Hyperglycaemia in Pregnancy

National Consensus Document

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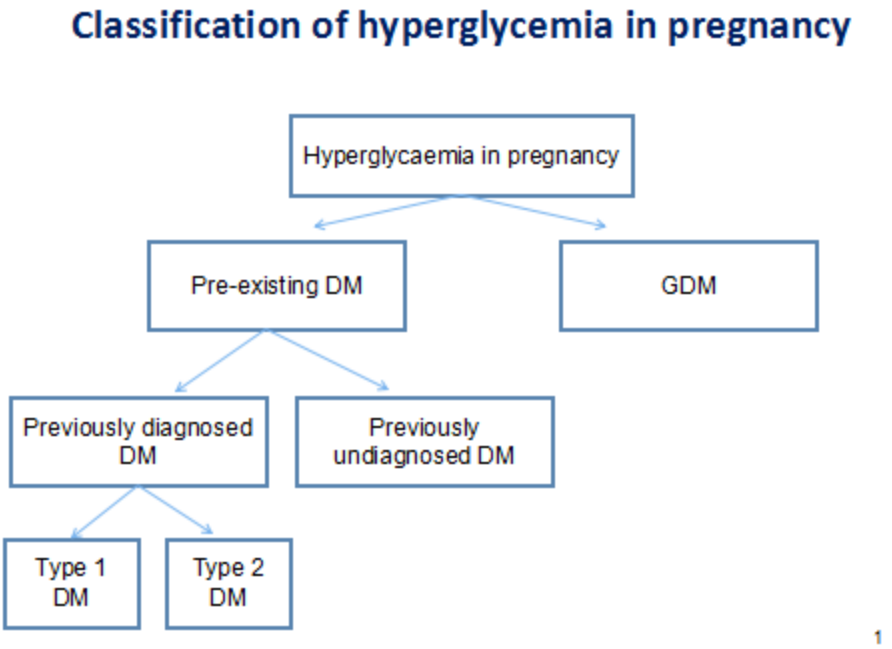
Hyperglycaemia in Pregnancy

Introduction

Hyperglycaemia in Pregnancy (HIP) is a common medical condition during pregnancy and the prevalence is rising in Sri Lanka. The majority is gestational diabetes mellitus (GDM) with the remainder being primarily pre-gestational diabetes (Flow chart 1). HIP is associated with adverse fetal outcomes such as macrosomia, intrauterine fetal death, shoulder dystocia, birth injuries, hyperbilirubinemia, polycythemia, neonatal hypoglycemia, respiratory distress syndrome, childhood obesity, glucose intolerance and diabetes in later adolescence. Maternal complications associated with HIP are increased incidence of miscarriages, pre-eclampsia, cesarean delivery, increased chance of developing type 2 DM later in life (approximately 50% in 5 to 10 years).



Flow chart 1-Classifiacation of hyperglycaemia in pregnancy

Recommendation 1 -Screening for pre-gestational diabetes mellitus

1.1. Undiagnosed diabetes mellitus in the community is on the rise .Undiagnosed pre-gestational diabetes is diagnosed if the diagnostic criteria for diabetes mellitus are met during the first trimester.

1.2. Patients who are already diagnosed with type 1 diabetes and type 2 diabetes are under this category and they do not need further investigations for diagnosis during pregnancy.

1.3. Fetal complications, mostly congenital anomalies are seen in this category.Therefore, **universal screening at the booking visi**t is essential to diagnose pre-gestational diabetes mellitus.

1.4. Standard diagnostic criteria used for non pregnant adults are used for diagnosis of pre-gestational diabetes mellitus

1.5. Tests recommended are

FBS $\geq$ 126 mg/dL
OR
PPBS $\geq$ 200 mg/dL
OR
HbA1c $\geq$ 6.5%

} Diagnose Pregestational DM

1.6. If, FBS is between 100 -125 mg/dL OR PPBS is 140-199 mg/dL proceed to 75 g two hour OGTT and diagnose GDM as per table 1.

Recommendation 2- Preconception care for women with diabetes mellitus

Preconception care includes detection and management of hyperglycemia,other metabolic and weight abnormalities prior to conception.

Screening of women in the reproductive age who are planning pregnancy

2.1. FBS / 75 g 2 hour OGTT should be carried out prior to pregnancy to detect undiagnosed diabetes.
2.2. This should be advocated through the eligible couple registry maintained by the primary health care staff.

Women with diabetes
Prior to conception, women with preexisting diabetes will need the following:

2.3.Optimization of HbA1c to < 6.5%, if it can be achieved without significant hypoglycemia.

2.4. Medications which are not safe at conception or embryopathic drugs should be discontinued.

2.5. Change of antihyperglycaemic drugs which are not safe during pregnancy to insulin.

2.6. Folic acid supplementation with 5mg/day

2.7. Baseline screening for retinopathy, nephropathy and appropriate treatment as needed.

2.8. Cardiac screening and treatment as needed in symptomatic women or pre-existing heart disease.

2.9. Self-monitoring of blood glucose is recommended. Targets for fasting and post-prandial glucose can be individualized. FBG: <100mg/dL & 2 hour PPBG <140 mg/dL are recommended.

Recommendation 3 – Diagnosis of GDM

3.1. Any degree of glucose intolerance with onset or first recognition during pregnancy can be termed GDM ,whether or not the condition persists after pregnancy.

3.2. All pregnant women should be routinely screened for GDM as Sri Lankan population falls under high risk group.

All pregnant women should be screened for hyperglycemia in pregnancy

3.3. Standard 75g 2 hour OGTT (Fasting - minimum of 8 hour / 1 hour / 2 hour) should be used for diagnosis of GDM and the procedure is given in detail in annexure..

3.4. In women with **negative pre pregnancy screening** and who had normal range of FBS/PPBS in early pregnancy ,75 g 2 hour OGTT is to be carried out between 20 to 28 weeks of gestation If that is normal, need to repeat OGTT in third trimester is only if clinically indicated.

3.5. Diagnostic criteria for diagnosis of GDM are given in Table 1.

Table 1–Diagnostic criteria to diagnose GDM

Test	FPG	1 h PG	2 h PG	Diagnosis
75g 2h OGTT	≥ 100 mg/dL	≥ 180 mg/dL	≥ 140 mg/dL	1 or more positive value(s)

Recommendation 4 –Management of HIP

4.1. Recommended therapeutic targets- *self monitoring of blood glucose (*SMBG)

4.1.1. *S*elf monitoring of blood glucose (SMBG) should be done fasting /pre breakfast and 2 hour post-prandial (4 times per day) to achieve glycemic targets and improve pregnancy outcomes. Daily SMBG is superior to less frequent monitoring.

4.1.2. Monitoring blood glucose before going to bed at night could be done to prevent nocturnal hypoglycemia in patients on Insulin.

4.1.3. Frequency of SMBG will vary according to treatment plan and availability of resources.

4.2. Plasma glucose targets

4.2.1 Fasting and 2 h PPG monitoring is recommended with target values as per Table 2

Table 2 Plasma glucose targets (applies to both venous and capillary)

	mg/dL
Fasting / Premeal	**< 95**
1 h PPG	**< 140**
2 h PPG	**< 120**

***(Please report to SLCOG /SLCE regarding difficulties in achieving recommended blood sugar targets for revision)**

4.3. HbA1c

HbA1c is not recommended for diagnosis of GDM,

4.4. Non-pharmacological treatment of HIP

4.4.1. Medical Nutrition Therapy (MNT) should be started soon after the diagnosis of HIP by a nutritionist /qualified personnel and reviewed in each trimester.

4.4.2. Aim of MNT is to achieve normoglycemia, provide adequate maternal weight gain, provide adequate fetal growth, prevent ketosis and achieving other general aims of MNT.

4.4.3. MNT is the cornerstone of treatment, especially for GDM. 80%-90% of GDM could be managed with MNT alone. .Hypocaloric diet leading to ketosis is not recommended.

4.4.4. MNT is a diet-based approach to patients, considering their medical, psychological ,dietary history, body weight and period of gestation.

4.4.5. A tailored diet should be created individually for each patient and monitored

4.4.6. MNT should be continued throughout the pregnancy.

4.4.7.An ideal dietary composition is 45-55% carbohydrates, 15-20% protein and 20-30 % fat with less than 10% of saturated fat from total daily calorie requirement. Consistent carbohydrate diet is important to maintain a consistent blood glucose level throughout the day. Adjusting the type and amount of carbohydrate to achieve the desired postprandial blood sugars is important.

Distribute carbohydrate-containing foods into smaller, frequent meals evenly spaced throughout the day.

4.4.8. It is best not to allow more than 10-12 hours between the last evening meal and the next morning meal.

4..4.9. Complex carbohydrates with low glycemic index are preferred.

4.4.10. Plate model for diet can be used to educate patients about the composition of each meal.

4.4.11. Calorie allowance varied according to the nutritional status of pregnant women.

- Underweight - 40 Kcal / present pregnant weight (Kg) / day

- Normal weight- 30 Kcal / present pregnant weight (Kg) / day
- Overweight- 24 Kcal / present pregnant weight (Kg)/ day
- Obese- 12-15 Kcal / present pregnant weight (Kg) / day

4.4.12. MNT for HIP to be supervised by trained professionals in nutrition and frequency of reviewing depends on the blood sugar control and weight gain.

4.4.13.Sample diet plan for sedentary mothers is given in the annexure.

4.5. Exercise /physical activity

4.5.1. Planned physical activity of 30 mins per day is recommended (based on obstetrician's evaluation of the patient's physical capacity).

E.g. walking briskly, arm exercises while seated in a chair for 10 mins after each meal will achieve this goal.

4.5.2 .Other exercises which the pregnant woman can carry out are flexibility and strength training, yoga and deep breathing. While doing exercises excessive abdominal muscular contraction should be avoided.

4.5.3. Exercises can be performed in the standing, sitting or lying positions.

4.5.4. Exercise may not be recommended if any medical or obstetric contra indication exists.

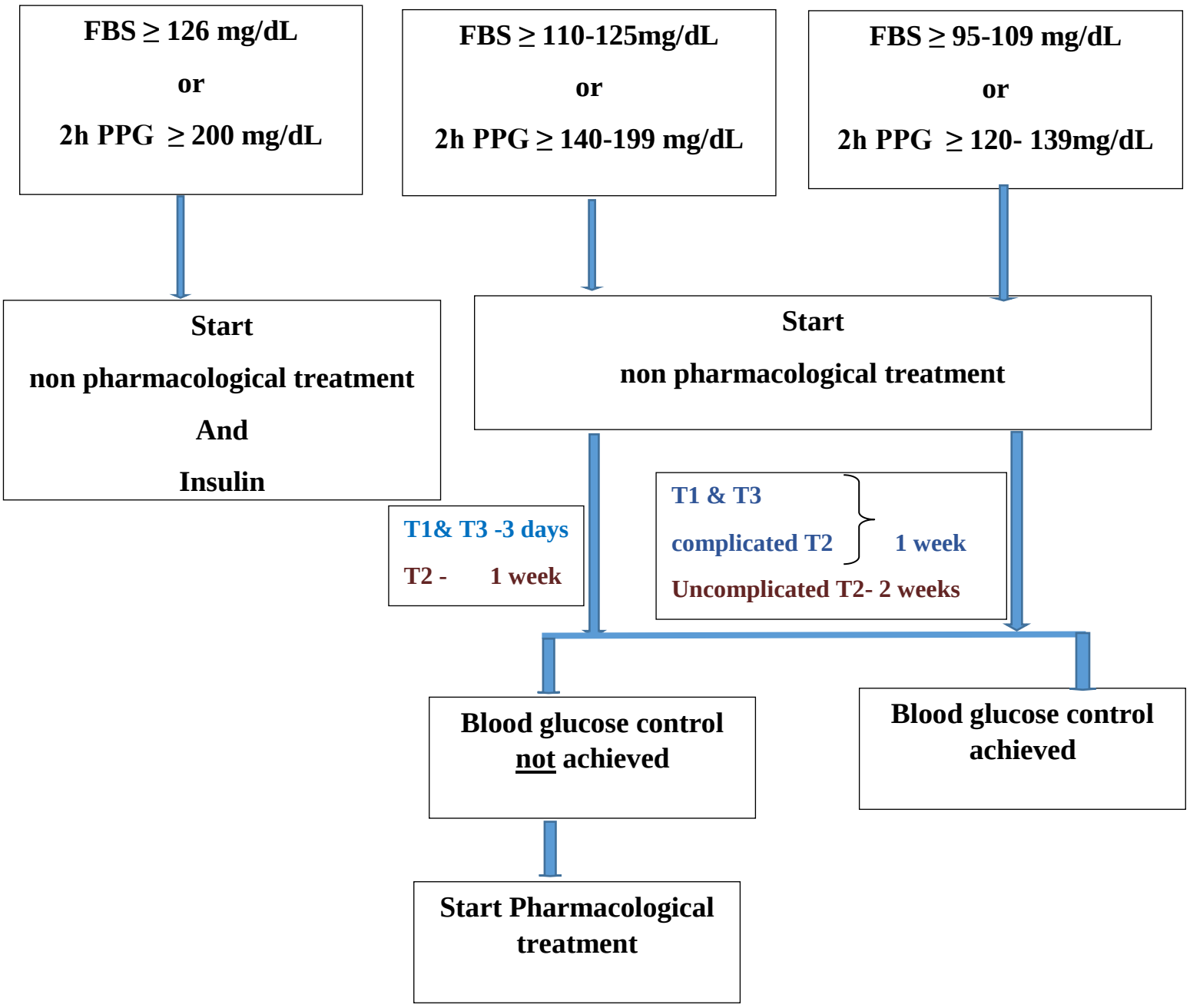
Recommendation 5- Pharmacological treatment of HIP

5.1. Pharmacological therapy should be considered if one fails to achieve glycemic targets with non-pharmacological therapy within target days.

5.2. Pharmacological treatment should be started if capillary plasma glucose targets are not achieved at any point of pregnancy after a trial MNT alone.

5.3 Algorithm based guidance on initiation of treatment considering fasting or 2 h PPBG is suggested (flowchart 2).

Pharmacological treatment of HIP based on SMBG



Flow chart 2-Algorithm based guidance on initiation of treatment in HIP

(T1/T2/T3 -Trimesters)

5.4. Insulin and Metformin are recommended for treatment of HIP (pre-gestational / GDM) as pharmacological therapy.

5.5. Recommended Insulins: Soluble / rapid acting insulin, human intermediate acting insulin (Isophane),pre-mix insulin are recommended for use during pregnancy. Among ultra short acting analogues aspart and lispro are safe. Among long acting analogues, detemir is recommended. Use of glulisine, glargine and degludec are not recommended. Required initial dose of intermediate acting/long acting insulin is 0.2 to 0.5 U/kg. Obese women may need higher doses. Treatment should be titrated to reach the targets.

5.6. Recommended approach to initiate insulin:

Step 1: Fasting hyperglycemia should be controlled first by Isophane/ basal insulin detemir at bed time at a dose of 0.2U/kg or Metformin.. The dose should be titrated twice a week to reach the target blood glucose.

Step 2: Post meal blood glucose should be controlled by bolus insulins (short acting insulin or ultra short acting analogue insulin) and the dose should be titrated as frequently as possible to reach the post-meal targets. This is the gold standard basal bolus regimen recommended in pregnancy.

- Only bolus insulin may be needed in some cases of HIP where FPG is well controlled with non-pharmacological therapy and only PPG targets are to be achieved.
- Premixed insulin can be considered on individual basis where patients are unwilling to or unable to take basal bolus regimen.

5.7. Oral antidiabetic drugs (OAD): Metformin could be continued for women with PCOS who were already on metformin prior to conception. Insulin is added if, metformin alone is inadequate to maintain target PG levels. Metformin is the only oral medication recommended for use during pregnancy. Use of sulphonylureas are not recommended.

Recommendation 6- Antenatal care

6.1 -First appointment: (joint diabetes and antenatal clinic)

Counseling should be given about need for glycaemic control preferably at the first antenatal visit in early T1. Thorough clinical history should be taken. Medications should be reviewed.

16 weeks: Routine clinical and laboratory assessment should be done.
20 weeks: Fetal anomaly scan should be done as per available expertise.
24 weeks: Routine care to be offered.
28 weeks: Ultrasound/ monitoring of fetal growth and amniotic fluid volume should be offered.
32 weeks: Ultrasound /monitoring of fetal growth and amniotic fluid volume should be offered.
34 weeks: Routine care should be offered.
36 weeks: Ultrasound /monitoring of fetal growth and amniotic fluid volume should be offered.

6.2. Aspirin 75/100 mg a day from 12 weeks on wards is recommended as diabetes is a risk factor for pre-eclampsia.

6.3 Counseling and planning should be done with regard to following issues:
–timing, mode and management of delivery.
–analgesia and anaesthesia (including anaesthetic assessment for women with comorbidities, such as obesity or autonomic neuropathy).
–changes to therapy during and after delivery.
–initial care of the baby.
–initiation of breastfeeding and the effect of breastfeeding on glycemic control.
- contraception and follow-up.

6.3 -Other maternal assessment

Urine for ketone bodies during severe hyperglycemia, during weight loss treatment or to detect possible starvation ketosis should be done. Psychological assessment is recommended to detect anxiety, depression, eating disorders and stress.

Recommendation 7 –Intrapartum management

7.1.Timing and route of delivery:

7.1.1.In general, women with pre-pregnancy diabetes or who receive insulin therapy, schedule obstetrician review at 36-37 weeks for planning their delivery be accomplished by 40 weeks. In a women with HIP if elective delivery is indicated it is to be considered by 38 weeks + 6 days of gestation. .

7.1.2.For women on diet control and/or women having optimal glycaemic control and, carrying a normally grown baby, there is insufficient evidence to suggest the best time for delivery.

7.1.3.Diabetes alone is not an indication for a caesarean section.

7.1.4.The obstetrician should make the decision after discussing with the woman.

7.1.5.Planned delivery should be arranged in the day time, when all supports are more easily available.

Recommendation 7.2 - Delivery:

7.2.1. Patients on MNT with good glycemic control do not require active glucose management during labor.

7.2.2. If the patient is on MNT, plasma glucose monitoring is recommended 4 to 6 hourly.Those on medication, frequent glucose monitoring, ideally hourly monitoring is needed.

7.2.3. Glycemia is managed with IV insulin infusion with dextrose aiming to keep target capillary BG values if required..

7.2.4. Goal of intra-partum capillary plasma glucose level is between 72-126 mg/dL.

7.2.5. Assessment for anesthesia should be done on 3rd trimester if GDM/ pre-existing diabetes is complicated with co-morbid conditions. If LSCS is carried out , plasma glucose should be monitored every 30 to 60 minutes.

7.2.6.Steroid usage during pregnancy

If Dexamethasone/Bethamethasone (Celestone Chronodose®) is prescribed by the obstetric consultant, pre-empt consequent hyperglycaemia by intensifying management 12 hours after first steroid dose as follows:

- Women with optimal glycaemic control on diet alone: intensify Medical Nutritional Therapy
- Women with suboptimal glycaemic control on diet alone: commence insulin
- Women on insulin: increase total daily insulin dose by 20-40% .

Return to previous management after 5 days in those who do not deliver before this.

Recommendation 8–Postpartum management

8.1 –**Day after delivery**

8.1.1. Those who were on metformin could stop the medication.

8.1.2. Mothers on MNT and metformin can reduce the intensity of glucose monitoring..

8.1.3. Mothers who were on low dose insulin (<0.5units/kg/day) can stop and monitor glucose levels.

8.1.4. Mothers who were on > 1unit/kg/day may reduce the dose to 50% while those on 0.5-1unit/kg/day need individualized clinical decision.

8.2 –Breastfeeding recommendation

8.2.1. All types of insulins and metformin can be safely used in lactating women.

8.2.2. Women with diabetes who are breastfeeding should continue to avoid any drugs for the treatment of diabetes complications that were discontinued for safety reasons in the pre-conception period.

8.3- All mothers with history of gestational diabetes should be counseled about screening for diabetes during every subsequent pregnancy

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8.3.1. After delivery at least 1 fasting and 1 postprandial PG should be measured before discharge in mothers who were managed with MNT.

-Fasting and PPPG should be monitored for at least 24 hours who were managed with insulin.

-When the mother is back on her regular diet prescribed, if blood glucose remains elevated, continued monitoring is warranted and possibility of type 2 diabetes should be considered.

-If immediate post-delivery blood glucose is suggestive of DM, then it should be confirmed by FPG or post-prandial plasma glucose.

8.3.2. Women with GDM should be screened for diabetes 6 to 12 weeks' post-partum (linked to child immunization) with **75g 2 hour OGTT** using non-pregnant OGTT criteria. Using A1c% is not recommended because of pre-partum management of hyperglycemia during pregnancy, .

8.3.3. If plasma glucose is normal, re-assessment should be done annually with standard investigations.

8.3.4. If pre-diabetes is detected, mothers should be put on MNT and/or metformin and should be followed accordingly to standard protocol.

8.3.4. Incorporating a post-partum calendar to ensure screening after index GDM and synchronizing with immunization calendar is advised.

8.3.5. Family planning

-All reliable methods of family planning can be used as appropriate for the needs of the individual woman with diabetes.

8.3.6. Screening for all components of metabolic syndrome should be offered.

Recommendation 9 –Child care

9.1. HIP is associated with increased risk of newborn complications including excessive birthweight/ macrosomia, birth injuries, birth asphyxia, respiratory distress, hypoglycemia, hypocalcaemia, hypomagnesemia, polycythemia, hyperbilirubinemia, thrombocytopenia, congenital anomalies and cardiomyopathy.

It is also associated with an increased risk of obesity, and metabolic syndrome in the offspring during childhood and adulthood.

9.1.1. At the time of delivery, birth weight, gestational age, congenital abnormalities if any, and blood glucose at birth should be noted.

9.1.2 Women with diabetes should breast feed their babies a soon as possible (within 30 minutes) after birth, and then at frequent intervals (every 2-3-hours) for the first few days of life.

9.1.3. First newborn blood glucose should be checked after the first feed and then before each subsequent feed for the first 24- 48 hours of life, to ensure that pre-feed BG is maintained at a minimum of 2.0 mmol/L (36 mg/dl). Glucometer calibrated for neonatal use should be utilized for this purpose.

9.1.4 .If capillary plasma glucose values are below 2.0 mmol/litre on 2 consecutive readings despite maximal support for feeding, if there are abnormal clinical signs or if the baby will not feed orally effectively, use additional measures such as cup/tube feeding or intravenous dextrose.

9.1.5.Test blood glucose levels in babies of women with diabetes who present with clinical signs of hypoglycaemia (jitteriness, staring, apnea, siezures ect.) and treat those who are hypoglycaemic with intravenous dextrose as soon as possible.

9.1.6. Blood tests for polycythemia, hyperbilirubinemia, hypocalcemia, hypomagnesemia should be carried out if clinical signs are present

9.1.7. Regular medical check-ups of baby/child should be carried out to monitor weight for age to detect childhood obesity. Parental counseling should be done at every visit to adopt healthy lifestyle and healthy eating habits to avoid obesity.

Recommendation 10 –Women with GDM and fetal loss

These women require special attention of the health care professionals. Special attention should be paid to their psychological well-being with referral to a mental health professional as and when needed. Since there is no subsequent baby immunization visits, these women should be screening with standard OGTT 6-12 weeks after pregnancy loss.

Annexure

1.Procedure of 75 g two hour OGTT

- The woman should have had no diet restrictions in the previous 3 days and participated in usual physical activity.
- The pregnant woman must reach the laboratory early morning, after overnight fasting. She must not have taken even coffee/tea.
- Minimum time required for fasting is 8 hours and fasting should not exceed 14 hours.
- On arrival at the laboratory, a blood sample is drawn and she is given a drink consisting of 75 gm of anhydrous glucose dissolved in a large glass of water (300 ml).
- Two more blood samples are drawn at one hour and two hours respectively, after drinking the glucose drink. The time is measured from the moment she begins to drink the glucose solution.
- If the patient arrives non fasting, only the two-hour blood samples should be taken after the glucose drink.
- The woman must be seated during this period with minimal physical activity.
- She must refrain from eating or drinking anything else, until the test is completed.

2, Suggested daily meal plans for sedentary normal weight, underweight and overweight pregnant mothers.

Food Group	Meal	Normal weight	Underweight	Over weight
Breakfast				
Cereals	Boiled cowpea/green gram	1 cup	1 cup	1 cup
Oil	Scraped Coconut	1 tbs	1 tbs	1 tbs
Snack				
Cereal & oil	Thriposha (with coconut 1 tbs)(without sugar)	3 tbs	3 tbs	3 tbs
Fruit	papaw	1 piece	1 piece	1 piece
Lunch				
Cereal	Rice	1 ⅓cups	1⅔ cups	1 cups
Vegetable	Green leaves	3 tbs	3 tbs	3 tbs
	Beans/long beans/wing beans	2 tbs	2 tbs	2 tbs
	Carrots/ pumpkin/beet root	2 tbs	2 tbs	2 tbs
Fish/meat	Fish/ chicken	2 pieces	2 pieces	2 pieces
Oil	Gravy	2tbs	3 tbs	2 tbs
Snack				
Milk	Full cream Milk powder 2 tbs(without sugar)	1 cup	1 cup	1 cup
Fruit	Guava	1 small	1 small	1 small
Oil	Peanuts	-	1 tbs	-
Dinner				
Cereal	Rice	1 ⅓ cups	1⅔ cups	1 cup
Vegetable	Vegetable	6 tbs	6 tbs	6 tbs
Fish/meat/egg	Fish/ chicken	1 pieces	2 pieces	1 pieces
Oil	Gravy	2tbs	3tbs	2 tbs
Snack				
Milk	Full cream Milk powder 2 tbs (without sugar)	1 cup	1 cup	1 cup
Water minimum of 8 glasses per day				

*This menu is only an example for sedentary pregnant mothers. Amounts and the type of the foods are varying according the individuals' height, current weight, activity levels, culture, preferences and availability.

References

1. Metzger BE. Proceedings of the third international workshop-conference on gestational diabetes mellitus. Diabetes. 1991;40(2):1–201.
2. Clinical practice recommendations 2001: gestational diabetes mellitus.Diabetes Care 2001; 24 (1): 77–79.
3. Metzger BE, Coustan DR.Summary and recommendations of the Fourth International Workshop Conference on Gestational Diabetes Mellitus. Diabetes Care 1998; 21 (2) : 161–167.
4. Mitanchez D.Foetal and neonatal complications in gestational diabetes: perinatal mortality, congenital malformations, macrosomia, shoulder dystocia, birth injuries, neonatal complications. Diabetes Metab. 2010 ;36(6):617-27.
5. IADPSGCP, International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. Diabetes Care 2010;33(3): 676-682.
6. National Institute for Health and Care Excellence (NICE) (2015) Diabetes in pregnancy: management of diabetes and its complications from preconception to the postnatal period. Clinical guideline NG3 (2015).
7. American Diabetes Association (2014) Standards of medical care in diabetes—2016.Diabetes Care 2016;39(1):94–98 .
8. South Asian Federation of Endocrine Societies (SAFES) GDM action plan and recommendations 2017.