

DIABETES MELLITUS IN PREGNANCY

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Carbohydrate metabolism

Changes during pregnancy

- **Pregnancy by itself induces profound metabolic alterations in the mother, becoming more marked with advancing gestation.**



Homo sapiens sapiens



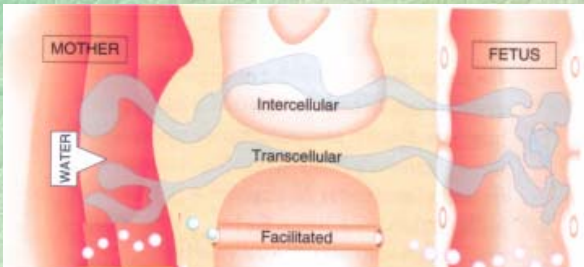
Homo sapiens gravidus



Carbohydrate metabolism

Changes during pregnancy

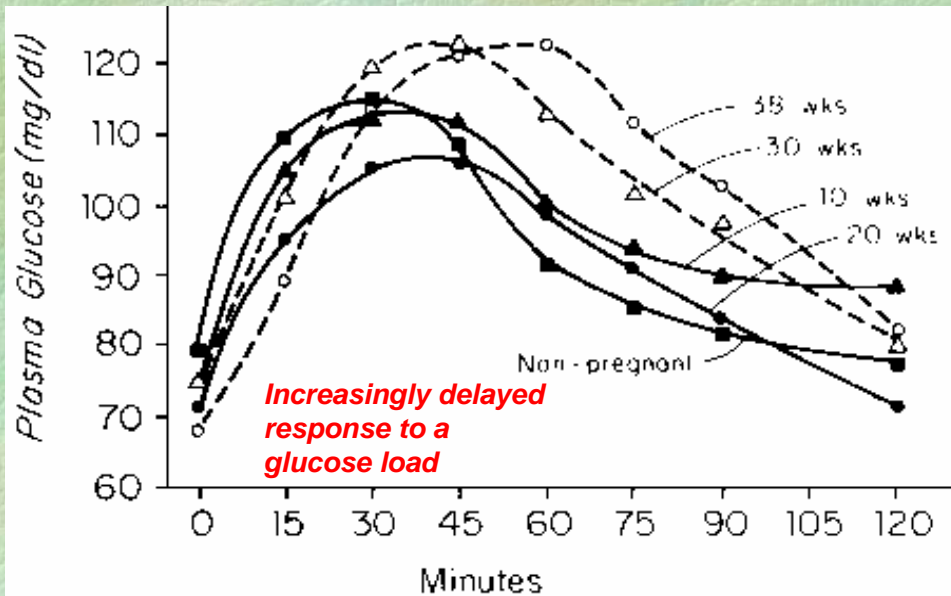
- **Changes are adaptive ensuring an optimal environment for fetal growth and development.**
 - Provide a Maternal “push” to assist Fetal “pull” of nutrients.
 - Facilitated transfer via carried protein



Glucose homeostasis in pregnancy

oGTT changes during pregnancy

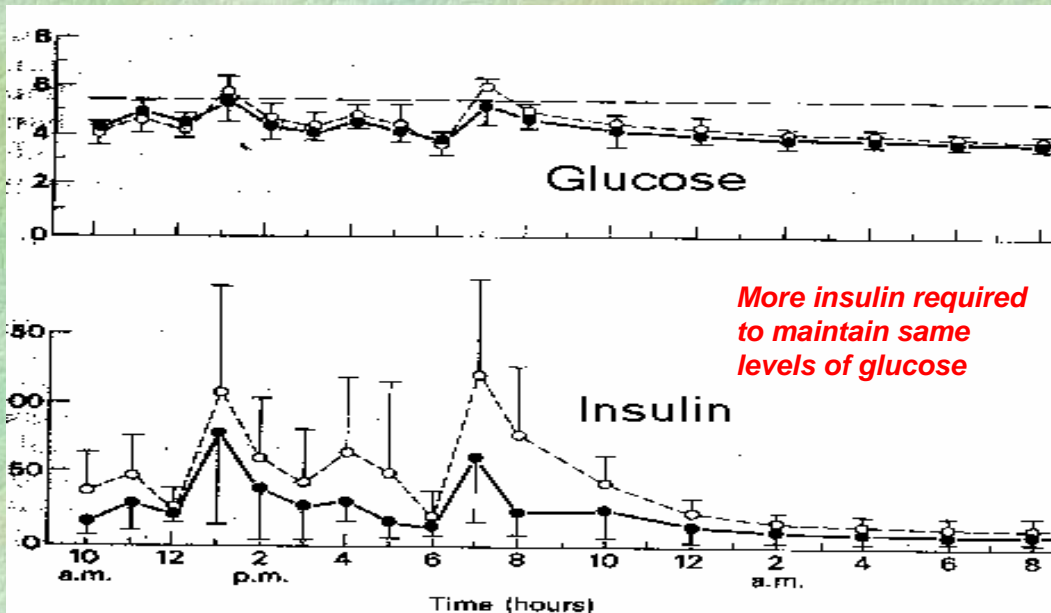
- Apparent increasing tissue insulin resistance during pregnancy causing a “diabetogenic” effect.



Glucose homeostasis in pregnancy

Tissue insulin resistance

- *By the 3rd trimester there is an increase in basal insulin concentration.*



75-gram glucose load

	Normal	GIGT*	GDM		non-pregnant
▪ Fasting	<5.3	5.3-7.0	≥ 7.0	mmol/l	≥ 7.0
▪ 1-hour		≥ 10.0		mmol/l	
▪ 2-hour	<8.6	8.6-10.9	≥ 11.0	mmol/l	≥ 7.8

** Now often regarded as mild forms of GDM*

Rates in Maltese Islands

TYPE	Incidence [1999-2004 deliveries]	Prevalence [population study 1985]	
pre-IDDM	0.29%	0.3%	0.5% of non-pregnant Maltese women aged 15-44 have previously diagnosed DM
pre-NIDDM/IGT	0.11%		
GDM	0.48%	0.7%	1.7% of non-pregnant Maltese women aged 15-44 years are found to have previously undiagnosed IGT on screening
pre-GDM/GIGT	0.19%		
GIGT [mild GDM]	1.09%	5.2%	25% pick-up rate with present screening methods
Suspected	0.21%		

oGTTs during 1999-2004 done in only 7.6% of all maternities

25% pick-up rate with present screening methods

C. Savona-Ventura, AG. Schranz, B. Chazan: Arch Perinatal Med 1997, 3(4):55-64

C. Savona-Ventura et al: Int J Risk Safety Med, 2007, 19: 229-236

G. Katona et al, 1983: WHO.NCD/OND/DIAB/83.2

Screening Protocol

- Risk factors**
- Age ≥ 40 yrs
 - Unexplained SB
 - P/H recurrent miscarriages
 - P/H BW ≥ 4.0 kg
 - Weight >100 kg
 - P/H oligomenorrhoea
 - Strong maternal/sibling F/H
- Clinical Indicators**
- Polyhydramnios
 - Macrosomia
 - Recurrent fasting glucosuria

First Obstetric Visit

HIGH RISK

- P/H GDM
- Elevated >7.0 mmol/l booking BG

AVERAGE RISK

- Presence of other risk factors
- Development of clinical indicators

LOW RISK

- No risk factors present

Timed blood glucose

75 gm oGTT at 24-28 wks

• Fasting	<5.3	>5.3 mmol/l
• 1 hr	<10.0	>10.0 mmol/l
• 2 hr	<8.6	>8.6 mmol/l

Fasting blood glucose <5.3 mmol/l

Fasting blood glucose $5.3-7.0$ mmol/l

Fasting blood glucose >7.0 mmol/l

LOW RISK

Normal GT

Abnormal GT

DIETARY ADVICE

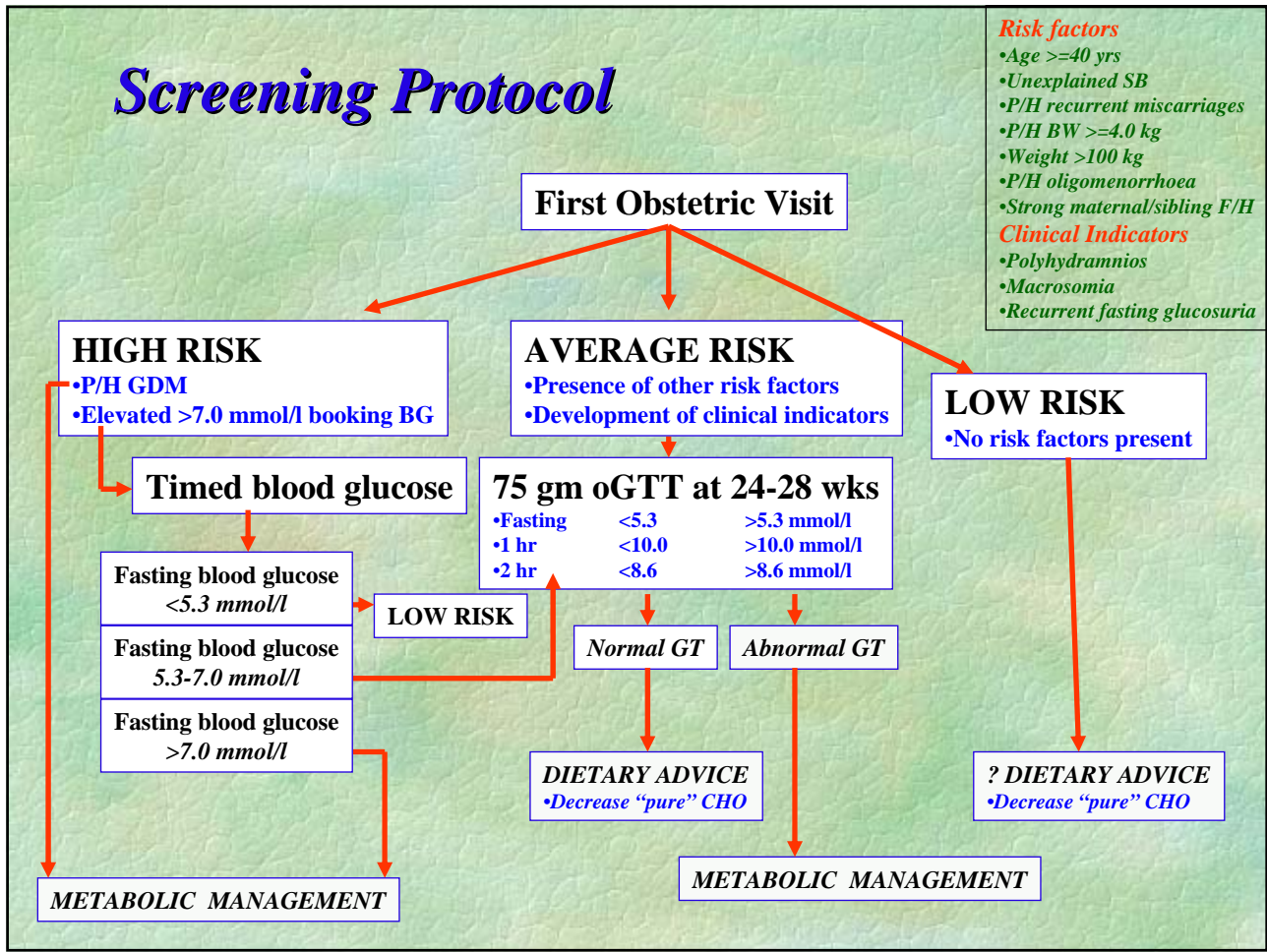
- Decrease "pure" CHO

? DIETARY ADVICE

- Decrease "pure" CHO

METABOLIC MANAGEMENT

METABOLIC MANAGEMENT



St Vincent Declaration

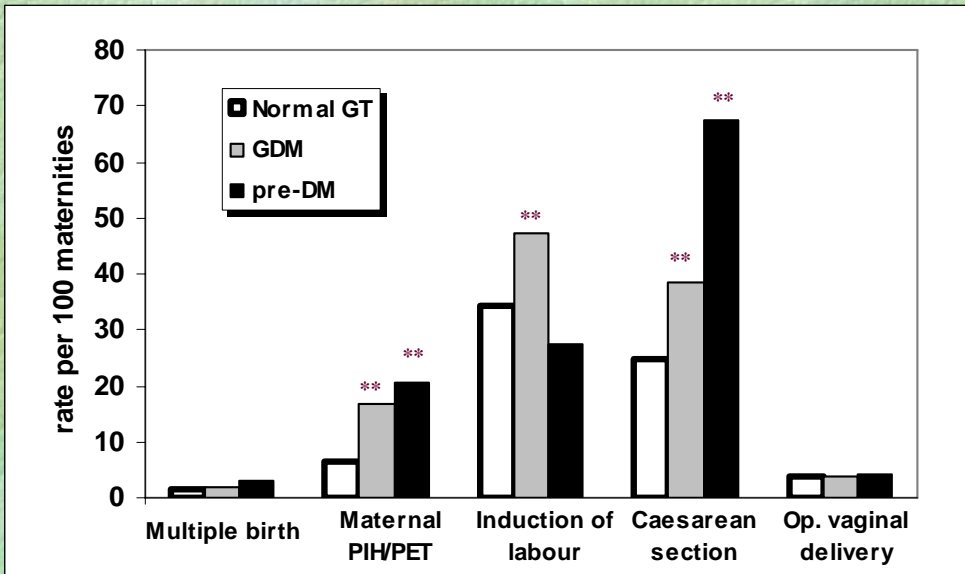


St Vincent, Italy,
10–12 October 1989
WHO and IDF meeting in Europe

“Achieve a pregnancy outcome in the diabetic woman that approximates that of the non-diabetic woman.”

16+ years later
Failure or Success?

Maternal Risks



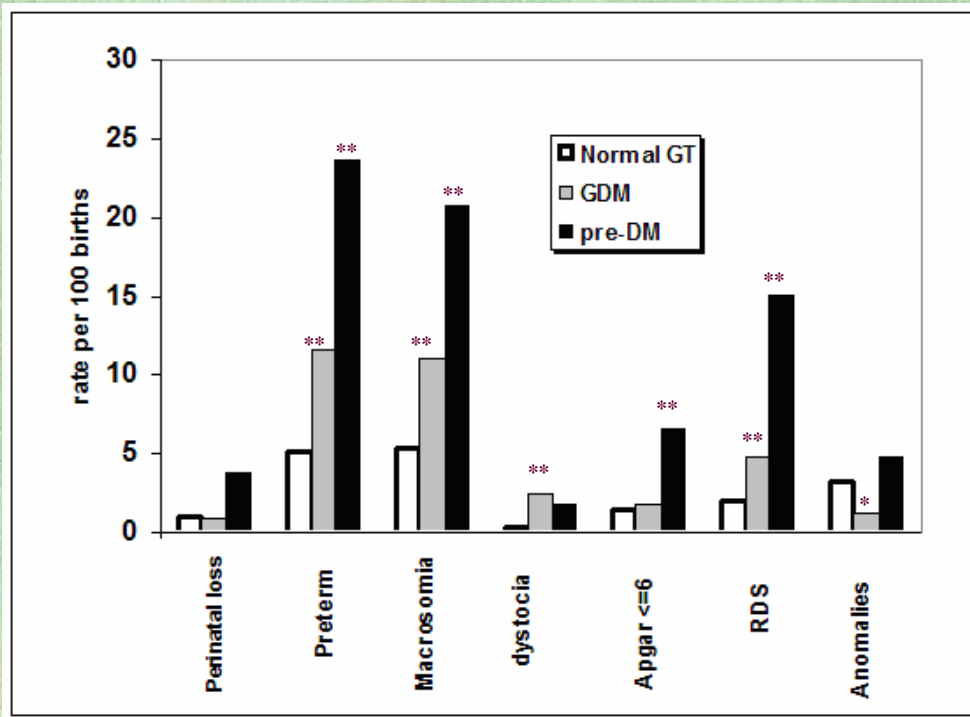
Pre-DM cases

- Pre-conceptional care: 29.6%
- DPJC attendance: 55.1%
- Deteriorating Retinopathy: 5.1%

GDM cases

- DPJC attendance: 60.2%
- Insulin treatment: 4.6%

Infant Risks



MANAGEMENT PROTOCOLS OF DIABETIC PREGNANCIES

<http://sahha.gov.mt/pages.aspx?page=381>

- **Preconception**
- **Antenatal**
 - **Dietary & exercise**
 - **Hypoglycaemic agents**
 - **Fetal wellbeing**
- **Intrapartum**
- **Postnatal**



Preconception

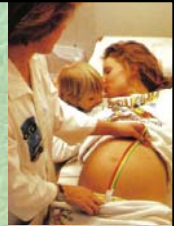


- **Ensure that metabolic control is at an optimum level to prevent congenital anomalies**
 - Pre-conception care only sought in 29% of our patients
 - Some change in malformation rates since 1983-1986 [6.8%] → 1999-2004 [4.7%]
- **Check for and treat any proliferative retinopathy found in 8.2% – deteriorating retinopathy in 5.1%**
- **Assess kidney function – deteriorating nephropathy in 1.02%**
- **Assess thyroid function**
- **Blood pressure control**
 - Stop ACE inhibitors; change to methyldopa, apresoline, nifedipine
- **Start folic acid – 400 mcg/day – three months before pregnancy**
- **Cardiac evaluation**
- **Neurological evaluation**
- **Review hypoglycaemic agents being used**
- **Stop smoking**

Contraindications for Pregnancy

1. **Severe nephropathy**
2. **Uncontrolled hypertension**
3. **Unmanageable retinopathy**
4. **Active coronary disease**

Antenatal



TRIMESTER	Retinopathy	Urea	Creatinine	HbA1c
Preconception	*	*	*	*
First - c10 wks	*	*	*	*
Second- c20 wks	*	*	*	*
Third - c28 wks	*	*	*	*
Third - c34 wks	*	*	*	*
Postpartum	*	*	*	*

- 1st - 2nd trimester U/S for abnormalities
- Also growth scans; test for fetal well-being in third trimester; fetal kick charts
- Manage pre-existing complications, e.g. hypertension and retinopathy - adequately before and during pregnancy
- Metabolic control
- All pregnant diabetic patients should be seen in a dedicated multidisciplinary combined clinic.
 - Only 55.1% of pre-DM and 60.2% of GDM are currently being referred at some stage of their pregnancy.

Dietary control

- Nutritional prescriptions should be personalised taking into account personal habits, body weight, physical activity, etc.
- Recommended daily caloric intake
 - BMI <19.8 kg/m² 35-40 kcal/kg body weight
 - BMI 19.8-29 kg/m² 30-32 kcal/kg body weight
 - BMI > 29 kg/m² 24-25 kcal/kg body weight
 - Distribution:
 - 35-40% complex carbohydrates
 - 20-25% proteins
 - 35-40% fats [10% polyunsaturated]
- Remember Folic Acid supplements and foods rich in antioxidants.
- Artificial sweeteners may be used in moderation.
- Exercise should be promoted → walking for at least 30 min per day

8.00hrs	10% CHO
10.30	5% CHO
13.00	30% CHO
15.00	10% CHO
17.00	5% CHO
20.00	30% CHO
23.00	10% CHO

Hypoglycaemic agents

- If glycaemic goals not achieved by diet → introduce hypoglycaemic agents → risks of hypoglycaemia

•Fasting BG	<5.3 mmol/l
•1 hr post-prandial	7.8 mmol/l
•2 hr post-prandial	6.7 mmol/l
•Mean BG	5.8 mmol/l
•HbA1c	<7.0%

- Oral hypoglycaemics

- Glyburide [glibenclamide]

Recent clinical studies seem to suggest that Glyburide is a suitable therapeutic options since it does not significantly cross the placenta and is clinically effective – adopted in some recent Guidelines

Start with 2.5 mg daily and increase dose every 4-5 days if control not achieved up to a limit of 20 mg/day

O. Langer et al: NEJM, 2000, 343:p.1134-1138

- Metformin

Metformin crosses placenta, seems to be clinically effective but still under investigation – not yet adopted in recent Guidelines

Start with 500 mg daily and increase dose to 500 mg t.d.s. depending on GIT symptoms

J. Rowan et al: NEJM, 2008, 358:2003-2015

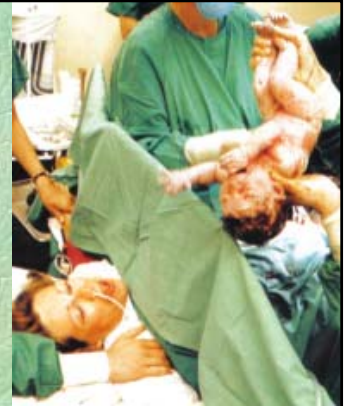
- Insulin

Used in only 4.6% of our GDM patients!

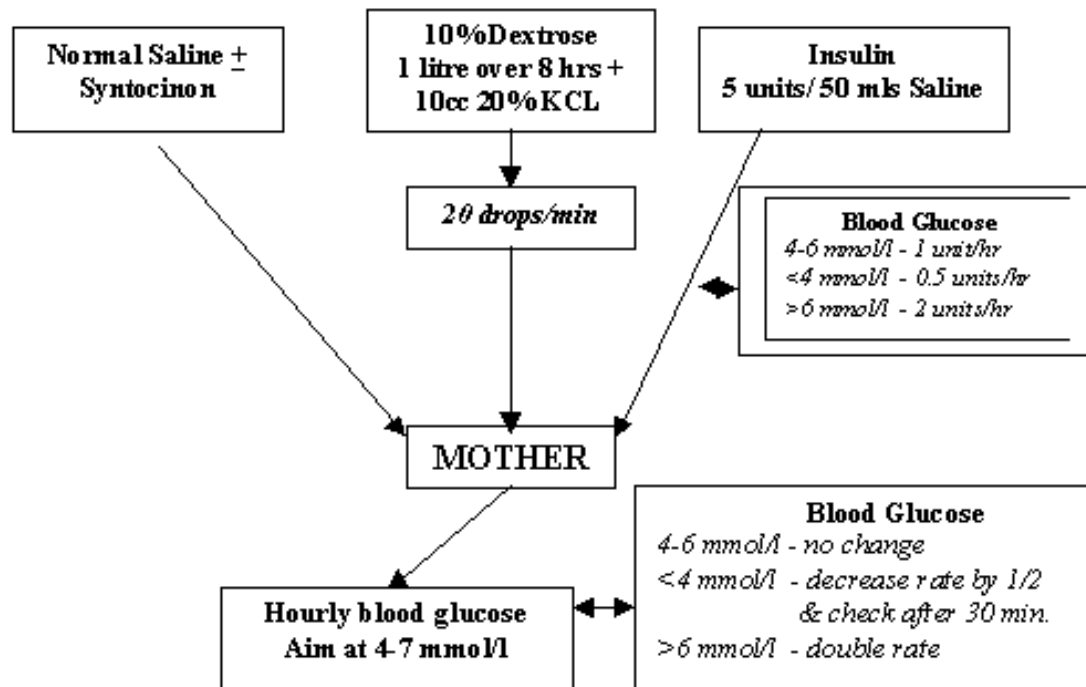
Use of human insulin - ideally in four divided doses – short and long-term acting combinations

Intrapartum management

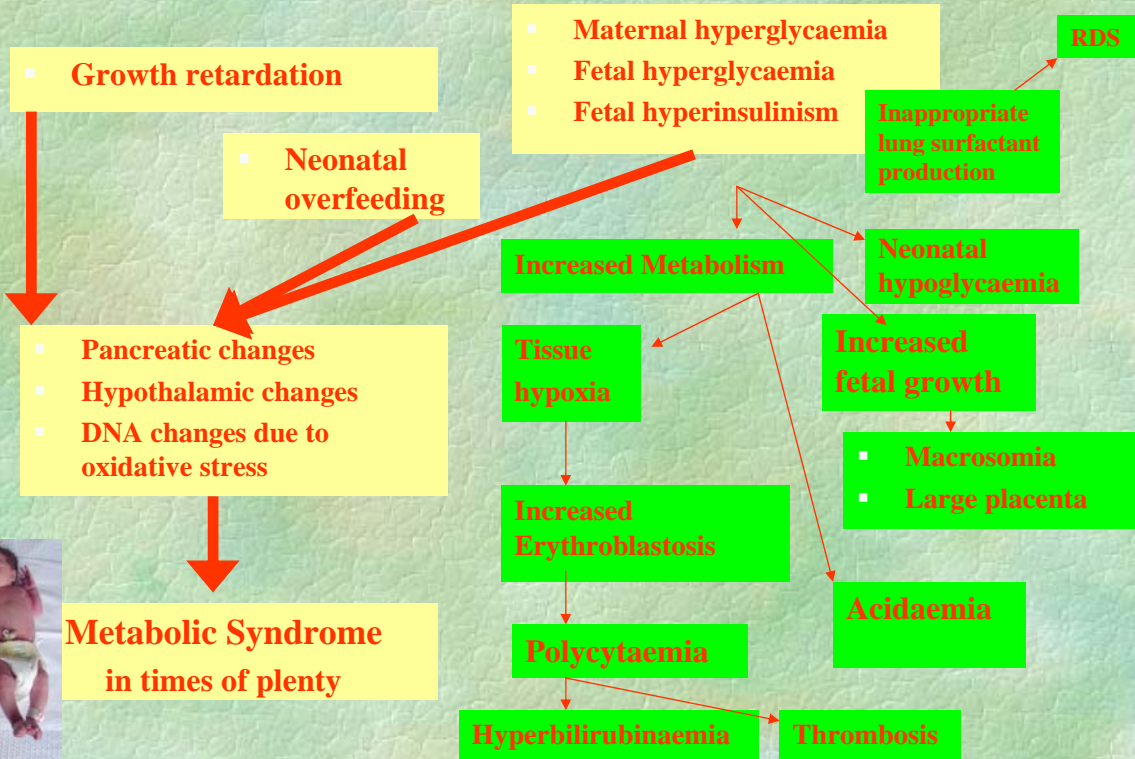
- The timing of delivery should be individualised, aiming for a vaginal delivery if possible.
- Glucose control during labour should be maintained in the region of 4-6 mmol/l [measure hourly]
- Plasma Potassium levels should be maintained between 3.4-4.8 mmol/l [measure on admission and every 6 hours]
- The possibility of shoulder dystocia should always be kept in mind.
- Delivery should be actively supervised by experienced obstetric and paediatric staff.
- Postpartum requirements of insulin should be significantly decreased, generally by half.



Intrapartum management



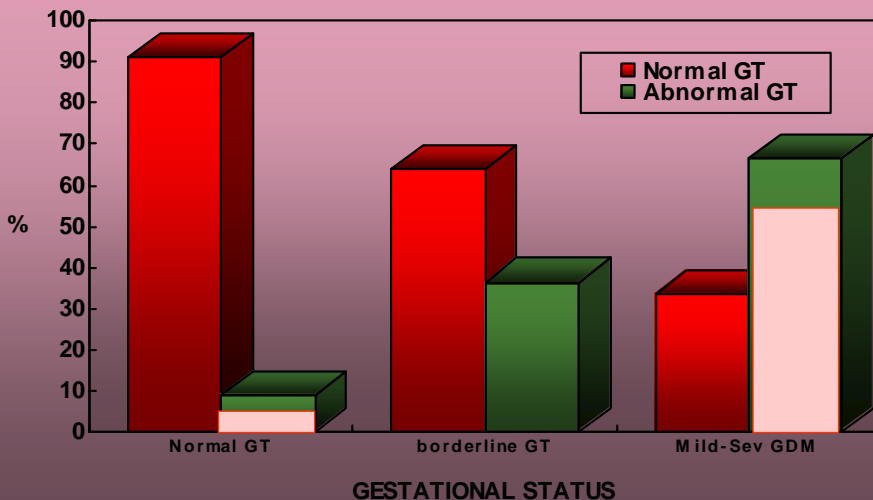
Short & Long-term effects on infant





**GDM IS A RISK DETERMINANT FOR
ADULT-ONSET DISEASE**
Wizard's Crystal Ball

Metabolic status of Maltese women 8 years postpartum.





Postpartum considerations

P/H GDM woman

Postpartum oGTT

Normal GT

**Diet & exercise
F/U Blood Glucose**

Stable glucose

**Diet & exercise
F/U Blood Glucose**

Raised glucose

75g oGTT

Normal GT

**Abnormal GT
IGT/DM**

Manage as appropriate