Hyperglycaemia in pregnancy

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Metabolic adaptations during pregnancy

- *Fetus* is a parasite continuously draining glucose (nutrients) from intermittently eating host, *the mother*

- *The placenta* which arises denovo is a temporary *endocrine organ* elaborating the contra insulin hormones like oestrogen, Progestrogens, cortisol and HPL

- The maternal nutrients pass through the placenta but maternal insulin do not cross the placenta. Maternal insulin is destroyed by the enzyme insulininase which is present in the placenta
Metabolic adaptations during pregnancy contd....

The mother, intermittently eating host has

- **Fed state** characterized by facilitated anabolism due to delayed gastric emptying and sluggishness of the entero-insular axis.

- **Fasting state** characterized by accelerated starvation. *(substrate deficiency for gluconeogenesis and diversion to lipolysis and ketogenesis - HPL).*
Pregnancy is characterized by hyper-insulinism and insulin resistance.

Hence pregnancy is diabetogenic.

There is 30% increase in insulin secretion to compensate the insulin resistance.

If islet cell reserve is poor, pregnancy unmasks the carbohydrate intolerance.

Maternal metabolic adaptation

\[ FBG \text{ 60-70mgs}\% \]

\[ PPBG \text{ -100-120mgs}\% \]
Effect Of Glucose Intolerance During Pregnancy

“FUEL-MEDIATED TERATOGENICITY”
Effects Of Glucose Intolerance During Pregnancy: Pathogenesis: Modified Pedersen’s and Freinkel’s Hypothesis

MOTHER

INSULIN

PLASMA

Glucose Amino Acids Lipids

FETUS

MACROSOMIA

INSULIN

MIXED NUTRIENTS

NEONATE

HYPOGLYCEMIA

PLACENTA

ADOLESCENT

OBESITY

IGT

DIABETES
“Diabetes may develop during pregnancy and cease with termination of pregnancy, recurring some times after that, Hydramnios is common that pregnancy is very liable to be interrupted by the death of the fetus and the dead child is often enormous”

Duncan (1882)
Types of Diabetes Mellitus complicating pregnancy

- Type 1 D.M
- Type 2 D.M
- Pancreatic D.M
- GDM
- IFG/IGT
- PCOD
- Others
Definition of GDM

- GDM is defined as CHO intolerance of any severity with recognition or onset during pregnancy irrespective of treatment with diet or insulin.

- The importance of GDM – 2 generations are at risk of developing future Diabetes, (Women with GDM and their children).

“Diabetes begets Diabetes”
GDM may be viewed as

An unidentified preexisting disease,

or

The unmasking of a compensated metabolic abnormality by the added stress of pregnancy,

or

A direct consequence of the altered maternal metabolism stemming from the changing hormonal milieu.
GESTATIONAL DIABETES MELLITUS

- Largely asymptomatic
- Unrecognized & untreated – associated with increased perinatal mortality & morbidity
- AGT during pregnancy is teratogenic
- Recognized & treated gives good fetal outcome.
Effects Of Hyperglycemia

**On the Mother**
- Increased preterm delivery
- Operative & instrumental delivery
- PIH 15 – 20%
- Hydramnios 50%
- Increased infections- UTI, moniliasis
- Shoulder dystocia

**On the foetus**
- Early fetal loss
- Congenital anomalies
- Prematurity
- Macrosomia
- Sudden IUFD at term

**On the neonate**
- RDS
- Hypoglycemia
- Hypocalcemia
- Hypobilirubinemia
- Childhood obesity, IGT
- Early onset diabetes
Diagnosis of GDM

Whom?
How?
- When?
ADA RECOMMENDS….

- Selective screening to detect GDM.
- (This policy may not be applicable for population belonging to ethnic group with high prevalence of DM.)
‘Low – Risk’ states where screening is not required’

- Age < 25 years
- Weight normal before pregnancy
- Member of an ethnic group with a low prevalence of DM
- No known diabetes in first-degree relatives
- No history of previous abnormal glucose tolerance
- No history of poor obstetric outcome

Indications for selective screening recommended by ADA for high risk patients likely to develop GDM

- Age > 25 years.
- Family history of diabetes.
- Obesity (Pre-pregnancy BMI > 25)
- BOH – previous history of
  - Unexplained perinatal loss
  - IUD
  - Large for gestational age infant
  - Congenitally malformed infant
  - Polyhydroamnios
  - Pre-eclampsia
- Glucose in second fasting urine sample.
Screening for AGT based on historical risk factors alone leaves 45.4% of the pregnant women unscreened.

Among the unscreened 35% had abnormal glucose tolerance.

- Anjalakshi Chandrasekhar, PhD thesis submitted to Dr.MGR. Medical University, 2002. Evaluation of diagnostic criteria for abnormal glucose tolerance AGT in south Indian pregnant women
ADA recommends selective screening

Compared with selective screening, universal screening for GDM detects more cases and improves maternal and offspring prognosis

Why all Indian women should be screened for glucose intolerance during pregnancy?
ETHNICITY

Screening is essential in all pregnant women as the Indian women have 11 fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women.

Among ethnic groups in South Asian countries, Indian women have highest frequency of GDM.

How to diagnose

- ADA recommends either
  - two steps procedure
  - or
  - single step procedure
The drawback of two step procedure

50g - one hour glucose challenge test recommended by ADA needs confirmatory OGTT

Also the requirement of a number of blood samples for diagnosis of GDM is not feasible especially in the Indian context and no show rate is high.
23% of the screen positive women did not return for OGTT

Luiz Guilherme Kraemer De Aguiar, Haroldo Jose De Matos, Marilia De Brito Gomes: Could fasting plasma glucose be used for screening high-risk outpatients for gestational diabetes mellitus?

Diabetes Care 2001: 24, 954-955
1. O’Sullivans & Mahan’s OGTT – Carpenter & Coustan’s Criteria

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<td>F</td>
<td>&lt;95</td>
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2. WHO GTT

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140-200 IGT – in pregnancy GDM
**DIAGNOSIS**  
**ADA criteria**  

Based on a 3-h 100 g OGTT,  
(FPG – 95mg/dl, 1hr PG – 180mg/dl,  
2hr PG – 155mg/dl, 3hr PG – 140mg/dl)  

Were originally validated against the  
future risk of maternal diabetes (not on  
fetal outcome);  
Accepted in USA  

But  

Are little used elsewhere

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John C Pickup & Gareth Williams Textbook of Diabetes 2,  
Third edition, Chap-65 : Pg 65.28  

Contd....
The 75-g, 2-hour OGTT is in use during pregnancy in many countries around the world, typically using the same thresholds as in nonpregnant individuals.

GDM based on two hour 75gm OGTT defined by either WHO or ADA Criteria predicts adverse pregnancy outcome.

- M.I. Schmidt et al for the Brazilian Gestational Diabetes Study Group. Gestational diabetes mellitus diagnosed with a 2-h 75-g oral glucose tolerance test and adverse pregnancy outcomes. Diabetes Care, July 2001: 24 (7), 1151-1155
WHO criteria of two hour PPG ≥140mg/dl identifying a large number of cases may have a greater potential for prevention.
One step procedure for screening and diagnosis of gestational diabetes mellitus

I. For Universal screening we suggest a single GCT with a 75g of oral glucose load in fasting state and diagnosing women with 2 hr PPG ≥ 140 mg/dl as GDM.

This method, recommended by WHO serves both as:

- ONE STEP SCREENING & DIAGNOSTIC PROCEDURE
- EASY TO PERFORM BESIDES BEING ECONOMICAL

II. WHO - OGCT

It is useful, to test for GDM in the first visit itself, and the ‘No show’ incidence that occurs with other diagnostic procedures (which requires a fasting state), can be avoided.
Results: Prevalence of GDM was 10.89%. All the pts who were diagnosed as GDM by OGTT had positive values by WHO OGCT also.

• The sensitivity and specificity for WHO OGCT is 100%
• And it will be useful test for diagnosing GDM.
• “No show” can be avoided in first visit.

Dr. Anjalakshi Chandrasekar and Dr. Preethi
IOG 2005-2006
When to screen !!!

Gestational Diabetes Mellitus Manifests In All Trimesters of Pregnancy

- *A considerable number of pregnant women develop glucose intolerance in the early weeks of pregnancy.*

- *A significant number of women, whose glucose tolerance was normal in the first visit, do develop glucose intolerance in the subsequent visits.*

- Out of the total 736 GDM women, 530 (72%) were detected at the first visit.

- Remaining 206 (28%) women were detected at repeat screening in subsequent visits

V.seshiah, V.balaji, Madhuri S Balaji. A Paneerselvam, Manjula Datta. In press
The gestational week at which screening has to be done

(Normally screening is recommended in 24 - 28 weeks)
EACH ISLET CELL FUNCTIONS AS AN ENDOCRINE ORGAN
APPEARS AT 11\textsuperscript{TH} WEEK OF GESTATION
RECOGNISES AND RESPONDS TO MATERNAL GLYCEMIA AT 15-16 WEEKS OF GESTATION
Screening around 16th week is a better predictor of Gestational Diabetes

Human studies have shown an increase in B cell mass and insulin secretion in fetuses of poorly controlled diabetic women by 16th week of gestation.

- Reiher et al., Diabetes care, 1983-6 446-61
The priming of the B cell mass in mid gestation may account for the persistence of fetal hyperinsulinemia throughout pregnancy and the risk of accelerated fetal growth even when mother enjoys good metabolic control in later pregnancy.

- Carpenter et al., Diabetes care, 2001 24:1259-63
- Schwartz et al, Diabetes Care, 1994 17:640-8

“Early maternal metabolic imprinting may affect fetal growth”
The Necessity For Repeat Screening

A significant number of women, whose glucose tolerance was normal in the first visit, do develop glucose intolerance in the subsequent visits.

- Out of the total 736 GDM women, 530 (72%) were detected at the first visit
- Remaining 206 (28%) women were detected at repeat screening in subsequent visits

V. Seshiah, V. Balaji, Madhuri S Balaji, A Paneerselvam, Manjula Datta. GDM manifests in all the timesters, In press (DRCP)
Indian Scenario

- Indian women have 11 fold increased risk of developing GI during pregnancy.
- The prevalence of GDM in our country was 16.55% by WHO criteria of 2hr PG ≥ 140mg%.
- Universal screening during pregnancy has become important in our country.

**Method**

- One step procedure of challenging women in fasting state with 75gm glucose and diagnosing GDM is simple, economical and feasible.
WHO OGCT as a diagnostic test for diagnosis of GDM

- Pregnant women often experience nausea while in fasting state.
- Travel long distance & wait for additional 2 to 3 hrs for GTT.
- WHO GTT is the widely used test except in US.
- WHO screening & diagnostic test have same cut off value for diagnosis.
- The OGCT has the advantage in any prandial state.
- Can be done on the same day when the pt report to the AN clinic.
- There will be no phenomenon of “no show”
- The no. of samples will be less, decreasing the load on the lab.
Pregnant women - there is a 11% increased risk of GDM.

Diabetes can occur in any age group:

Children

Adults

Male – 30% increased risk
Female – 36% increased risk

Adolescents
EPIDEMIOLOGY

• **Risk Factors for Type 2 DM:**
  
  Genetic predisposition

  *In utero Environmental factor - (foetal origin of the disease)*

  Other risk factors: obesity, lifestyle…..
“Fetal origin of disease” Hypothesis

- "Gestational programming is a process whereby stimuli or stresses that occur at critical or sensitive periods of development permanently change structure, physiology & metabolism which predispose individuals to disease in adult life"—Lucas. A 1991—The Childhood Environment & Adult Disease

- Gestational programming may critically influence adult health and disease.

- DM is one amongst them.
Government of Tamil Nadu wanted a test which is “Economical and evidence based procedure to diagnose Gestational Diabetes” in the community without disturbing the lifestyle of pregnant women.

A single test procedure to diagnose Gestational Diabetes Mellitus (Irrespective of last meal timing)

At the first visit to the antenatal clinic, a pregnant woman after undergoing preliminary clinical examination, has to be given a 75g oral glucose load, without regard to the time of the last meal. A venous blood sample is collected at 2 hours for estimating plasma glucose by the GOD-POD method.

GDM is diagnosed if 2 hr PG is $\geq 140$ mg/dl (7.8 mmol/L)

Management of GDM & EDM

- **Aims of Treatment:**
  1. Normalisation of Maternal BG level
  2. Prevention of Obst complications by good prenatal care
  3. Early detection and prompt treatment of medical problem
  4. Careful timing and appropriate mode of delivery
  5. Intensive Neonatal care.
1. Reproduce pregnancy normoglycaemia
The maternal blood glucose must be lowered to such a level that it is not RECOGNISED as elevated by the developing fetus in utero.
Ladder of preconceptional care in diabetic women

- Diagnosis
  - Disease information
  - Medical management

- Established Disease
  - Highlight the importance of preconception care
  - Contraception

- Preconception
  - Education
    - Planned metabolic control
    - Folic acid
    - Complication; Nephropathy, hyper tension, Retinopathy, CV disease, Neuropathy, hypothyroidism

- Early pregnancy
  - Metabolic control
    - Folic acid
    - Treat complications
  - Counsel
    - Impact on pregnancy
      - Impact on diabetes
      - Treat complication
        - Concern: Severe gastroperesis, CAD
# Blood sugar level and perinatal mortality

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<th>Blood sugar level</th>
<th>Perinatal mortality</th>
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<tr>
<td>&gt;200</td>
<td>35%</td>
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<tr>
<td>150-200</td>
<td>16%</td>
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<tr>
<td>100-150</td>
<td>8%</td>
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<td>Around 100</td>
<td>4%</td>
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*Karlson and kjellman*
“The secret of successful perinatal outcome in all pregnant diabetic patients lies more in the achievement of excellent blood glucose level than in the means of achieving it.”

(Conclusion of Cape Town Trail – 1974)
Treatment modalities

- Diet
- Exercise
- Drugs  - Insulin - Biological Insulin or human insulin
  - Designer insulin
  - OHA
INSULIN

1. Does not cross the placenta due to it’s high molecular weight
2. Pharmaco kinetics not altered
3. Pharmaco dynamics altered
4. Insulin Lispro is safe

**Drawbacks**

- Several daily injection
- Handling, stocking and refrigeration are major problems
- Immunogenic insulin-insulin antibody complexes cross the placenta
- High cost of insulin and syringe
- Insulin being anabolic has been shown to cause macrosomia in experimental animals in the absence of maternal and foetal Hyperglycemia.
Why OHAS not recommended?

- Potential teratogenicity - teratogenic in animals but not in Humans
- Transplacental transfer - very minimal transport across the placenta
  Foetal Beta cell stimulation
  Foetal hyperinsulinaemia
  Foetal macrosomia
  Prolonged neonatal hypoglycaemia

Advantages of OHA

- Improved compliance and better glycaemic control
- Economical
Management of GDM / EDM

1. Team approach

2. Patient education
   ✓ Implication of GDM for her baby and herself.
   ✓ Dietary and exercise recommendation.
   ✓ Self monitoring of blood glucose.
   ✓ Self administration of insulin and adjustment of insulin dose.
   ✓ Treatment of hypoglycemia (Patient and family members).
   ✓ Incorporate safe physical activity.
   ✓ Development of techniques to reduce stress.
   ✓ Care should be taken to minimize the anxiety of the women.
3. Medical nutrition therapy

**General principles**

• Expected weight gain during pregnancy is 300 to 400 gm per week.

• Total weight gain is 10 to 12 kg by term.

• Calorie requirement depends on age, activity, pre-pregnancy weight and stage of pregnancy.

• Approximately 30-40 kilo calories per kg ideal body weight or an increment of 300 kilo calories per day above the basal requirement.
Contd…

- Pregnancy is not the time for obesity correction.

- Underweight subjects and those not gaining weight particularly in 3rd trimester require admission to ensure adequate nutrition to prevent low birth weight infants.
**Calorie counting**

- Pregnant diabetic women are advised to widely distribute their calorie consumption especially breakfast.
- This implies the splitting of usual breakfast into 2 equal halves and consuming the portions with 2 hr gap in between.
- This avoids undue peak in plasma glucose levels after ingestion of total quantity of breakfast at one time.
- This has a scientific basis, as the peaking of plasma glucose is high with breakfast, due to *Dawn phenomenon* than with lunch and dinner.
- GDM mothers have deficiency in I phase insulin secretion and hence to challenge the quantity of food at one time should also be less.

*(fasting and feasting should be avoided)*
4. Insulin therapy

- Insulin is essential if MNT fails to achieve euglycemia.
- If the FPG on OGTT is ≥ 120mg%, then the patient is started on insulin immediately along with meal plan.
- Other GDM women are seen within 3 days and also taught self monitoring of blood glucose.
- SMBG is to be performed in fasting and 2 hours after each meal.
- GDM women usually have high post breakfast plasma glucose compared to post lunch and post dinner.
• Insulin is started within 1–2 weeks if the majority of the fasting values exceed 90mg%, similarly if the majority of post prandial values >120mg%.
• Initial dose of NPH insulin could be as low as 4 units and the dose can be adjusted on follow up.
• Few GDM patients may require combination of short acting and intermediate acting insulin in the morning and evening.
• If a patient has elevated pre-lunch blood sugar, regular insulin is usually necessary in the morning to handle post breakfast hyperglycemia.
• Pen injectors are very useful and patients acceptance is excellent
• The above regimen of regular and intermediate acting insulin in the morning controls hyperglycemia in the morning.

• If the post dinner blood sugar is high a small dose or regular insulin is necessary before dinner in addition to the regular and intermediate acting insulin given in the morning.

• Combination of regular and intermediate acting insulin before dinner may be necessary if the fasting blood sugar is high.

    (mixed and split dose insulin regimen).
Split and mixed dose regimen

- **Morning Insulin**
  - Short acting
  - Intermediate acting

- **Post-breakfast**
  - Intermediate acting

- **Pre-dinner Insulin**
  - Short acting
  - Intermediate acting

- **Post-dinner**
  - Intermediate acting

- **Morning fasting**
In this regimen

2/3rd - morning.
1/3rd - evening.

- For each combination 1/3rd dose should be regular insulin and 2/3rd intermediate acting insulin.
- If patient continue to have fasting hyperglycemia the intermediate acting insulin is given at bed time instead of before dinner.
- Insulin dose in individualized.

Target blood glucose level

- Mean plasma glucose-105mg% is ideal for good fetal outcome.
- This is possible if fasting and PP peaks are around 90 and 120mg%.
- Mean plasma glucose should not be less than 85mg% as this may give rise to SGA infants.
**Species of insulin**

- Ideal to use human insulin-least immunogenic.
- Rapid acting insulin analogs (Novorapid/Humalog) has been found to be safe and effective in achieving the targeted PP glucose value during pregnancy.

**Oral anti-diabetic drugs**

- Recent reports have shown good fetal outcome in GDM women who were on Glyburide.
- Treatment with insulin and Glyburide resulted in similar perinatal outcomes.
- Metformin has been found to be useful in women with PCOD who fail to conceive.
- Safe to continue this drug throughout Pregnancy.
Monitoring Glycemic control

Success of treatment for women with GDM depends on Glycemic control.

To know the effectiveness of treatment, monitoring is essential.

• After diagnosis-MNT for two weeks.

• If MNT fails to achieve control ie. FPG ≥90mg% and or 2hr PPG ≥120mg%, insulin may be initiated.
• Once target blood glucose is achieved up to 28 weeks fasting, PPBG once in a month and at other time as a clinician decides.

• After 28 weeks monitoring once in 2 weeks, if needed more frequently.

• After 32 weeks once in a week till delivery.
• In high risk pregnancy-more frequent monitoring with SMBG.

• Continuous monitoring devices (CGMS) are available, they are more useful in high risk pregnancy, needs special training and are expensive.
A1C levels

- If the glucose intolerance is detected early in pregnancy A1C level will be helpful to differentiate pre GDM and GDM (A1C >6%-pre GDM).
- A1C is useful in monitoring glucose control during pregnancy and not for day to day management.
- A1C level may serve as a prognostic value.
- Mean blood glucose = 33.3 (Hb A1c)-86

(nathan et al, 1984)

- Estimation of Fructosamine during pregnancy is less frequently used.
Measuring other parameters

- BP - To be monitored every visit.
- Examination of fundus every trimester.
- Estimation of microalbuminuria every trimester
- Thyroid screening every trimester

Ultrasound fetal monitoring

- Assessment of fetal growth.
- Identifying fetal macrosomia.
- Fetal well being.
Obstetric consideration
Fetal evaluation

- An USG has to be performed around 18-20 weeks focusing on structures – spine, skull, kidney, heart.
- Fetal echocardiogram has to be done around 20-24 weeks.
- From 26 weeks onward fetal growth and liquor volume every 2-3 weeks.
- Fetal AC provides baseline for further serial measurements which gives growth acceleration or restriction. (AC>75 &<10 percentile respectively)
- Fetal movements are monitored from 20 wks.
Contd…

- Screening for chromosomal anomalies is necessary in pre-GDM.
- Screening should be done for Downs syndrome.
- Alpha feto protein for neural tube defects.
- HCG, Alpha feto protein and estradiol (Triple Test) at 16 - 20 wks to identify any chromosomal abnormalities.
Timing of delivery

- Sudden intrauterine death in third trimester is not uncommon.
- Causes of sudden IUD:
  - Chronic intrauterine Hypoxia
  - Alteration in Red cell O2 release (GHB)
  - Maternal Hyperglycaemia - decreased utero-placental blood flow
- Fetal demise can occur due to pre-eclampsia – fetal hypoxia via decreased placental blood flow.
- To avoid this, preterm delivery is recommended—RDS may occur.
- Steroids for lung maturity & B adrenergic receptor agonist in preterm labor
  (These are likely to induce adverse metabolic effects due to their glycolytic, glycogenolytic and lipolytic effects. In this situation, extra insulin may be required to maintain euglycemia.)
Contd…

• Some centers allow uncomplicated GDM to go into spontaneous labor.
• Most still advocate delivery at 38 weeks as perinatal mortality and morbidity appear to increase after this time.
• Induction at 38 weeks - slow or unsuccessful, but this has to be balanced against the poorly defined and predictable risk of late intra-uterine death, if pregnancy is allowed to continue beyond 38 weeks.
• Fetal health may deteriorate suddenly and hence obstetric management should not be rigid.
• Having Neonatology support during delivery is advisable.
Intrapartum management

- If labor is to be induced in GDM, usual evening dose of insulin should be given.
- Insulin may be given in the morning when induction begins.
- Once labor begins insulin - not necessary.
- In a gestational diabetic requirement of insulin falls precipitously.
- No insulin required after expulsion of placenta.
**Delivery**

A neonatologist should be present whether the delivery is vaginal or LSCS.

As soon as the infant is born, following actions are mandatory,

1. Early clamping of the cord within 20 secs of delivery to avoid erythrocytosis (polycythemia).
2. Evaluate vital signs, Apgar scores at 1 and 5 mins.
3. Clear oropharynx and nose of mucus, later empty stomach - be aware that stimulation of the pharynx with the catheter may lead to reflex bradycardia and apnea.
4. Avoid heat loss, keep neonate warm, transfer to incubator pre-warmed to 34* C.
5. Perform a preliminary physical examination to detect major congenital malformations.
6. Monitor heart and respiratory rates, color, and motor behavior for at least the first 24 hr after birth.

7. Start early feeding, preferably breast milk, at 4-6 hrs after delivery, aim at full caloric intake (125kcal/kg/24hrs) at 5 days, divided into six to eight feeds a day.

Contd…

Neonate is best cared in a specialized neonatal unit.

- Minimal interference.
- Observed for respiratory distress.
- Capillary blood glucose should be monitored at 1 hr of age and before the first 4 breast feedings, in high risk pregnancy up to 24 hrs.
- Cutoff of 44mg% is now currently used as the working definition for hypoglycemia.
- In macrosomic babies, Ca and Mg should be checked on day 2.
- Breast feeding should always be encouraged.

(Where facilities for neonatal specialisation is not there policy of in utero transfer should be followed)
Summary of treatment of GDM

GDM
  ↓
MNT+Excercise
  ↓
FBS>95 PPBS>120
  ↓
Insulin
    ↓
2/3-AM 1/3-PM
    ↓
2/3-R 1/3-L 2/3-R 1/3-L
  ↓
Delivery at 40 weeks
  ↓
Check F&PPBS after delivery
    ↓
normal
    ↓
Elevated
    ↓
insulin
    ↓
Follow up
    ↓
GTT 6 weeks post-partum
  ↓
Contraception
    ↓
Annual screening for DM
    ↓
Screen again if misses period
Follow up of GDM

Gestational diabetic women require follow up.

✓ GTT with 75gms glucose after 6 weeks of delivery and if necessary repeated after 6 months, every year to determine the GT has returned to normal or progressed.

✓ A small proportion of diabetic women may continue to have glucose intolerance.
GDM recurs in 50% of subsequent pregnancy.
The future risk of developing diabetes for a GDM is 2 fold if she becomes overweight.
By maintaining ideal weight the risk is halved.
Requirement of insulin in addition to diet during the index pregnancy is also predictive of future diabetics.

The maternal health and fetal outcome depends upon the care by the committed team of diabetologists, obstetricians and neonatologists.
A short term intensive care gives a long term pay off in the primary prevention of obesity, IGT and diabetes in the offspring, as the preventive medicine starts before birth.
Take home message

- Pregnancy is diabetogenic and it unmasks minor degrees of carbohydrate intolerance if the islet cell reserve is poor.
- The CHO intolerance is asymptomatic and if not treated it increases the perinatal mortality and morbidity.
- If detected and treated, perinatal outcome improves.
- Screening as early as 16 weeks gestation is recommended.
- Screening should be universal.
- Screening should be repeated if found negative, at 28 and 32 weeks.
In a country like ours a simpler test with a lower cut-off (WHO – OGCT $\geq 140$ mg) is recommended.

Strict control of blood sugar is necessary throughout pregnancy and labour to reduce perinatal morbidity (mean blood sugar-100mg%).

Apart from insulin certain OHAS also have a place in the treatment of GDM.

A team approach is mandatory.

Follow up of GDM patients and treatment of modifiable risk factors will help in preventing future diabetes.

People with EDM should optimize the blood sugar and diabetic complications should be treated before planning pregnancy.