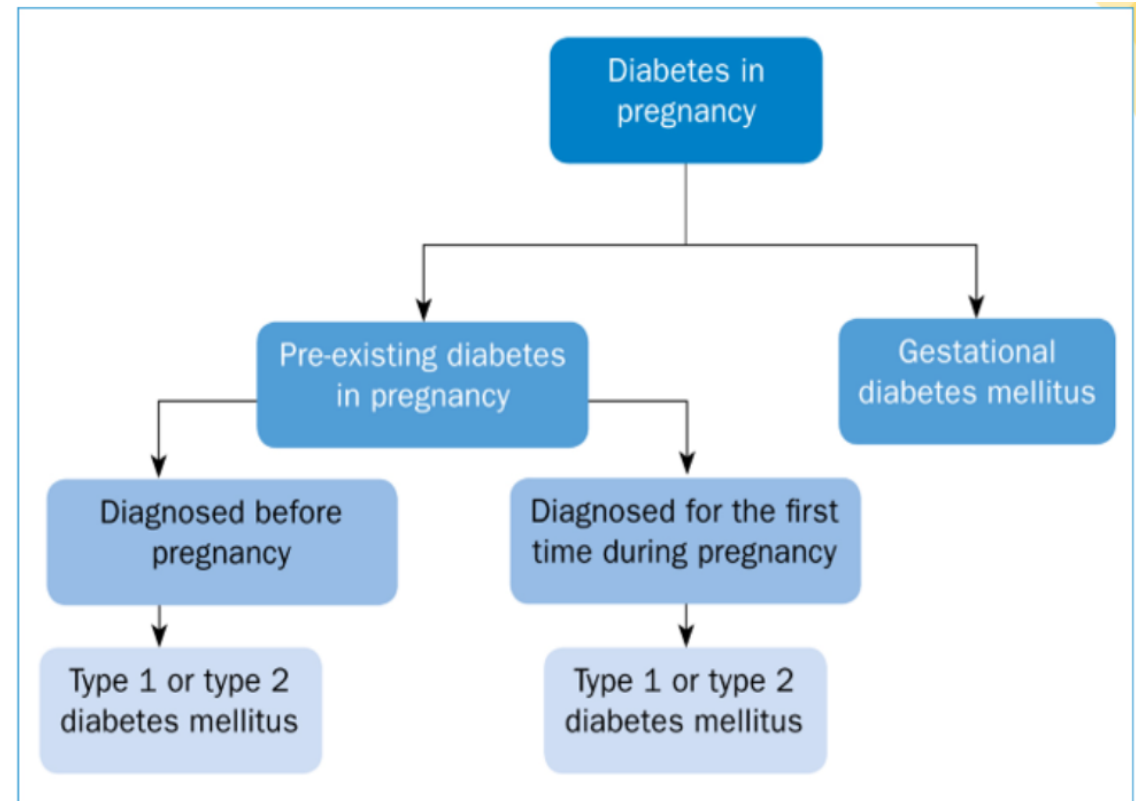


What we will cover....

- What is GDM?
- Why should we test for and treat GDM?
- Diagnosis of GDM
- Treatment for GDM
- Management of GDM postpartum

What is gestational diabetes?

- GDM is defined as glucose intolerance with first recognition in pregnancy (this definition therefore includes women with previously undiagnosed abnormalities)



Overt DM diagnosed in pregnancy

- HbA1c \geq 6.5% or Fasting \geq 7.0 / 2-hour \geq 11.1
- Refer to diabetes educator, dietician and physician
- Baseline urinary albumin:creatinine ratio
- If suspicion of T1DM also check TFT and autoantibodies
- Women with pre existing diabetes are at greater risk of adverse outcomes than those with GDM

Why do we need to know about overt DM?

- Elevated HbA1c at conception and first trimester
 - Increased risk of miscarriage
 - Increased risk of major malformation
 - HbA1c >10% -> 25% chance of major malformation (esp cardiac)
 - Refer for tertiary level ultrasound and fetal echo
- Aspirin to reduce risk of pre eclampsia
- Growth surveillance
 - Growth US 28, 32, 36 weeks gestation

GDM

- More than 1:6 women (17.9%) who gave birth in Australia in 2020-21 was diagnosed with GDM- 53 900 women
- It is important because it tells us about the risk of T2DM in 2 generations!

Figure 1: Incidence of gestational diabetes, by age, 2021-22

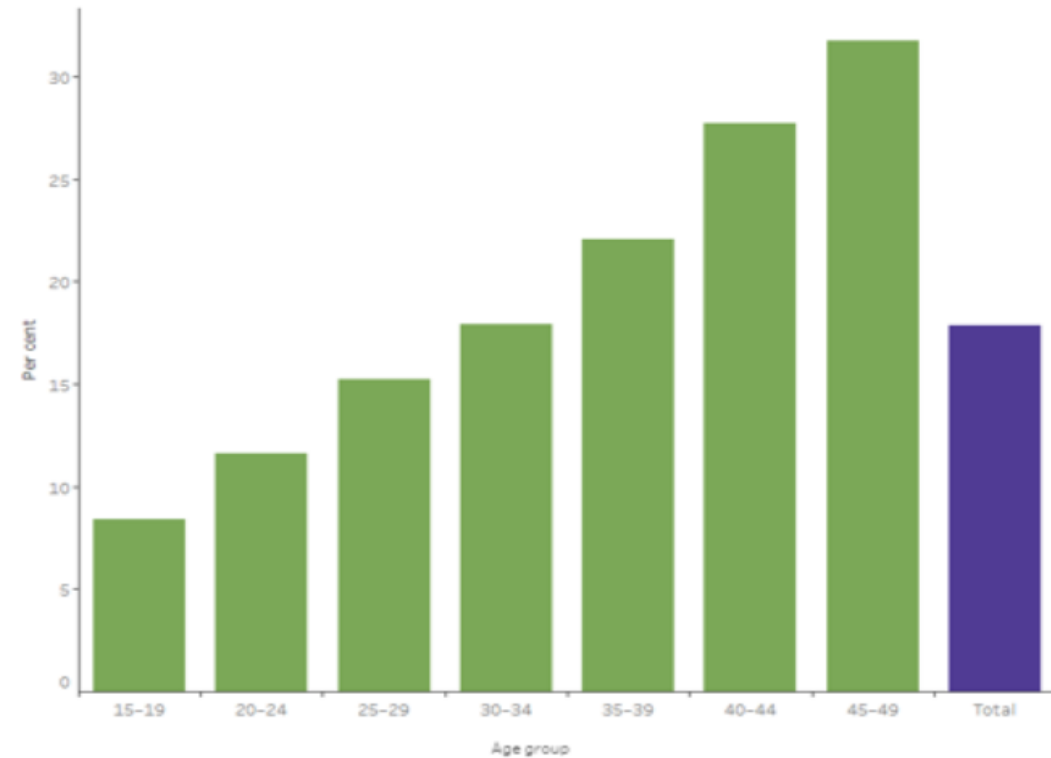


Figure 1: Incidence of gestational diabetes, by age, 2021-22

Notes:

1. Population (women aged 15-49 giving birth in Australian hospitals) based on ICD-10-AM diagnosis codes.

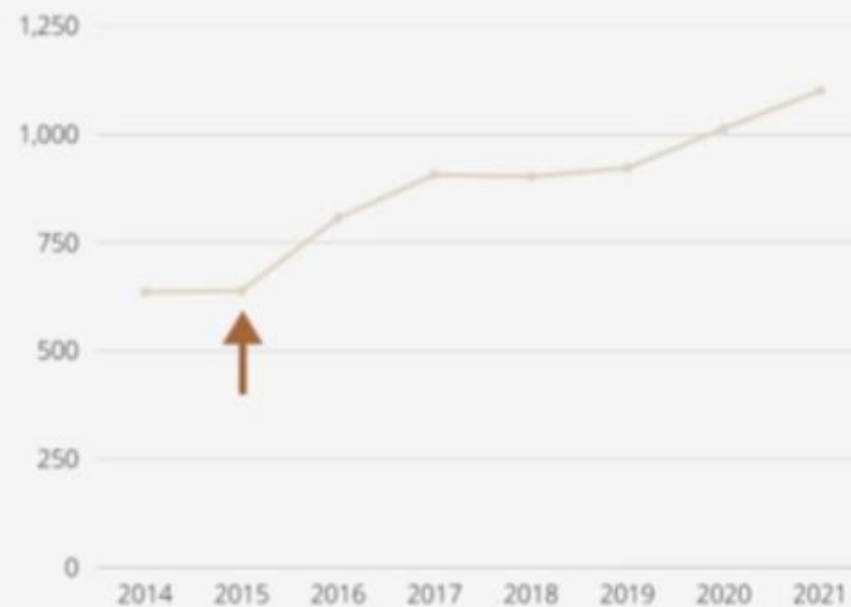
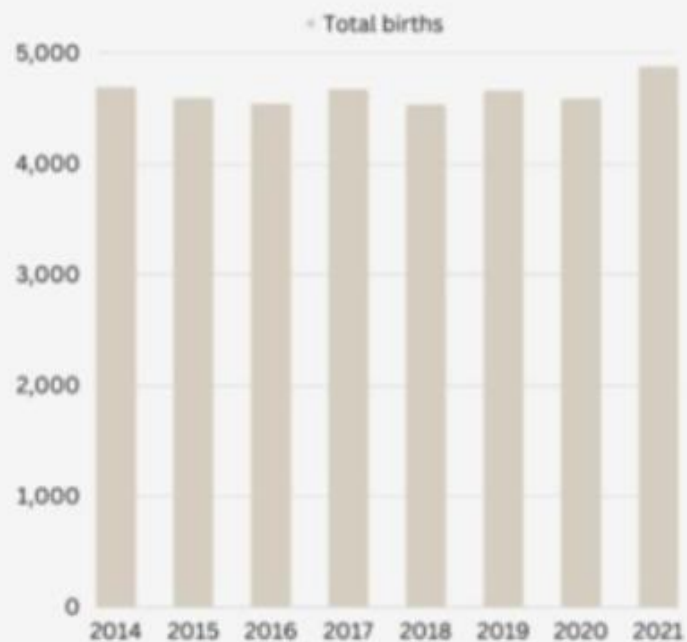
2. Includes persons with missing or unassigned information on age and/or sex.

Chart: AIHW. Source: National Hospital Morbidity Database.

<https://www.aihw.gov.au>

Diabetes in pregnancy

at the Women's and Children's Hospital, Adelaide, South Australia.



Incidence of Diabetes in pregnancy at the WCH

•In 2015 the WCH introduced new Perinatal Practice Guidelines (PPG) for diagnosis and treatment targets for GDM which had a smaller normal range.

•This has seen more women being diagnosed with gestational diabetes.

2014 - 636 women with Diabetes in pregnancy

2021 - 1101 women with Diabetes in pregnancy

- GDM is the fastest growing type of diabetes in Australia
- Contributing factors include age and weight of women becoming pregnant, excessive weight gain during pregnancy and Australia's changing ethnic make up

Pre-pregnancy BMI	Recommended weight gain over the whole pregnancy
BMI less than 18.5 (underweight)	12.5kg to 18kg
18.5 to 24.9 (healthy weight) 18.5 to 22.9 if Asian	11.5kg to 16kg
25 to 29.9 (overweight) 23 to 27.5 if Asian	7kg to 11.5kg
30 or more	5kg to 9kg

Normal pregnancy physiology

- In a pregnancy NOT affected by GDM
- Multiple factors – growth hormones, placental lactogen, progesterone, corticotrophin releasing hormones are produced by the placenta which result in insulin resistance
- The pancreas can secrete sufficient insulin to cope with the increase in insulin resistance over the pregnancy
- Normal blood sugar levels are maintained
- The fetus receives adequate glucose, produces a normal amount of insulin and has normal growth

GDM physiology

- In GDM
- The same factors are produced by the placenta resulting in insulin resistance
- The pancreas is unable to secrete sufficient insulin to overcome the insulin resistance of pregnancy
- This results in maternal hyperglycaemia
- Excessive maternal glucose crosses the placenta resulting in fetal hyperglycaemia
- The fetus responds by secreting extra insulin which results in excessive fetal growth

Diagnosis of GDM

The NEW ENGLAND
JOURNAL of MEDICINE

ESTABLISHED IN 1812

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Hyperglycemia and Adverse Pregnancy Outcomes

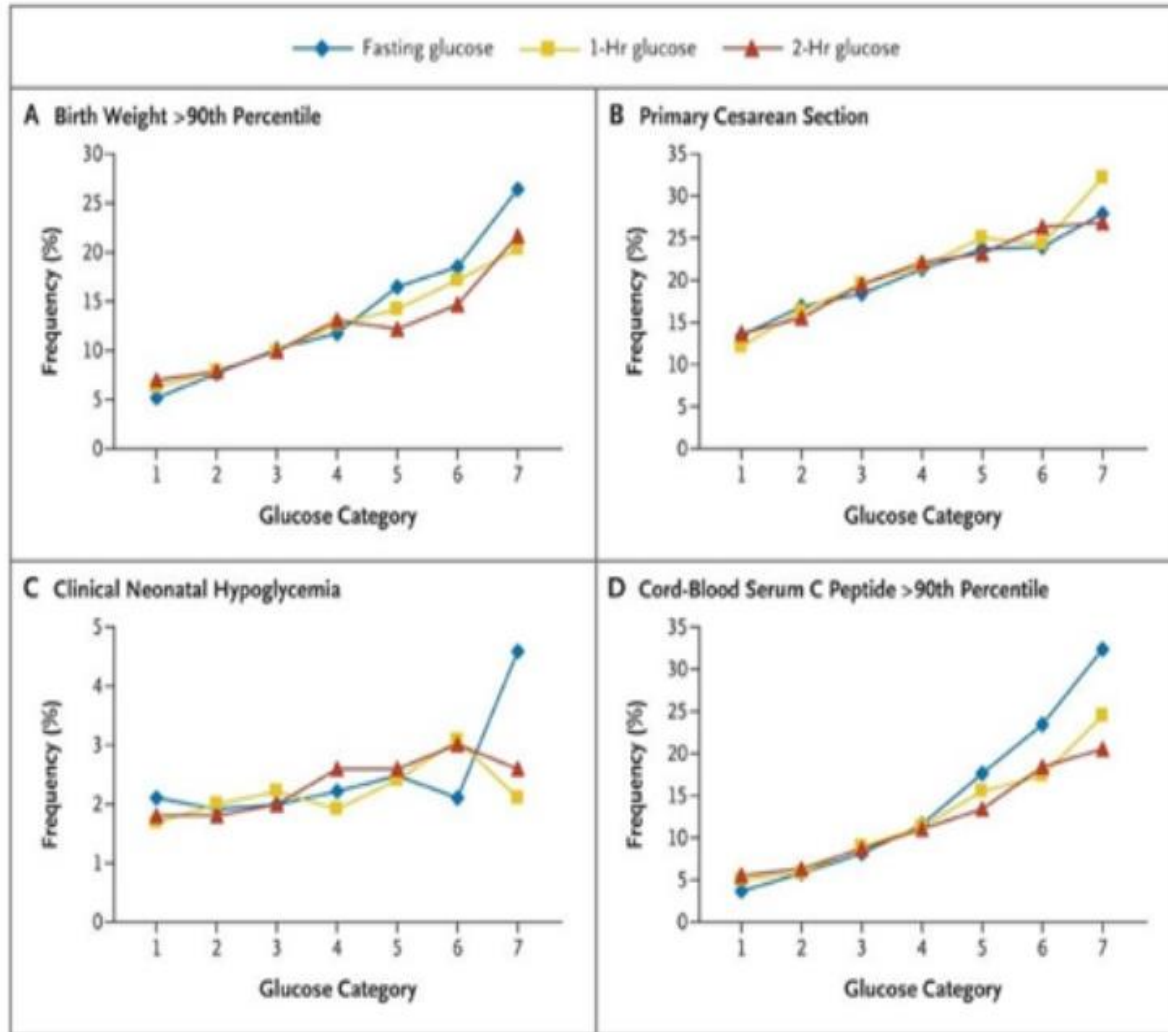
The HAPO Study Cooperative Research Group*

- Question: does lesser severity of hyperglycaemia than that of diabetes adversely affect pregnancy outcomes?
- N = 25 505 women from 9 countries
 - Australia, USA, Canada, UK, Singapore, Hong Kong, Bangkok, Beersheba, Barbados
- 75g OGTT at 24-32 weeks gestation
- Stratified pregnancy outcomes according to glucose categories
 - Cat 1: F <4.2 mmol/L
 - Cat 7 F 5.6-5.8mmol/L
- Excluded women if F>5.8mmol/L, 2hr 11.1mmol/L

Hyperglycemia and Adverse Pregnancy Outcomes

The HAPO Study Cooperative Research Group*

- Primary outcomes
 - Birth weight >90%
 - Primary caesarean delivery
 - Neonatal hypoglycaemia
 - Cord blood serum C – peptide >90th %
- Secondary outcomes
 - Delivery < 37/40
 - Shoulder dystocia
 - Pre-eclampsia



HAPO study

Glucose categories (F / 1h / 2h):

1. ≤ 4.1 / ≤ 5.8 / ≤ 5.0
2. 4.2 – 4.4 / 5.9 – 7.3 / 5.1 – 6.0
3. 4.5 – 4.7 / 7.4 – 8.6 / 6.1 – 6.9
4. 4.8 – 4.9 / 8.7 – 9.5 / 7.0 – 7.7
5. 5.0 – 5.2 / 9.6 – 10.7 / 7.8 – 8.7
6. 5.3 – 5.5 / 10.8 – 11.7 / 8.8 – 9.8
7. ≥ 5.6 / ≥ 11.8 / ≥ 9.9

Key messages from HAPO study

- Maternal hyperglycaemia increases adverse pregnancy outcome: macrosomia, adiposity, neonatal hypoglycaemia, preterm delivery, neonatal ICU admission, hyperinsulinaemia and pre-eclampsia
- The effect of maternal hyperglycaemia on pregnancy is a continuum and its diagnostic criteria and cut off threshold is by consensus and opinion

Diagnosis of GDM

- IADPSG defined diagnostic values on the basis of an odds ratio of 1.75 for adverse neonatal outcomes
 - 75g OGTT one-step approach
 - Fasting ≥ 5.1 / 1 hour ≥ 10 / 2 hour ≥ 8.5 (mmol/L)
 - 2013 WHO endorsed the criteria
- In the presence of overt DM, do not offer OGTT
 - HbA1c $\geq 6.5\%$
 - Fasting ≥ 7.0 / 2 hr ≥ 11.1

Why should we test for and treat GDM?

- Increased risk of
 - Pre eclampsia
 - LGA
 - Late stillbirth
- Enduring effect on the metabolic health of the offspring

Testing for GDM- Early OGTT risk assessment

- Previous GDM
- AMA \geq 40
- Medications – prednisolone, tacrolimus, antipsychotics
- BMI $>$ 30
- Previous macrosomic baby
- Hx of PCOS
- First degree relative with diabetes
- Ethnic origin (Asian, Indian, ATSI)

Standard testing for GDM

- 26-28 weeks gestation
- 75g OGTT performed
 - Consumption of standard carbohydrate load 3 days prior to test
 - Can get a false negative test if patients restrict carbs prior to the test
 - Overnight fast for 10-16 hours prior to test
 - No food consumption, no smoking, no exercise during the test

Treatment targets

- Fasting < 5
- 2 hours PP < 6.7

Treatment for GDM- Lifestyle interventions

- Dietary modification
 - 3 meals and 3 snacks each day with the carbohydrate evenly distributed across the day
 - Best foods are high fibre, low GI
 - Gestational weight gain within targets
- Exercise
 - Aim for 30 min walk each day (puffing but not speechless)
 - Insulin sensitivity increases for 24-48 hours after exercise
 - If physically limited (back pain etc) try walking 10 mins three times a day

Treatment of GDM - Pharmacotherapy

- Insulin

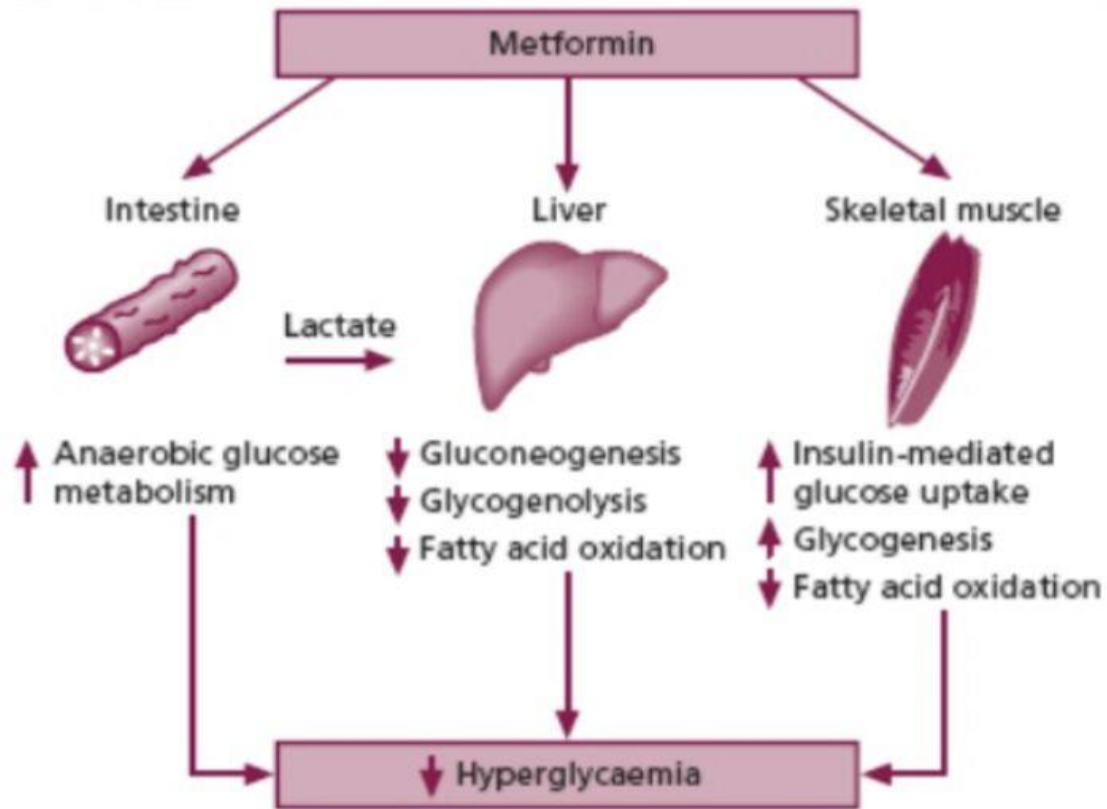
- Replaces the hormone that is insufficient
- Has been used for nearly 100yrs
- Does NOT cross the placenta
- Has to be injected

- Metformin

- It makes the insulin that the body produces work better
- Has been used for 10-12 years in pregnancy
- Crosses placenta- concerns about fetal programming in utero
- Oral medication

Mechanism of action of metformin

Mechanism of action of metformin



Metformin versus Insulin for the Treatment of Gestational Diabetes

Janet A. Rowan, M.B., Ch.B., William M. Hague, M.D., Wanzhen Gao, Ph.D., Malcolm R. Battin, M.B., Ch.B., and M. Peter Moore, M.B., Ch.B. for the MiG Trial Investigators*

- More women in the metformin group said they would choose to receive their assigned treatment again (76.6 vs 27.2%)

Short- and long-term outcomes of metformin compared with insulin alone in pregnancy: a systematic review and meta-analysis

S Butalia ¹, L Gutierrez ², A Lodha ³, E Aitken ⁴, A Zakariasen ⁵, L Donovan ^{1 5}

- Metformin lowered risk of
 - Neonatal hyperglycaemia
 - LGA babies
 - Pregnancy induced hypertension
 - Total maternal pregnancy weight gain
- Metformin did not increase
 - Preterm delivery
 - Small for gestational age
 - Perinatal mortality
 - CS

Insulin Types

Rapid

Lispro (Humalog)
Aspart (Novolog)
Glulisine (Aspidra)

Onset: 15-30 mins
Peak: 1-3 hours
Duration: 4-6 hours

- Use **just before meal**
- Highest risk of hypoglycemia

Short

Regular (Humulin R)
Regular (Novolin R)

Onset: 30-60 mins
Peak: 2-4 hours
Duration: 5-8 hours

- Take **30-60 mins** before meal
- Useful for managing **Diabetic ketoacidosis**

Intermediate

NPH (Humulin N)
NPH (Novolin N)

Onset: 2-4 hours
Peak: 8-12 hours
Duration: 10-18 hours

- Act as basal insulin
- Cover insulin need **around 0.5 day**

Long

Glargine (Lantus)
Detemir (Levemir)

Onset: 1-2 hours
Peak: No peak
Duration: 24+ hours

- Act as basal insulin
- Cover insulin need **around 1 day**

Ultra long

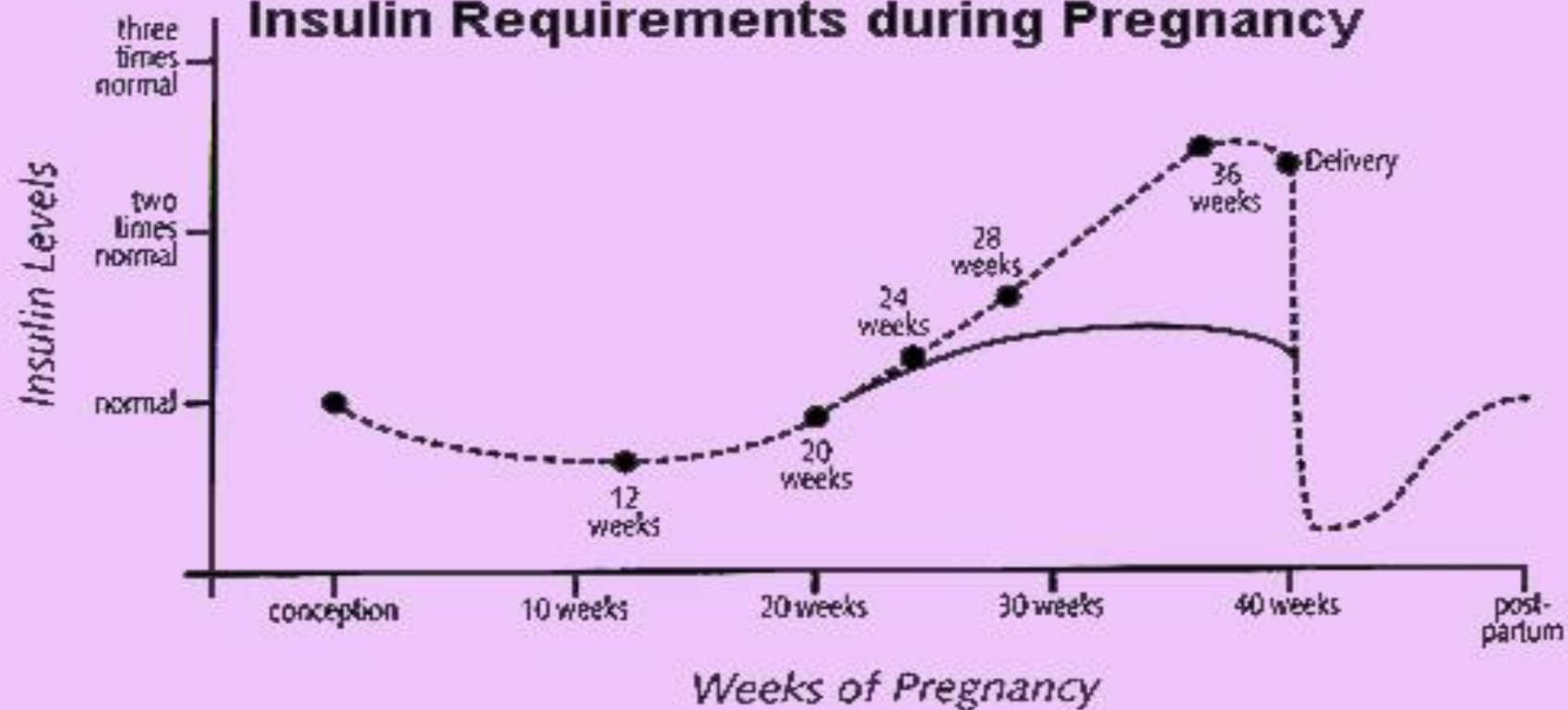


Degludec (Tresiba)

Onset: 1 hour
Peak: No peak
Duration: **42+ hours**

- Useful for extra long glucose control

Gestational Diabetes Insulin Requirements during Pregnancy



----- = Usual insulin production during pregnancy

———— = Shortage of insulin production during pregnancy with gestational diabetes

Timing and mode of delivery with GDM

- Diet control
 - 39-40 +6 weeks
- Medication + good control
 - 38-39 weeks
- Medication + poor control/LGA
 - 37-38 weeks
 - Consider CS if EFW >4kg

Intrapartum risks

- Shoulder dystocia
- Perineal trauma
- CS
- Birth trauma
- Nursery admission
 - Neonatal hypoglycaemia
 - RDS
 - hypocalcaemia

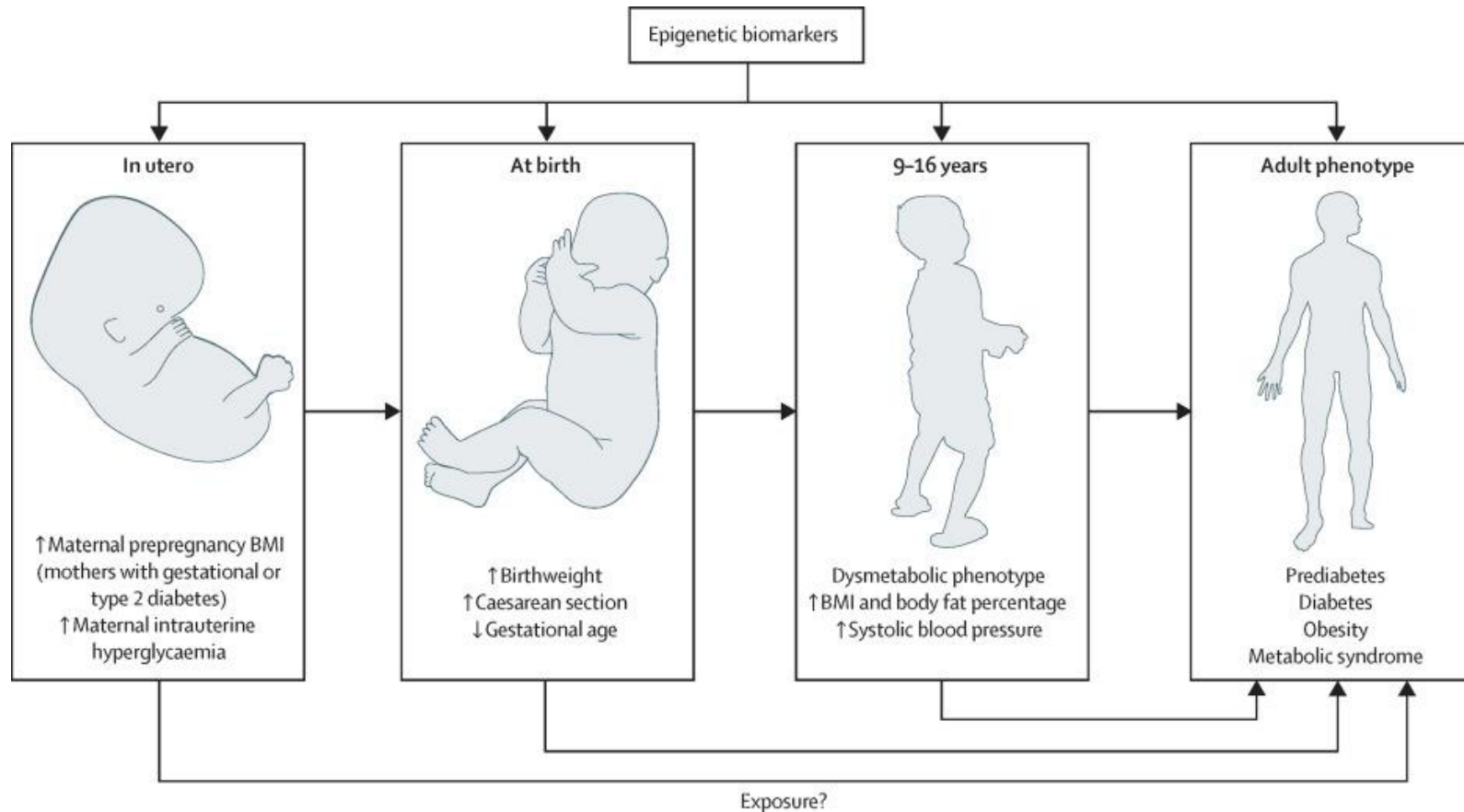
Post-partum testing

- Mother – 7x more likely to develop T2DM
 - Most women return to normal glycaemic control after delivery
 - Can check BGL's BD after delivery then cease (different protocols in different hospitals)
 - 75g OGTT 6-12 weeks post delivery
 - Screen 1-3 years
- Baby
 - Baby will not be born with diabetes
 - Heel prick to check glucose level immediately post-delivery
 - If hypoglycaemia, breast milk/formula/glucose may be required for 24-48 hours

Long term risks following GDM

- Mother
 - Increased risk of developing T2DM
 - Increased risk of GDM in future pregnancies
- Child
 - Increased risk of obesity
 - Increased risk of developing GDM and T2DM later in life
- These effects are likely to exacerbate the current epidemic of obesity and diabetes

Long term implications for the offspring



Risk reduction strategies

- Encourage women to attend GP for pre pregnancy assessment
- More support to help women optimise their weight before pregnancy
- Access to diabetes education and dietetic services
- Ensuring women receive follow up after pregnancy
- Improving screening for T2DM after GDM
- Providing T2DM risk reduction/prevention programs for women in the years after GDM

Questions

