

Diagnosis & Management of Gestational Diabetes Mellitus

Technical and Operational Guidelines



February 2018



Maternal Health Division
Ministry of Health and Family Welfare
Government of India



**Diagnosis & Management of
Gestational Diabetes Mellitus**
Technical Guidelines

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Secretary



सत्यमेव जयते

भारत सरकार
स्वास्थ्य एवं परिवार कल्याण विभाग
स्वास्थ्य एवं परिवार कल्याण विभाग
Government of India
Department of Health and Family Welfare
Ministry of Health & Family Welfare
Dated : 26th February, 2018

Preface

Hyperglycemia in pregnancy and Gestational Diabetes Mellitus are becoming a significant public health issue globally and in India. Gestational Diabetes Mellitus increase the risk to pregnant women and newborns and leads to poor pregnancy outcomes.

Although access to antenatal care has improved in the country, universal screening for gestational diabetes mellitus has not yet been operationalized across the country. Early diagnosis and appropriate management of the disease is important to the health of women with GDM and their newborns. Although, Government of India released National Guidelines on Diagnosis and Management of Gestational Diabetes Mellitus in 2014, several technical advances, both in India and globally, necessitated the revision of existing guidelines. GOI constituted expert groups to revise the guidelines based on these advancements and include operational aspects for better implementation at field level.

The revised guidelines will provide technical and programmatic guidance to service providers and programme officers to implement universal screening of pregnant women for GDM and its management. I urge all states to implement these guidelines optimally for better maternal and newborn survival.


(Preeti Sudan)



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भारत सरकार

स्वास्थ्य एवं परिवार कल्याण विभाग

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GOVERNMENT OF INDIA

MINISTRY OF HEALTH & FAMILY WELFARE

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Foreword

India has made significant progress in improving Maternal and Child Health services under the National Health Mission. The access and utilization of services has also increased considerably leading to marked reduction in maternal and infant mortality. However, non-communicable diseases are on the rise globally and in the country and need attention at all levels of the public health system.

Gestational Diabetes Mellitus (GDM) is one such disease which affects the health of the pregnant woman, her fetus and newborn adversely and gives rise to several complications. Hence, early diagnosis and appropriate management of gestational diabetes mellitus at all levels of public health facilities is critical. This will help in improving pregnancy outcomes and reduce maternal and newborn mortality and morbidity with positive impact on SDGs related to maternal and child health.

Although Government of India had introduced National Guidelines for Diagnosis & Management of Gestational Diabetes Mellitus, recent advancements and country level experiences have necessitated the modification of these guidelines. Accordingly, after several consultations and deliberations of the domain and programme experts, maternal health division has developed the technical and operational guidelines to facilitate and strengthen early diagnosis and appropriate management of GDM. Additionally, the guidelines also provide directions on awareness and demand generation activities needed to address long term effects of GDM, such as type 2 Diabetes Mellitus.

These guidelines are intended for the state and district level officials to serve as a tool to help implement this initiative effectively. I urge all States/ UTs to ensure universal screening and management of Gestational Diabetes Mellitus for better maternal and child health outcomes.

(Manoj Jhalani)

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Message

Reduction of Maternal & Infant Mortality is one of the key goals of the National Health Mission (NHM). Although there has been marked reduction in maternal and infant mortality during the past few years due to implementation of the RMNCH+A approach under NHM, further decline will require an approach that also focuses on contributory factors such as Gestational Diabetes Mellitus.

Gestational Diabetes Mellitus (GDM) has emerged as an important cause of poor pregnancy outcomes with adverse effects on women and newborns. The National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus by Government of India, released in 2014, recommend universal screening of pregnant women for GDM during antenatal period.

Recently, global evidences were generated on safety and efficacy of Oral Hypoglycaemic Drugs recommending use of Metformin for GDM management. Further, several pilot projects in India have generated experience in management of GDM. For this reason, Govt constituted an expert group to deliberate on GDM in detail and revise the National Guidelines for India, incorporating the recent global evidences on the use of Metformin and learnings based on country experiences. This will provide operational clarity for early identification and management of GDM.

Given the multifaceted challenges in implementation of the programme for Gestational Diabetes Mellitus, these revised guidelines are need of the hour. I sincerely believe that these guidelines will help the programme managers and service providers for improving the execution of the programme and aid in better pregnancy outcomes.


(Vandana Gupta)



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Message

Globally, Gestational Diabetes Mellitus is emerging as a major health concern for pregnant women. This trend is visible in India too, with much risk of adverse outcomes for the pregnant women and to the newborns, if not managed appropriately.

Despite improvement in the access to antenatal care services across the country, there still remain gaps in providing some essential components such as universal testing and management of (GDM). The Ministry of Health & Family Welfare has revised the existing guidelines for GDM in view of newer global evidences and field experiences. The revised guidelines focus on technical and operational aspects of early identification and appropriate management of GDM in pregnant women. These guidelines define the standard protocols for diagnosis of GDM and also introduce measures for better management of GDM such as use of metformin. They also aim to serve as a reference for the program managers and service providers at all levels of health care.

I appreciate the efforts and inputs of the technical experts, development partners and the Maternal Health Division, Ministry of Health & Family Welfare in developing these revised national guidelines. It is envisaged that implementation of these guidelines will help in reducing the maternal and neonatal mortality and morbidity related to GDM and I request all States/ UTs to give adequate focus to the implementation of this programme.

(Dr. Manohar Agnani)



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Programme Officer's Message

Prevalence of gestational diabetes mellitus among the pregnant women is estimated to be around 10-14% in the country, with more cases in the urban areas. An expert group constituted by the maternal health division of the Ministry deliberated to develop the National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus in December 2024 to integrate GDM diagnosis and management with essential antenatal care. These guidelines were disseminated country wide and one district (Hoshangabad) of Madhya Pradesh implemented them as a pilot project to test their feasibility.

With a lot of new global evidences on programming for screening and management of GDM especially on safety of oral antidiabetic drug like metformin during pregnancy and the experience generated by the Hoshangabad project, led the GDM to update the guidelines through deliberations of a National Technical Advisory Group held in September 2025. Thus, the guidelines have been revised with inclusion of newer global evidences, field level learning from country as well as operational aspects.

These revised guidelines would not have come to shape without the ongoing encouragement from Mr. Manoj Joshi, AS & MD (MAM), Ms. Vandana Gurnani, JS (RD) and Dr. Manish Agrawal, JS (Policy). I thank them for their valuable inputs in framing these guidelines.

I sincerely acknowledge the contributions of all the members of the Expert and Technical Advisory Group including the Development Partners who helped update the technical and operational content of the guidelines. I also appreciate and acknowledge my colleagues in the MH division for their efforts during the revision process of these guidelines.

I hope the state and district stakeholders will find these revised GDM guidelines useful to plan and implement the initiative in their respective areas at all levels of health care to save pregnant women and their newborns from the adverse effects of GDM.

Healthy Village, Healthy Nation



पूरत - आशीर्वादी की शक्ति है
Talking about ASH is taking care of each other

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List of Abbreviations

ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
BMI	Body Mass Index
BMR	Basal Metabolic Rate
CEmOC	Comprehensive Emergency Obstetric Care
CHC	Community Health Centre
DH	District Hospital
GDM	Gestational Diabetes Mellitus
IEC	Information Education Communication
IGT	Impaired Glucose Tolerance
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
JSSK	Janani Shishu Suraksha Karyakram
LHV	Lady Health Visitor
LSCS	Lower Segment Cesarean Section
LT	Lab Technician
MC	Medical College
MNT	Medical Nutrition Therapy
MO	Medical Officer
NCD	Non-Communicable Diseases
OGTT	Oral Glucose Tolerance Test
PHC	Primary Health Centre
PIP	Project Implementation Plan
PMSMA	Pradhan Mantri Surakshit Matritva Abhiyan
PPBS	Post Prandial Blood Sugar
SN	Staff Nurse
TSF	Table Spoonfull

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1. Introduction

Gestational Diabetes Mellitus (GDM) is defined as Impaired Glucose Tolerance (IGT) with onset or first recognition during pregnancy. Worldwide, one in 10 pregnancies is associated with diabetes, 90% of which are GDM. Undiagnosed or inadequately treated GDM can lead to significant maternal & fetal complications. Moreover, women with GDM and their offsprings are at increased risk of developing type 2 diabetes later in life.

In India, one of the most populous country globally, rates of GDM are estimated to be 10-14.3% which is much higher than the west. As of 2010, there were an estimated 22 million women with diabetes between the ages of 20 and 39 & an additional 54 million women in this age group with impaired glucose tolerance (IGT) or pre-diabetes with the potential to develop GDM if they become pregnant. The incidence of GDM is expected to increase to 20% i.e. one in every 5 pregnant women is likely to have GDM. In a field study in Tamil Nadu performed under the "Diabetes in Pregnancy" – Awareness and Prevention project, of the 4151, 3960 and 3945 pregnant women screened in urban, semi urban and rural areas, respectively, the prevalence of GDM was 17.8% in the urban, 13.8% in the semi urban and 9.9% in the rural areas.

To address to the urgent need to prevent and minimize maternal and fetal morbidity associated with GDM, Ministry of Health and Family Welfare released a national guideline for provision of universal screening and management of GDM as part of the essential antenatal package. State of Madhya Pradesh with support from Govt. of India implemented the recommendations of national guideline on "ANC care based GDM Diagnosis and Management" in district Hoshangabad from Nov 2016 to Oct 2017. During the implementation period 84% (21358) of ANC client were tested for GDM and prevalence of GDM was found to be 11% and 8% in urban and rural areas respectively. Further, the GDM diagnosis and management services were initiated in additional 11 states across India.

1.1 Consequences of GDM

Maternal risks of GDM include polyhydramnios, pre-eclampsia, prolonged labour, obstructed labour, cesarean section, uterine atony, postpartum hemorrhage, infection and progression of retinopathy which are the leading global causes of maternal morbidity and mortality.

Fetal risks include spontaneous abortion, intra-uterine death, stillbirth, congenital malformation, shoulder dystocia, birth injuries, neonatal hypoglycemia and infant respiratory distress syndrome. Long-term clinical effects of GDM are important contributors to the burden of non-communicable diseases in many countries.

Maternal Risk	Fetal Risk
◆ Abortion	◆ Spontaneous abortion
◆ Polyhydramnios	◆ Intra-uterine death
◆ Pre-eclampsia	◆ Stillbirth
◆ Prolonged labour	◆ Congenital malformation
◆ Obstructed labour	◆ Shoulder dystocia
◆ Cesarean section	◆ Birth injuries
◆ Uterine atony	◆ Neonatal hypoglycemia
◆ Postpartum hemorrhage	◆ Infant respiratory distress syndrome
◆ Infection	

2. Evidence

2.1 International evidence

Review of international evidences shows definite guidelines for screening pregnant women for GDM. The American & Canadian guidelines recommend universal screening by two step approach. This includes a screening with 50g one hour blood sugar test (>140 mg/dL taken as screen positive). The screen positive women are subjected to 100gm OGTT and those with 2 or more abnormal values of blood sugar are diagnosed as GDM. The NICE & Australian guidelines recommend a risk based screening with 75gm 2 hour OGTT with fasting blood sugar ≥ 126 mg/dL & 2hr ≥ 140 mg/dL taken as diagnostic for GDM. The WHO and FIGO endorses universal screening for GDM at 24-28 weeks of gestation using the 75gm 2hr BS (cut offs fasting ≥ 126 mg/dL & ≥ 140 mg/dL). Almost all guidelines agree to management of GDM using Medical Nutrition Therapy (Diet plan) & insulin therapy if needed. Recently, global evidences have also concluded that metformin is safe and effective for GDM management after 20 weeks of gestation if not controlled by MNT.

2.2 National evidence

Evidences from India show that women in the country are at much higher risk of developing glucose intolerance during pregnancy as compared to white women. In pan India study conducted by FOGSI and DIPSI shows about one-third of the pregnant women are diagnosed with GDM during the first trimester and over quarter of them have a history of fetal loss in the previous pregnancies. Similar findings were also found in GDM demonstration project in Hoshangabad where pregnant women

diagnosed for GDM during first, second and third trimester were 33%, 40% and 28% respectively. Advancing age and BMI were found to be important risk factor for developing GDM, but their positive predictive value differed substantially from rural to urban settings. Indian study endorse the "Single Step Procedure" for screening and diagnosis of GDM by 2 hr 75 gms post blood sugar \geq 140 mg/dL being a simple and economical procedure.

2.3 Need for National guidelines

Government of India released a "National Guidelines on Diagnosis and Management of Gestational Diabetes Mellitus" in 2014 to address the need of high prevalence of GDM in India. The initiatives led to integration of GDM diagnosis and management within ANC care package in public health system. This resulted in many field level learnings in Indian context. Recently, globally many more evidences were generated on safety and effectiveness on oral hypoglycemic drugs recommending use of "Metformin" for GDM management. For this reason, GOI constituted an expert group to deliberate on GDM in detail & revise the national guidelines for India incorporating the recent global evidences on use of Metformin and in country experiences.

The present guideline has been prepared based on the recommendations of the experts & available national/international evidences.

3. Operational Definition of GDM

Gestational Diabetes Mellitus (GDM) is defined as Impaired Glucose Tolerance (IGT) with onset or first recognition during pregnancy². National guideline for diagnosis and management of Gestational Diabetes endorses the single step test recommended by WHO for diagnosis of GDM using a 75gm glucose, through Oral Glucose Tolerance Test (OGTT) irrespective of the last meal with a threshold value of 2-hour BS $>$ 140 mg/dL. Guidelines advocate for universal screening of all pregnant women at first antenatal contact. If the first test is negative, second test should be done at 24-28 weeks of gestation. GDM Pregnant women should be managed by Medical Nutrition Therapy (MNT), and insulin therapy/metformin as required. In the postpartum period, OGTT should be repeated at 6 weeks after delivery, if blood sugar $<$ 140 mg/dL, then women should be referred to NCD clinic for Post Prandial Blood Sugar (PPBS) testing annually.

4. Technical guidelines on testing & management of GDM

4.1 Target population

All pregnant women in the population

4.2 Pre-requisites for testing & management of GDM

- ☛ Availability of supply & testing facility
- ☛ Trained human resources to manage the cases after diagnosis
- ☛ Appropriate referral linkages

4.3 Selection of facility

- ☛ States are free to choose the number of districts where the programme will be implemented initially, however all districts to be covered in phased manner.
- ☛ Once a district is chosen, implementation of programme should be universal in that district from Medical College to sub-centre to VHSND level.
- ☛ All Union Territories will do universal testing.
- ☛ A health facility chosen for implementation of programme should have all the pre-requisites in place.
- ☛ The service provider & programme officer must be oriented and trained about the programme.
- ☛ OGTT for pregnant women will be done in the NCD clinic, where ever it is available in the facilities.

4.4 Protocol for investigation

- ☛ Testing for GDM is recommended twice during ANC.
- ☛ The first testing should be done during first antenatal contact as early as possible in pregnancy.
- ☛ **The second testing should be done during 24-28 weeks of pregnancy if the first test is negative. It is important to ensure second test as many pregnant women develop blood sugar intolerance during this period (24-28 weeks). Moreover, only one third of GDM positive women are detected during first trimester. If it could not be done during this time, then it can be done any time after 24 weeks of pregnancy.**
- ☛ There should be at least 4 weeks gap between the two tests.
- ☛ The test is to be conducted for all pregnant women even if she comes late in pregnancy for ANC at the time of first contact.
- ☛ If she presents beyond 28 weeks of pregnancy, only one test is to be done at the first point of contact.

- ☛ OGTT of all pregnant women should be done at Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) sites as per protocol.
- ☛ If the test is positive at any point, protocol of management should be followed as given in this guideline.
- ☛ At MC/DH/other CEmOC Centres, availability of glucometer, metformin and insulin must be ensured at all ANC clinics and labour rooms with facility for collection of sample and interpretation of result there itself (by training of personnel).
- ☛ At all other facilities up to PHC level, there should be an in-house arrangement of glucometer and 75 gm glucose pouches for conducting the test & giving report immediately so that necessary advice can be given on the same day by the treating doctor.

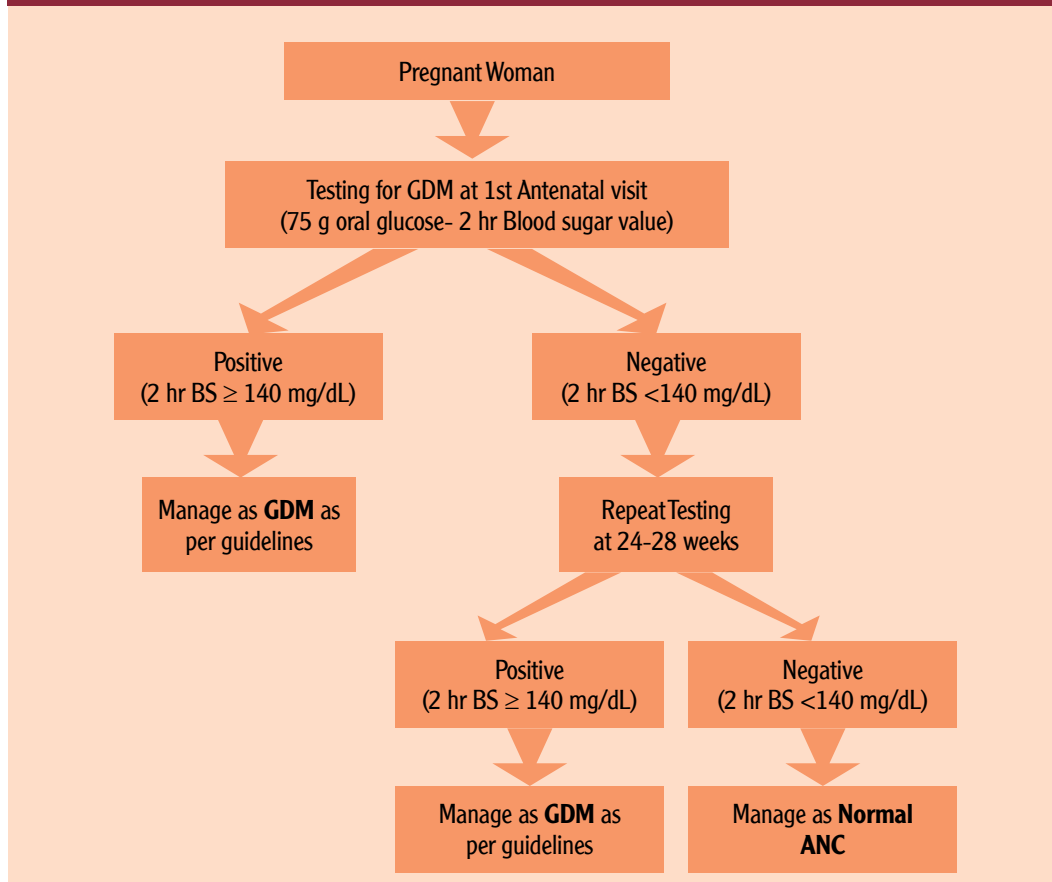
4.5 Methodology: Test for diagnosis

- ☛ Single step testing using 75 gm oral glucose & measuring blood sugar 2 hours after ingestion.
- ☛ 75 gm glucose is to be given orally after dissolving in approximately 300 ml water whether the pregnant women comes in fasting or non-fasting state, irrespective of the last meal. The intake of the solution has to be completed within 5-10 minutes.
- ☛ A plasma standardized glucometer should be used to evaluate blood sugar 2 hours after the oral glucose load.
- ☛ If vomiting occurs within 30 minutes of oral glucose intake, the test has to be repeated the next day, or else refer to a facility. If vomiting occurs after 30 minutes, the test continues.
- ☛ The threshold blood sugar level of ≥ 140 mg/dL (more than or equal to 140) is taken as cut off for diagnosis of GDM.

4.6 Instrument used for diagnosis

- ☛ For this programme, it has been decided that a plasma calibrated glucometer can be used for diagnosis of GDM for getting the results immediately.
- ☛ The facilities with provision of laboratory services i.e. FRU, district hospitals etc. can use semi-auto-analyser/auto-analyser or plasma calibrated glucometer ensuring that there is no delay in getting the results immediately. All other facilities are recommended to use plasma calibrated glucometer.
- ☛ Since it will be difficult for pregnant women to come another day just to collect the result, testing facility with a glucometer should be available at all facilities in the ANC clinic itself. This facilitates getting the result immediately so that necessary advice may be given the same day.
- ☛ A glucometer should also be available in the labour room for close monitoring of GDM cases during labour.
- ☛ Calibration of glucometer is recommended using calibration test strips or test solutions as per the instruction of the manufacturer, provided with glucometers. See Annexure 10

Universal testing for GDM



☛ Specification for the glucometer is given at Annexure 11. Procurement of same type of glucometer and strips to be made at the district level.

☛ Details on FAQs for plasma calibration of glucometer is given in Annexure 12

4.7 Management of GDM

Guiding Principles

- ☛ All Pregnant women who test positive for GDM for the first time should be started on Medical Nutrition Therapy (MNT) and physical exercise for 2 weeks. The woman should walk/exercise for 30 mins a day.
- ☛ After 2 weeks on MNT and physical exercise, 2 hrs PPBS (post meal) should be done.

Thus, GDM is managed initially with MNT and physical exercise and if it is not controlled with MNT (lifestyle changes), Metformin or Insulin therapy is added to the MNT.

- ☛ If 2hr PPBS is <120 mg/dL, repeat test as per high risk pregnancy protocol i.e. to undertake 8 tests (4 regular tests and 4 additional). It is recommended to conduct at least one test every month during 2nd and 3rd trimester. More follow-up tests can be done as recommended by the treating physician.
- ☛ If 2hr PPBS is \geq 120 mg/dL, medical management (metformin or insulin therapy) to be started as per guidelines.

Medical Nutrition Therapy (MNT)

Principles of MNT

◆ Healthy eating during pregnancy

All pregnant women with GDM should get Medical Nutrition Therapy (MNT) as soon as diagnosis is made. MNT for GDM primarily involves a carbohydrate controlled balanced meal plan which promotes

- ☛ Optimal nutrition for maternal and fetal health
- ☛ Adequate energy for appropriate gestational weight gain
- ☛ Achievement and maintenance of normoglycemia.

◆ The importance of the individualised nutrition assessment in GDM

Nutrition assessment in GDM should be individualised to allow an accurate appraisal of the woman's nutritional status. This assessment includes defining her Body Mass Index (BMI) or percentage of desirable pre-pregnancy body weight and optimal pattern of weight gain during pregnancy.

◆ Calories and GDM

- ☛ Individualisation is important when determining energy requirement, and adjustments should be made based on weight change patterns.
- ☛ Energy requirement during pregnancy includes the normal requirement of adult and an additional requirement for fetal growth plus the increase in the body weight of pregnant woman.
- ☛ Energy requirement does not increase in the first trimester unless a woman is underweight.
- ☛ Energy requirement increases during second and third trimester.
- ☛ Energy intake should be adequate enough to provide appropriate weight gain during pregnancy.
- ☛ As per Indian ICMR guidelines, for an average weight gain of 10-12 Kg, an addition of 350 kcal/day above the adult requirement is recommended during second and third trimester.
- ☛ Severe caloric restriction is not recommended as it may result in ketonemia and ketonuria and impair physical and mental development in offspring.
- ☛ Equations proposed by ICMR expert group can be used to calculate adult energy requirement which are as follows:
 - Energy requirement (kcal/d)= BMR \times PAL

*BMR= Basal metabolic rate and *PAL= Physical activity level

- BMR (kcal/d) for adult females (18-30 yrs)= $14 \times \text{B.W (Kg)} + 471$
- BMR (kcal/d) for adult females (30-60 yrs)= $8.3 \times \text{B.W (Kg)} + 788$
*B.W= body weight
- Pre-pregnancy body weight to be taken into consideration when calculating the requirement.

Example

How to determine calorie requirement of a 28 years of age sedentary active pregnant woman in second trimester with height=153 cm, current weight=60 kg, and pre-pregnancy weight=54 kg.

1. First calculate the BMI

$$\text{BMI (kg/m}^2\text{)} = \text{weight in kg/height in meter square}$$

$$= 54/1.543^2 \times 1.53$$

$$= 23.06 \text{ kg/m}^2$$
 BMI is in normal range
2. Calculate BMR
 - BMR (kcal/d) for adult females (18-30yrs) = $14 \times \text{B.W(kg)} + 471$
 $= 14 \times 54 + 471$
 $= 1227 \text{ kcal}$
3. Identify Physical activity level
 Physical activity level of sedentary activity is 1.53
4. Total energy requirement of adult = $\text{BMR} \times \text{Physical activity level}$
 $= 1227 \times 1.53$
 $= 1877.31 = 1877 \text{ kcal}$
5. Total energy requirement in pregnancy = $\text{Total energy requirement of adult} + 350 \text{ kcal/d}$
 $= 1877 + 350 = 2227 \text{ kcal per day}$

👉 However, for the ease at field level, expert recommend following calculation

	Level of Activity	Energy requirement during pregnancy	Total energy requirement (kcal/Day)
1	Sedentary work	1900+350	2250
2	Moderate work	2230+350	2580
3	Heavy work	2850+350	3200

👉 An addition of 350 kcal can be made for pregnant women after calculating the energy requirement for adults as stated in above table.

Further, addition or deduction of 500 calories per day is recommended as per following table:

Weight Category	BMI(kg/m ²)	Energy requirement (kcal/Day)
Underweight	<18.5	Energy requirement as per level of activity + 500 kcal/day
Normal weight	18.5-22.9	Energy requirement as per level of activity
Overweight	23-24.9	Energy requirement as per level of activity
Obese	>25	Energy requirement as per level of activity - 500 kcal/day

*Desirable weight calculated from the Ideal height/weight chart (Annexure 1)

Hypocaloric diets in obese women with GDM can adversely impair fetal growth besides ketonemia and ketonuria. However, moderate caloric restriction (reduction by 30% of estimated energy needs) in obese women with GDM may improve glycemic control without ketonemia and reduce maternal weight gain.

Select Carbohydrates Carefully

Carbohydrate foods and daily intakes

- Carbohydrate foods are essential for a healthy diet of mother and baby. Once digested, carbohydrate foods are broken down to glucose which goes into blood stream. The type, amount and frequency of carbohydrate intake has a major influence on blood sugar readings.
- Foods sources of carbohydrate include cereals (wheat, bajra, ragi, corn rice etc.) and its products (suji, refined flour, breads, pasta, noodles etc), pulses (green gram, bengal gram, black gram etc.), starchy vegetables (potato, sweet potato, corn tapioca etc), fruits, sweets, juices etc.
- Large amounts of carbohydrate foods eaten at one time will lead to high blood sugar level and should be avoided.
- Spreading carbohydrate foods over the day will help to prevent this. It is better to spread carbohydrate foods over 3 small meals and 2–3 snacks each day than taking 3 large meals.
- Complex carbohydrates (like whole-grain cereals like oats, bajra, jowar, ragi, whole pulses, vegetables and fruits with skins) should be preferred over simple carbohydrates like food with lots of added sugar or honey, or foods that are made from refined white flour. Some examples of simple carbohydrates include sweets, cakes, puddings, sweet biscuits, pastry, juice, soft drinks, chips, white bread, naan, pizza etc.
- Counting the number of carbohydrate serves that a mother eats during the day will help her to eat the right amount of carbohydrate. As a guide, aim should be for 2–3 carbohydrate serves at each major meal and 1–2 carbohydrate serves at each snack.
- One serve = approximately 15 grams of carbohydrate. Exchange list for carbohydrate is given in annexure 3.

Understanding Fat Intake during Pregnancy

Saturated fat intake (sources - ghee, butter, coconut oil, palm oil, red meat, organ meat, full cream milk etc) should be less than 10 % of total calories and dietary cholesterol should be less than 300 mg/dL. In obese and overweight patients, a lower-fat diet overall can help slow the rate of weight gain.

Ways to trim the fat from your diet

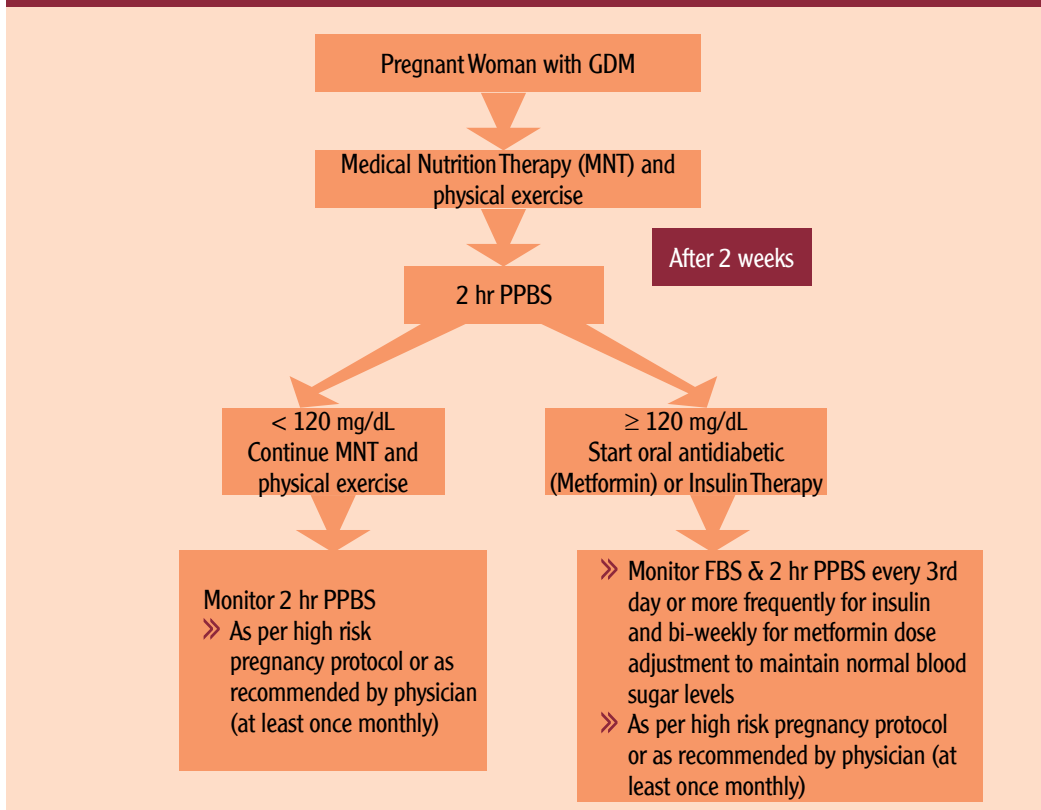
- ☞ Use less fat in cooking and avoid frying of foods.
- ☞ Using low-fat dairy products in place of whole milk or full cream products.
- ☞ Choosing low fat snacks like substituting fresh fruit, salads, baked and steamed food items for high-fat snacks such as cakes, biscuits, chocolates, pastries, samosas and pakoras etc.
- ☞ Using lean meat in place of red meat.

Protein: Protein requirement in pregnancy is increased (additional 23 g/day) to allow for fetal growth. At least 3 serving of protein foods are required every day to meet the increased demand. Sources of protein are milk and milk products, egg, fish, chicken, pulses (dal), nuts etc

Fiber: High fiber foods especially soluble fibre may help control blood sugar by delaying gastric emptying, retarding the entry of glucose into the blood stream and lessening the postprandial rise in blood sugar. Soluble fiber in flax seed, psyllium husk, oat bran, legumes (dried beans of all kinds, peas and lentils), and pectin (from fruit, such as apples) and forms in root vegetables (such as carrots) are helpful.

Further details are given on dietary intake, sample diet chart (Annexure 2) and food exchange chart for MNT (Annexure 3).

Management of Pregnant Woman with GDM



Medical Management (Oral Antidiabetic Drug-Metformin; and Insulin Therapy)

- ☛ Metformin or Insulin therapy is the accepted medical management of pregnant women with GDM not controlled on MNT. Insulin is the first drug of choice and metformin can be considered after 20 weeks of gestation for medical management of GDM.
- ☛ Insulin can be started any time during pregnancy for GDM management. If pregnant women with GDM before 20 weeks, and Medical Nutrition Therapy (MNT) failed, Insulin should be started.
- ☛ Metformin can be started at 20 weeks of pregnancy, if MNT has failed to control her blood sugar. If the woman's blood sugar is not controlled with the maximum dose of metformin (2 gm/day) and MNT, Insulin to be added. The dose of metformin is 500 mg twice daily orally up to a maximum of 2 gm/day.
- ☛ Hypoglycemia and weight gain with metformin are less in comparison to Insulin.
- ☛ If Insulin is required in high doses, metformin may be added to the treatment.
- ☛ At PHC, MO should initiate treatment & refer pregnant women with GDM to a higher centre if blood sugar levels are not controlled or there is some other complication.

- At CHC/DH/MC, a Specialist/Gynaecologist/Physician/MO can start metformin or insulin.
- Any pregnant women on insulin therapy should be instructed to keep sugar/jaggery/glucose powder handy at home to treat hypoglycemia if it occurs.
- The common side-effect that occur with metformin include diarrhoea, nausea, stomach pain, heartburn, gas and the serious side-effects are lactic acidosis and low blood sugar

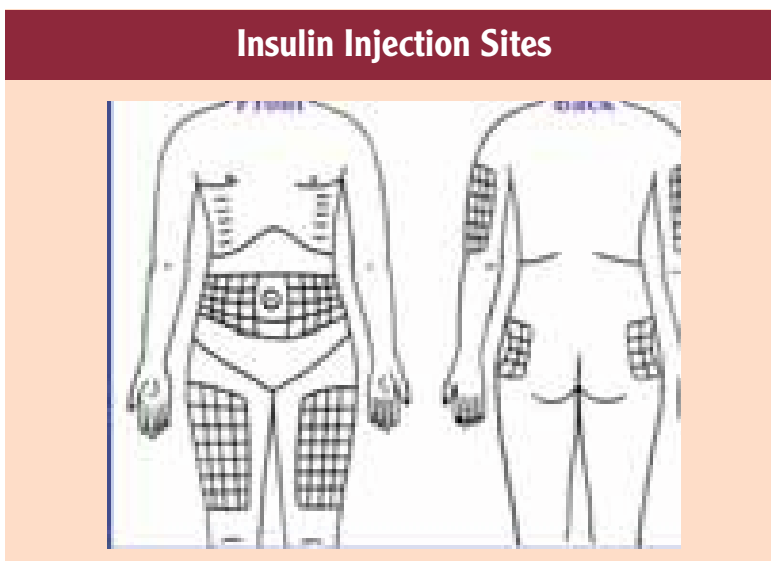
Pregnant woman who has discontinued the medical management should be referred to facility for evaluation and initiation of further management.

Very high 2 hr PPBS:

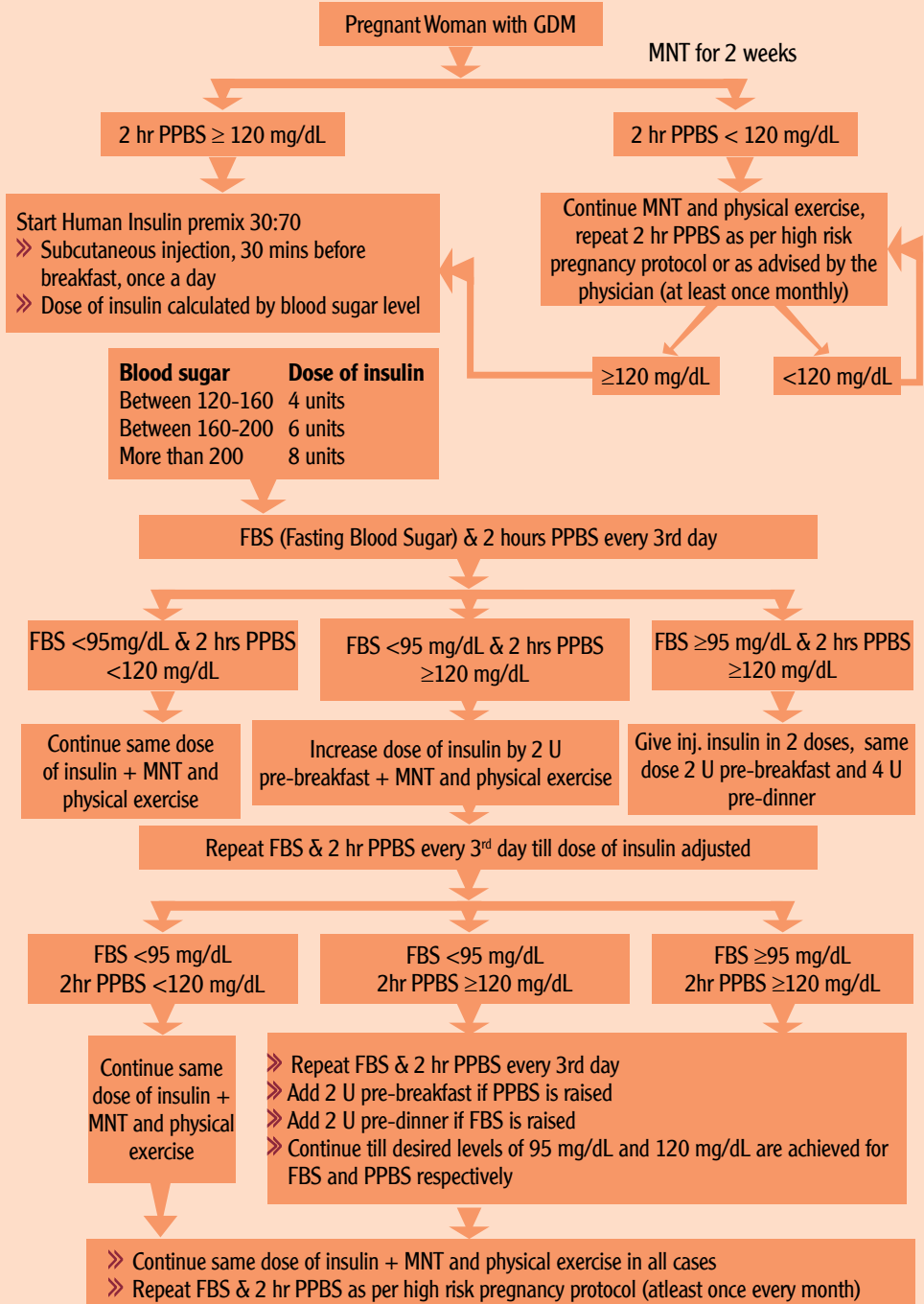
- If 2hr PPBS is >200 mg/dL at diagnosis, starting dose of insulin should be 8 units pre-mixed insulin.
- The dose to be adjusted on follow-up and at the same time MNT and physical exercise has to be followed. Frequency of monitoring to be decided by the treating Physician/Gynaecologist/MO.
- If pregnant women requires more than 20 units insulin/day or metformin more than 2 gms/ day, she should be referred to higher health-care centre.
- The dose of insulin should be followed as per the flow chart given on page 13.

Site of Insulin Injection:

- Front/Lateral aspect of the thigh or over abdomen
- Insulin injection is to be given subcutaneously only.



Insulin Therapy



* Only Injection human premix insulin 30/70 to be used * Insulin syringe – 40 IU syringe * Subcutaneous injection only

Details of Insulin delivery device (Pen/Syringe), Storage and Disposal:

- ☞ Insulin pen or syringe can be provided to the pregnant women for subcutaneous delivery of injection
- ☞ Health provider to train the pregnant women on use of insulin pen or syringe for self administration of insulin.
- ☞ Insulin syringe – 40 IU syringe is to be used.
- ☞ Insulin pen includes an insulin cartridge, dial to measure dose and a disposable needle.
- ☞ Single use-insulin syringe and pen needle should be used.
- ☞ Before use, check syringe every time whether needle is straight or not.
- ☞ Never clean needle with spirit or any other disinfectant.
- ☞ Tip of needle of syringe or pen should not come in contact with anything else except cleaned skin.

Details of Insulin vial/cartridge

- ☞ Only Injection Human premix insulin 30/70 is to be administered
- ☞ Insulin vial – 40 IU/mL is to be used
- ☞ Insulin cartridge – insulin dose to be adjusted as per units required

Storage of insulin vial & pen/syringe:

- ☞ Insulin vials have to be made available along with pen/disposable syringe to the pregnant women for use.
- ☞ Appropriate arrangement should be made for storage of insulin in refrigerator at 4^o–8^oC (in the door of the refrigerator) and battery backup in areas with an erratic supply of electricity. Vial should never be kept in freezer compartment of refrigerator. If by mistake, vials are stored in freezer and frozen, they should not be used at all and discarded.
- ☞ At PHCs, stock of insulin vials should be stored in refrigerator.
- ☞ Insulin vials should not be exposed to direct heat/sunlight, and are stable up to 25^o-30^oC.
- ☞ Open insulin vials (in current use) should be stored in refrigerator or in dark and cool place. If refrigerator is not available such as at household level, the vial should be kept in a zipped polybag and then kept in earthen pots filled with water or kept in cool place (near drinking water storage).
- ☞ Insulin vial once opened, should be used within a month. If not used within a month, it should be discarded. Date of opening of vial to be written on the vial.
- ☞ Syringes can be stored at room temperature without direct exposure to sunlight or heat. There is no need to store in refrigerator.
- ☞ Unopened insulin pens should be kept in refrigerator, once opened they can be kept at room temperature out of direct sunlight.

Bio-medical Waste Management

(i) Disposal of home used syringe/pen:

- ☞ Syringe with needle or blunt disposable pen needle should be discarded if tip is blunt, bent, or caused pain at the time of injection.
- ☞ This syringe/disposable pen needle should not be used by any other person or pregnant women again. It should be used only once.
- ☞ Place the entire syringe/disposable pen needle in an opaque plastic bottle with a screw cap or a plastic or metal box that closes tightly.
- ☞ The pregnant women should carry the used syringes or disposable pen needles, empty insulin vials/cartridges to the health facility/VHSND in a closed plastic or metal box separately, for the waste management.

(ii) Waste management at health facility

Syringes/needles are cause of most of the injuries to the health care providers at all levels. The following safety guidelines should be followed when handling sharp instruments such as needles and syringes:

- ☞ Sharp instruments should never be passed on from one hand to other hand directly.
- ☞ All syringes/needles should be handled properly and disposed in puncture proof container.
- ☞ Needles should be destroyed immediately using hub-cutter.
- ☞ Sharps should be disposed immediately in a puncture resistant container. Needles should not be recapped, bent, broken or disassembled before disposal.
- ☞ The used needles/syringes once decontaminated and destroyed using hub-cutter should be disposed as per bio-medical waste guidelines.
- ☞ All sharps including needles once processed as above should be disposed as per bio-medical waste guidelines.

Refer to higher centre if one or more of the following conditions are met:

- ☞ Nausea & vomiting and not able to take food orally
- ☞ Fasting blood sugar >200 mg/dL with or without metformin or insulin
- ☞ Fasting blood sugar >150 mg/dL or PPBS >250 mg/dL even after giving metformin or insulin, referral is uniformly required
- ☞ If PPBS is more than 200 mg/dL at any point of time during management, then she has to be referred
- ☞ Total dose of insulin (combined morning and evening dose) on each day exceeds 20 units
- ☞ If pregnant women develops low blood sugar (hypoglycemia) more than once in a day
- ☞ If pregnant woman refuses to take insulin injection

How to recognise & manage hypoglycemia?

- ◆ Any Pregnant women on insulin can develop hypoglycemia at any time
- ◆ Hypoglycemia is diagnosed when blood sugar level is < 70 mg/dL
- ◆ Important to recognise symptoms of hypoglycemia & treat immediately

How to recognise hypoglycemia?

- ◆ **Early symptoms** - Tremors of hands, sweating, palpitations, hunger, easy fatigability, headache, mood changes, irritability, low attentiveness, tingling sensation around the mouth/lips or any other abnormal feeling
- ◆ **Severe** - Confusion, abnormal behaviour or both, visual disturbances, nervousness or anxiety.
- ◆ **Uncommon** - Seizures and loss of consciousness

How to manage hypoglycemia?

- ◆ Ask pregnant women to take 3TSF of glucose powder (15-20 grams) dissolved in a glass of water
- ◆ If glucose is not available, take one of the following: Sugar - 6TSF in a glass of water/fruit juice/honey/anything which is sweet/any food
- ◆ After taking oral glucose, she must take rest & avoid any physical activity
- ◆ 15 minutes after taking glucose, she must eat one chapati with vegetable/rice/one glass of milk/idli/fruits/anything eatable which is available
- ◆ If hypoglycemia continues, repeat same amount of glucose and wait
- ◆ Take rest, eat regularly and check blood sugar if possible
- ◆ If pregnant women develops >1 episode of hypoglycemia in a day, she should consult any doctor immediately

4.8 Special obstetric care for pregnant women with GDM

Antenatal care

- ☞ Antenatal care of a pregnant women with GDM should be provided by gynaecologist if available.
- ☞ In cases diagnosed before 20 weeks of pregnancy, a fetal anatomical survey by USG should be performed at 18-20 weeks.
- ☞ For all pregnancies with GDM, a fetal growth scan should be performed at 28-30 weeks gestation & repeated at 34-36 weeks gestation. There should be at least 3 weeks gap between the two ultrasounds and it should include fetal biometry & amniotic fluid estimation.

- Pregnant women with GDM in whom blood sugar level is well controlled & there are no complications, should continue with antenatal visits as per high-risk pregnancy protocol or as recommended by the physician (as least once monthly).
- In pregnant women with GDM having uncontrolled blood sugar level or any other complication of pregnancy, refer to higher facility and the frequency of antenatal visits should be as per high-risk pregnancy protocol or as recommended by the physician (at least once monthly).
- Monitor for abnormal fetal growth (macrosomia/growth restriction) and polyhydramnios at each ANC visit.
- Pregnant women with GDM to be diligently monitored for hypertension in pregnancy, proteinuria and other obstetric complications.
- In pregnant women with GDM between 24-34 weeks of gestation and requiring early delivery, antenatal steroids should be given as per GOI guidelines i.e. Inj. Dexamethasone 6 mg IM 12 hourly for 2 days. More vigilant monitoring of blood sugar levels should be done for next 72 hours following injection. In case of raised blood sugar levels during this period, adjustment of insulin dose should be made accordingly.

Fetal surveillance in pregnant women with GDM:

- Pregnant women with GDM are at an increased risk for fetal death in utero and this risk is increased in pregnant women requiring medical management. Hence vigilant fetal surveillance is required.
- Fetal heart should be monitored by auscultation on each antenatal visit.

Pregnant women should be explained about Daily Fetal Activity Assessment. One simple method is to ask her to lie down on her side after a meal and note how long it takes for the foetus to kick 10 times. If the foetus does not kick 10 times within 2 hrs, she should immediately consult a health care worker and if required should be referred to a higher centre for further evaluation.

Labour & Delivery

- Pregnant women with GDM with good control of blood sugar (2 hr PPBS <120 mg/dL) levels may be delivered at their respective health facility ideally have institutional delivery
- Pregnant women with GDM on insulin therapy with uncontrolled blood sugar levels (2 hr PPBS \geq 120 mg/dL) on MNT and physical exercise and metformin or insulin requirement >20 U/day should be referred at 34-36 weeks for delivery planning at CEmOC centres under care of gynaecologist.
- Timing of delivery: GDM pregnancies are associated with delay in lung maturity of the fetus; so routine delivery prior to 39 weeks is not recommended.

- Such referred cases must get assured indoor admission or can be kept in a birth waiting home with round the clock availability of medical staff for monitoring.
- If a pregnant women with GDM with well controlled blood sugar has not already delivered spontaneously, induction of labour should be scheduled at or after 39 weeks pregnancy.
- In pregnant women with GDM with poor blood sugar control, those with risk factors like hypertensive disorder of pregnancy, previous still birth & other complications should be delivered earlier. The timing of delivery should be individualised by the obstetrician accordingly.
- Vaginal delivery should be preferred and LSCS should be done for obstetric indications only.
- In case of fetal macrosomia (estimated fetal weight >4 kg) consideration should be given for a primary cesarean section at 39 weeks to avoid shoulder dystocia.

Special precaution during labour

- Pregnant women with GDM on medical management (metformin or insulin) require blood sugar monitoring during labour by a glucometer.
- The morning dose of insulin/metformin is withheld on the day of induction/labour and the pregnant women should be started on 2 hourly monitoring of blood sugar.
- IV infusion with normal saline (NS) to be started & regular insulin to be added according to blood sugar levels as per the table below.

Blood sugar level	Amount of Insulin added in 500 ml NS	Rate of NS Infusion
90-120 mg/dL	0	100 ml/hr (16 drops/min)
120-140 mg/dL	4 U	100 ml/hr (16 drops/min)
140-180 mg/dL	6 U	100 ml/hr (16 drops/min)
>180 mg/dL	8 U	100 ml/hr (16 drops/min)

4.9 Immediate neonatal care for baby of mother with GDM

- All neonates should receive immediately essential newborn care with emphasis on early breastfeeding to prevent hypoglycemia.
- If required, the sick neonates should be immediately resuscitated as per GOI guidelines.
- Newborn should be monitored for hypoglycemia. Monitoring should be started at 1 hour of

delivery and continued every 4 hours (prior to next feed) till four stable glucose values are obtained.

- ☞ The cut off capillary blood glucose for hypoglycemia in normal birth weight newborn is <45 mg/dL and <54 mg/dL in case of intrauterine growth restriction (IUGR), to initiate treatment.
- ☞ Neonate should also be evaluated for other neonatal complications like respiratory distress, convulsions, hyperbilirubinemia.

4.9.1 Hypoglycemia in a newborn with GDM mother

All babies born to mothers with GDM are at risk for development of hypoglycemia irrespective of treatment whether they are on insulin or not and should be observed closely. All babies of GDM mother should be checked for hypoglycemia at or within one hour of delivery by glucometer.

Diagnosis of hypoglycemia

The operational definition cut off of blood sugar by glucometer is 45 mg/dL. Any newborn with blood sugar less than 45 mg/dL and for IUGR baby with less than 54 mg/dL should be considered as 'baby with hypoglycemia'.

The glucometers are not very reliable for diagnosis of hypoglycemia as their sensitivity decreases at lower blood sugar range. The most definite diagnosis of hypoglycemia is by measurement of blood sugar by established laboratory methods (glucose oxidase method by calorimeter). In view of non-availability of laboratory facilities at all places and time delay in getting result, blood sugar values obtained by glucometers will be considered for all operational steps. Wherever lab facilities are available, treating physician can take a decision to send a blood sugar sample to the lab without delaying next management step.

Symptoms of hypoglycemia

Most of the time, newborn baby may not have any symptom of hypoglycemia at all. Symptoms of hypoglycemia are very variable and seen only in a smaller proportion of patients. A physician should observe for following sign in a new born child for hypoglycemia:

- ☞ Stupor or Apathy
- ☞ Jitteriness or tremors
- ☞ Episodes of cyanosis
- ☞ Convulsions
- ☞ Intermittent apnoeic spells or tachypnea

- ☞ Weak and high pitched cry, limpness and lethargy
- ☞ Difficulty in feeding
- ☞ Eye rolling
- ☞ Episodes of sweating
- ☞ Any unexplained clinical feature in baby of diabetic mother

Management of hypoglycemia

All cases of hypoglycemia should be managed in following manner:

Step 1:	Whenever there is suspicion of hypoglycemia BS should be checked immediately with glucometer. In all babies born to diabetic mother, BS should be checked by glucometer between 1-2 hours after birth.
Step 2:	If blood sugar values is <45 mg/dL, this should be considered as ‘hypoglycemia’, move to next step
Step 3:	Newborn with hypoglycemia – immediately ask mother to give breast feed without any delay. Direct breast feeding is the best management step for neonatal hypoglycemia. If the infant is unable to suck, expressed breast milk from mother should be given. If mother is not in a position to give breast feed or no breast milk secretion, baby should be given any formula feed. One of the good options is to dissolve one TSF of sugar in 100 ml of normal cow’s milk and give. If the lactation management centres (Human Milk Banks) is available at the facility then it can also be involved in feeding the baby.
Step 4:	Once feed has been given, check blood sugar again after one hour. If blood sugar is >45 mg/dL, 2 hourly feeding (breast feeding is the best option but if not available, formula feed can be given) should be ensured by explaining to mother/relatives and supervised.
Step 5:	If at any time blood sugar by glucometer is <20 mg/dL, give immediate intravenous bolus injection of 10% dextrose 2 ml/kg body weight of baby. This should be followed by intravenous infusion of 10% dextrose at a rate of 100 ml/kg/day. Blood sugar should be checked 30 minutes after starting the infusion. If it is still less than 20 mg/dL, infant should be referred to higher centre where paediatrician is available.

Signs of danger: Refer to higher centre

If any of the following sign/reports are observed, infant should be referred to higher centre with 10% dextrose IV infusion drip (100 ml/kg/day)

- ☞ Two values of blood sugar <20 mg/dL inspite of starting 10% dextrose IV infusion
- ☞ Occurrence of seizures

- ☞ Baby is not able to suck at repeated attempts and blood sugar is <20 mg/dL
- ☞ Failure to maintain IV line and blood sugar is <20 mg/dL

Procedure for capillary blood glucose testing

A blood sample obtained from a heel puncture is useful and simple way of collecting blood sample from newborns and is recommended for blood sugar testing. The procedure is not without risk and might cause increased pain in newborns, local trauma, damage to nerves, blood vessels and bones, excessive blood loss and infection. So, it should be performed by a trained health care personnel, preferably by a paediatrician.

Preparation:

Keep the following equipments ready:

- ☞ Gloves
- ☞ Cotton wool
- ☞ Capillary tube/and or blood bottle
- ☞ Clean tray to hold equipments
- ☞ Sharps disposal box

Procedure:

- ☞ Wash hands and wear gloves
- ☞ Select the heel site for puncture
- ☞ The back of the heel should be avoided
- ☞ The site chosen for the sampling should be free from previous injury
- ☞ Ensure baby is laying in a safe and secure place
- ☞ Hold the baby's heel
- ☞ Hold the ankle with index and middle finger
- ☞ Use other fingers to steady the baby's leg
- ☞ Partly encircle the baby's heel with thumb
- ☞ Clean the proposed puncture site with disinfectant
- ☞ Allow the area to dry
- ☞ Gently compress the heel and hold the skin under tension
- ☞ Puncture the skin in a steady manner
- ☞ Relax the tension and wipe away the initial blood flow with cotton
- ☞ Whilst maintaining the grip, hold the heel so that blood is allowed to come out

- ☞ Gently but firmly press the baby's heel to form a large droplet of blood
- ☞ Do not squeeze
- ☞ Hold the capillary tube or blood bottle to the blood droplet and touch
- ☞ Momentarily release the pressure to collect subsequent blood then reapply pressure allowing the blood to flow
- ☞ Continue until sufficient blood has been obtained
- ☞ Once the sample has been obtained apply pressure to the site with gauze, maintain the pressure until bleeding has stopped
- ☞ Use the hypoallergenic tape
- ☞ Baby should be kept comfortable and handed to mother
- ☞ Equipments should be disposed
- ☞ The staff doing the puncture should wash hands after the procedure
- ☞ The sample should be sent for analysis as soon as possible

4.10 Post-delivery follow up of pregnant women with GDM

- ☞ Immediate postpartum care of women with GDM is not different from women without GDM but these women are at high risk to develop Type 2 Diabetes Mellitus in future.
- ☞ Maternal glucose levels usually return to normal after delivery.
- ☞ Subsequently, ANM must perform 75 gm OGTT (fasting and 2 hr PP) at 6 weeks postpartum to evaluate glycemic status of woman. Cut off for normal plasma and abnormal blood sugar levels in the fasting and 75 gms OGTT values are:
 - Fasting blood sugar: ≥ 126 mg/dL
 - 75 gms OGTT 2 hour blood sugar
 - ❖ Normal: < 140 mg/dL
 - ❖ IGT: 140-199 mg/dL
 - ❖ Diabetes: ≥ 200 mg/dL

- ◆ Test normal: Woman is counselled about lifestyle modifications, weight monitoring & exercise. Advise women to get annual screening for DM in NCD clinic as per their protocols.
- ◆ Test positive/IGT: Woman should be linked with NCD program for further management.
- ◆ Pregnant women with GDM and their offsprings are at increased risk of developing Type II Diabetes mellitus in later life. They should be counselled for healthy lifestyle and behaviour, particularly role of diet & exercise.

- ◆ GDM should be a part of NCD programme.
- ◆ To ensure postpartum follow-up of GDM positive women and their newborns, linkages at various platforms eg. NCD clinic, postpartum care clinic, paediatric set ups, ASHAs etc. will be established.

4.11 Pre-conception care & counselling

- ☞ Woman with history of GDM to be counselled about BMI & blood sugar estimation before next pregnancy
- ☞ Desired blood sugar levels:
 - FBS - <100 mg/dL
 - 2 hr PPBS - <140 mg/dL
- ☞ Counsellor to consult Gynaecologist as soon as she misses her period

Counselling tips:

- ◆ Gestational diabetes mellitus (GDM) can be easily controlled by diet (MNT) and exercise
- ◆ Only in few women in whom blood sugar is not controlled by diet and physical exercise, oral antidiabetic (metformin) or insulin injections are required
- ◆ GDM can be treated with oral metformin tablets as they do not harm the fetus.
- ◆ Insulin injections are required only during pregnancy. Insulin will be stopped in most of the cases after pregnancy.
- ◆ If you are injecting insulin over abdomen, it can not reach your baby in any condition. Injecting insulin over abdomen is 100% safe.
- ◆ Modification of diet is very easy and will not cost more. Sweets should be avoided at all times during pregnancy
- ◆ If blood sugar is controlled, you and your baby both are safe and healthy
- ◆ If blood sugar is not properly monitored, it may harm both you and baby
- ◆ If you are taking insulin, always keep glucose, sugar with you.
- ◆ Pregnant women with GDM should deliver at health facilities. It will help in management of any complications which can be countered during delivery.

5. Operational aspects of GDM Programme

5.1 Road map for rolling out GDM Program in districts

Due to high maternal morbidity and mortality associated with Gestational Diabetes Mellitus, provision of universal, integrated, ANC care based GDM diagnosis and management services need to be made available within the Public Health System. GDM program should be rolled out in phasic manner by the states so that all districts have GDM service provision in next 5 years.

The states that have high maternal and perinatal mortality, need to prioritize GDM service provision initially to cover all High Priority Districts (HPDs) and then plan to cover remaining districts. To maximize the benefits of the program, the introduction of the GDM services in HPDs needs to be completed in next 3 years.

Rolling Out Approach

State based on their readiness status for introduction of GDM diagnosis and management services, can adopt two approaches.

Approach 1: Single step Introduction (One-step)

Under this approach, the introduction of GDM services can be done simultaneously at the facilities and at the SHC /Community outreach in one step.

Approach 2: Staggered Introduction (Two-step)

Under this approach, introduction of GDM services can be done initially at the facilities. Once the services and the program management processes at the facilities get mature (usually after one-year post introduction), the services to be introduced at SHC and community outreach.

Integration of GDM in maternal health and NCD programs is the need of the hour for effective program implementation and follow up to ensure continuum of care.

5.2 Role of Health personnel at different levels of Health Facility

Village

- ASHA: To mobilise & counsel Pregnant women for timely testing & follow up

VHND

- ANM: Testing/MNT/Referral of cases needing medical management

Level I: Sub-centre

- ANM: Testing/MNT/Referral of cases needing medical management
- Maintaining records, monitoring & follow up

Level II: PHC/corresponding Urban centre

- MO/SN/ANM/LT: To undertake activities as per their training & defined jobs
- Counselling & Testing/MNT/Delivery of uncomplicated & controlled GDM cases/referral of uncontrolled & complicated GDM cases to higher centre
- GDM controlled on MNT can be delivered by ANM/SN
- Medical management with Metformin or Insulin & delivery of controlled GDM cases should be undertaken by MOs
- GDM not controlled on Insulin/metformin therapy/GDM with complications should be referred to higher facility for care by a specialist.
- Maintaining records, monitoring & follow up

Level III

DH & All CEmOC centres

- All jobs as defined under Level II
- +
- Specialist/Gynaecologist/MO: Management of all types of GDM cases

NCD Clinic

- Education to the client
- Screening
- Investigation for blood sugar
- Diagnosis and treatment of diabetes
- Refer the difficult or complicated cases to district hospitals

Community linkages

- ◆ ASHAs & ANMs are the key persons connecting pregnant women in community with health facilities and therefore they have an important role in detection & follow up of GDM cases.
- ◆ Testing for GDM for all pregnant women should be integral part of existing antenatal care.
- ◆ GDM cases should be followed during ANC as per the advice of the treating doctor & in the post natal period as defined under follow up protocol.
- ◆ In case of any complication or for delivery of pregnant women with GDM, referral facility under JSSK should be made available.
- ◆ ANM & outreach workers from sub centre/PHC should periodically visit all those mothers on treatment for GDM in their area & ensure that pregnant women with GDM follow the advice of MNT and medical management.

- ◆ MO at PHC should make sure that periodic visits by the GDM mothers are done as per schedule and there are no drop outs.
- ◆ In case GDM mothers are moving out of the area, a detailed report should be given to her regarding the management plan for continuing care wherever she goes.
- ◆ She should be tracked through MCTS/RCH portal & the concerned District Programme Manager should be informed by the treating doctor/designated officer about her migration along with duly filled in Migration form.

5.3 Capacity building of Health personnel under GDM programme

Activity	General orientation about Programme including awareness & IEC	Counselling & Motivation	Knowledge & Skills for Testing GDM	MNT	Medical Management (Metformin and Insulin therapy)	Special obstetric care (antenatal/ intrapartum/ postpartum)	Maintaining records & Follow up
ASHA	√	√		√			√
ANM/SN/ LHV/LT/	√	√	√	√			√
MO	√	√	√	√	√	√	√
Ob/Gyn & Specialist	√	√	√	√	√	√	√
State/ District Programme Managers & Facility in-charges	√						√

NCD staff to be provided appropriate training as per the training provisions stated above

5.4 Training

Training needs for different cadres

Cadre of health workers	Type of training	Days and Content of training
ASHA	<ul style="list-style-type: none"> ◆ General orientation about Programme including awareness & IEC ◆ Maintaining records & follow up 	Half-day (ASHA days to be utilized orientation on: <ul style="list-style-type: none"> ◆ GDM, disease burden, consequences on pregnant women and neonates ◆ Importance of healthy lifestyle including diet in preventing diabetes ◆ Do's and Don'ts for GDM ◆ Recognition of Hypoglycemia ◆ IEC materials on awareness ◆ Maintenance of records and different reporting formats
ANM/LHV/Supervisor	<ul style="list-style-type: none"> ◆ All of the above + ◆ Counselling & Motivation ◆ Knowledge & Skills for Testing GDM ◆ MNT 	2 days orientation on: <ul style="list-style-type: none"> ◆ Methodology of counselling ◆ Awareness & Counselling tips ◆ How to measure blood sugar using a glucometer ◆ How to calibrate glucometer ◆ Diagnosis of GDM based on blood sugar values ◆ MNT: Calculation of caloric requirement & planning a diet accordingly ◆ Diet charts with locally available foods ◆ How to administer Insulin injection: Site & route of insulin injection ◆ When and where to refer ◆ Post-partum testing of glycemic status of mother with GDM
MO & Ob/Gyn/SN/LT/Counsellors	<ul style="list-style-type: none"> ◆ All of the above + ◆ Medical Management (Metformin and Insulin therapy) ◆ Special obstetric care (antenatal/intrapartum/postpartum) 	2 days orientation on: <ul style="list-style-type: none"> ◆ Medical management: When & how to initiate Metformin or Insulin therapy, titration of dose of Insulin ◆ Recognition & management of Hypoglycemia ◆ Special obstetric care: Antepartum, Intrapartum & postpartum ◆ Management of Neonate ◆ Identification of cases requiring referral and referral protocols
Programme Managers/Store in charge	General orientation about programme and quality assurance	One day orientation on: <ul style="list-style-type: none"> ◆ Structure of training ◆ Logistics of training and service delivery ◆ Records and registers ◆ Monitoring and quality assurance ◆ Outcome measures

Structure of Training for GDM Programme

- ☞ A cadre wise training will be organised for GDM programme in every district as per the table under section 5.3

Training/Orientation duration and batch size

- ☞ ASHA : Half day orientation; Batch size-25-30
- ☞ ANM/LHV/Supervisor (Front Line Workers): Two days training; Batch size-25-30
- ☞ MO & Ob/Gyn/SN/LT/Counsellors: Two days training; Batch size-10-15
- ☞ Programme Managers/Store In charge: One day orientation; Batch size-40-60

Training Planning

- ☞ All delivery points in a district will be mapped
- ☞ Health personnel of all delivery points need to be oriented/trained
- ☞ Once delivery points are saturated, other health personnel involved in antenatal care will be oriented
- ☞ District training in-charge will accordingly prepare training plan & calendar

Training sites

Prerequisites:

- ☞ Seminar/Conference room with capacity of 50-60 participants
- ☞ AV aids & other training aids
- ☞ Facility with high delivery load
- ☞ Preferably in-house Ob/Gyn & 1 Physician/Endocrinologist
- ☞ Availability of in-house 1 paediatrician, 1 counsellor & 1 dietician is preferred
- ☞ Facility conducting comprehensive management of GDM including both controlled & uncontrolled cases
- ☞ Any Medical College/District Hospital having above prerequisites can be chosen as a training site

Trainer

- ☞ Ob/Gyn, physician/endocrinologist, paediatrician, counsellor, dietician to be included as trainers for GDM clinical trainings as per their availability & area of expertise

- ☞ District Program Managers/District Community Mobilizers/Block Community Mobilizers can be included as trainers for ASHAs orientation
- ☞ 2 days TOT should be organised for 20-25 trainers at medical college level/district hospital for clinical trainings and one day for community mobilization orientation for ASHAs

Training material

- ☞ GOI guidelines on GDM
- ☞ Any other teaching or training material synchronised with GOI guidelines

Training aids

- ☞ Job aids/Posters/Handouts
- ☞ Presentations
- ☞ Video
- ☞ Hands on workshop

6. Records & Registers

- ☞ GDM reporting should be synchronised with HMIS and MCTS/RCH portal for reporting purpose
- ☞ Health personnel at various levels should keep/maintain records as defined under the programme for various levels as indicated below:
 - Monthly GDM Reporting Format for State & District Programme Managers (Annexure 4)
 - Monthly GDM Reporting Format for Health Facility (Annexure 5)
 - Migration form for pregnant women with GDM (Annexure 6)
- ☞ Use of SMS and mobile phones may be promoted for collection of information/data regarding GDM.

7. Monitoring and Quality Assurance

State & district Programme Managers to ensure

- ☞ Constant supply of metformin, insulin, pen and other logistics and its proper storage and distribution
- ☞ Supply, maintenance and calibration of glucometers and glucometer strips
- ☞ Accreditation of training sites and timely completion of training
- ☞ Periodic evaluation of technical skills of ANM/SN/LHV
- ☞ Any maternal death if attributed to GDM should be specially mentioned in Maternal Death Surveillance and Response (MDSR reporting)

- ☞ Include GDM in State IEC plans
- ☞ GDM testing & care to be linked to the existing NCD programme
- ☞ Reflecting adequate budget in PIP & ensuring timely release of funds
- ☞ Monitoring the outcome & progress

8. Outcome measures to be assessed

- ☞ Number/percentage of pregnant women who tested positive for GDM out of total ANC
- ☞ Number/percentage of pregnant women diagnosed as GDM in 1st trimester out of total ANC
- ☞ Number/percentage of pregnant women diagnosed as GDM in 2nd and 3rd trimester out of total ANC
- ☞ Number/percentage of GDM women requiring medical treatment-metformin or insulin out of total diagnosed as GDM
- ☞ Number/percentage of GDM women requiring referral for further management out of total diagnosed as GDM

9. Key points

- ◆ Universal testing of all pregnant women for GDM
- ◆ Testing recommended twice in pregnancy; at 1st antenatal visit and then at 24-28 weeks of gestation.
- ◆ Single step 75 gm 2 hr OGTT test performed.
- ◆ Pregnant women testing positive (2 hr OGTT \geq 140 mg/dL) should be started on MNT for 2 weeks.
- ◆ If 2 hr PPBS \geq 120 mg/dL after MNT and physical exercise, medical management (metformin or insulin therapy) of pregnant women to be started as per guidelines.
- ◆ Pregnant women to be monitored by 2 hr PPBS throughout pregnancy as per high risk pregnancy protocol. Recommended 8 antenatal visits (4 additional visits) to be conducted during pregnancy period (at least a monthly visit to be ensured)
- ◆ Pregnant women with GDM on Insulin therapy with uncontrolled blood sugar levels (2 hr PPBS \geq 120 mg/dL) or insulin requirement $>$ 20 IU/day should be referred for delivery at CEmOC centres
- ◆ GDM pregnancies are associated with delay in lung maturity of the fetus; so routine delivery prior to 39 weeks is not recommended.
- ◆ Early delivery with administration of prophylactic corticosteroid therapy for fetal lung maturity to be planned only if uncontrolled blood sugar or any other obstetric indication
- ◆ Vaginal delivery preferred, LSCS for only obstetric indications or fetal macrosomia.
- ◆ Neonatal monitoring for hypoglycemia and other complications
- ◆ Postpartum evaluation of glycemic status by a 75 g OGTT at 6 weeks after delivery.

10. Budget

- ☛ Infrastructure: Not required
- ☛ Human resource: No separate human resource required
- ☛ Equipments/Instruments and supplies:
 - i. Plasma calibrated Glucometers
 - ii. Glucometer strips
 - iii. Insulin syringe: 40 IU/Insulin Pen
 - iv. Calibration fluids
 - v. Lancets
 - vi. Cotton for swabs
 - vii. Disposable glasses 300 ml
 - viii. Spoons
 - ix. Beaker 500 ml with markings
 - x. 75 gms glucose pouches
- ☛ Drugs:
 - i. Metformin: 500 mg tablets
 - ii. Insulin: pre-mixed 30:70 & regular / cartridge for pen
- ☛ Printing material:
 - i. Monthly GDM reporting format for State & District Programme Managers (Annexure 4)
 - ii. Monthly GDM reporting format for Health Facility (Annexure 5)
 - iii. Migration form for Pregnant women with GDM (Annexure 6)

Case Load for GDM program:

- a. Nearly 14% of ANC screened pregnant women may be tested positive for GDM.
- b. Around 3% of pregnant women may need medical therapy by metformin or insulin therapy.

Budget estimates and provision for following needs to be done by the state/district programme officer:

- 1 **Insulin:** Human premix insulin 30/70 /cartridge for pen
 - (a) **Insulin syringe and vial**
 - i. On an average one woman may need 5 units of insulin per day and initial estimation for 180 days needs to be done.
 - ii. Thus one woman will need average 900 units of insulin during her treatment of 180 days, this amount to an average 6 vials (10 ml vial of 40 IU/mL) of insulin per woman.
 - iii. One syringe can be used only once. Thus each woman will need 180 insulin syringes during her treatment of 180 days.

(b) Insulin pen, cartridge and disposable needles

- i. One Insulin pen will be needed by each women
- ii. On an average one woman may need 5 units of insulin per day and initial estimation for 180 days needs to be done. Thus one woman will need average 900 units of insulin during her treatment of 180 days. Thus an average 6 cartridge (3 ml cartridge of 100IU/mL) of insulin per woman.
- iii. One needle can be used for single injection. Thus each woman will need 180 disposable needles during her treatment of 180 days

2 Metformin tablets 500 mg each

- i. On an average one woman may need two tablets of 500mg of Metformin per day and initial estimation for 150 days needs to be done (can be initiated after 20 weeks pregnancy).
- ii. Thus one woman will need average 300 tablets of Metformin during her treatment of 150 days.

3 Other logistics

(a) Glucometer

- i. Availability of glucometer with standard specifications is to be ensured at all such centres where GDM is being implemented.
- ii. Before procuring new equipment, availability of existing glucometer through regular programme or under NCD needs to be accounted for.
- iii. No separate budget for sub centre may be required since untied funds can be utilised for this.
- iv. Even at higher facility the untied funds can be utilised since the cost of device is not high. each pregnant women on insulin (3% of pregnant women) will require 18 strips for the 6 months of treatment.
- v. MCH L2 level centres should have 3 glucometers. One to be kept in Labour room, one in ANC room for testing blood sugar during ANC and one in store as standby.
- vi. MCH L3 level centres including medical colleges should have 5 glucometers. One to be kept in labour room, another in ANC room for testing blood sugar during ANC and one in lab. Two standby glucometer is suggested to be kept in the equipment store for use due to any exigency like currently used glucometer becoming non-functional.
- vii. Sub health centres (MCH L1) needs to have one glucometer.

(b) Testing strips for Glucometer and Lancets

- i. It is estimated that each pregnant women will be tested twice during the ANC period for diagnosis of GDM.
- ii. The pregnant women on MNT will require PPBS estimation as every month from diagnosis of GDM to delivery. Thus GDM positive women (14% of ANC registered) will require 6 strips and lancets for the 6 months of treatment.

- iii. The pregnant women on medical management (insulin/metformin) will require fasting and PPBS estimation every month from diagnosis of the GDM to the delivery. GDM positive women on insulin will need to be monitored for those titration, thus each pregnant women on insulin (3% of pregnant women) will required 18 strips for the 6 months of treatment.
- iv. A GDM positive woman (14% of ANC registration) will be tested at 6 weeks after delivery
- v. Strips can be purchased either from state/regular PIP budget or JSSK diagnostic funds.
- vi. Corresponding to strips, sterile lancets will be required for testing.

(c) Glucose pouch

- i. The state should procure 75 gm glucose pouch
- ii. It is estimated that each pregnant women will be tested twice during the ANC period for diagnosis of GDM and once at 6 week postpartum follow-up. Thus the number of glucose pouches to be procured should be twice the number of estimated pregnancies in the district + 14% (expected % of women who will be diagnosed to have GDM) of the estimated pregnancies for 6 weeks postpartum.

4. Training:

- i. Training will be organised for GDM programme in every district as per table 5.3. Budget for residential training can be planned and proposed under NHM PIP.
- ii. Programme Managers will attend one day orientation
- iii. MO/ObGyn/SN/LT/Counsellors will attend 2 days training
- iv. ANM/LHV will attend 2 days training
- v. ASHAs will attend a half day orientation.

Budget for 1 days orientation of Program Managers/Store in charge, Batch size of 50

Sr. No	Head	Unit Cost	Number of Participants	Total
1	DA to district/block level Programme officers	Rs. 700/day	16	Rs. 11,200/-
2	DA to Medical Officers/ObGy	Rs. 700/day	16	Rs. 11,200/-
3	DA to Store in charge	Rs. 400/day	15	Rs. 6,000/-
4.	Lunch & Tea Day	Rs. 200/day	50	Rs.10,000/-
5.	Honorarium to district and Sub-district level guest faculty**	Rs. 600/ (per day)	2	Rs.1,200/-
6.	Honorarium to State level faculty	Rs. 1000/day	1	Rs.1,000/-
7	Accommodation for State level faculty (as per actual, if Govt. accommodation not available, receipts to be produced)	Rs. 2000/day	1	Rs. 2,000/-
8	Logistic expenses like study material, course material, photocopying, job aids, flip chart, Audio Visuals etc. (Rate x number of participants)	Rs. 200	50	Rs. 10,000/-
	Sub Total			Rs. 52,600/-
11	Incidental overhead (10% of sub-total)		50	Rs. 5,260/-
	Total for One batch			Rs. 57,860/-

Budget for 2 days training ObGy/MO/SN for GDM, Batch size of 30

Sr. No	Head	Unit Cost	Number of Participants	Days	Total
1	DA to participants MO/ObGy	Rs. 700/day	28	2	Rs. 39,200/-
2	Lunch & Tea Day	Rs. 200/day	30	2	Rs.12,000/-
3	Honorarium to district and Sub-district level guest faculty**	Rs. 600/ (per day)	2	2	Rs. 2,400/-
4	Logistic expenses like study material, course material, photocopying, job aids, flip chart, Audio Visuals etc. (Rate x number of participants)	Rs. 200	30		Rs. 6,000/-
	Sub Total				Rs. 59,600/-
8	Incidental overhead (10% of sub-total)				Rs. 5,960/-
	Total for One batch				Rs. 65,560/-

Budget for 2 days training Field Level Workers for GDM, Batch size of 30

Sr. No	Head	Unit Cost	Number of Participants	Days	Total
1	DA to participants SNM/LHV	Rs. 400/day	28	2	Rs. 22,400/-
2	Lunch & Tea Day	Rs. 200/day	30	2	Rs.12,000/-
3	Honorarium to district and Sub-district level guest faculty**	Rs. 600/ (per day)	2	2	Rs. 2,400/-
4	Logistic expenses like study material, course material, photocopying, job aids, flip chart, Audio Visuals etc. (Rate x number of participants)	Rs. 200	30		Rs. 6,000/-
	Sub Total				Rs. 42,800/-
8	Incidental overhead (10% of sub-total)				Rs. 4,280/-
	Total for One batch				Rs. 47,080/-

Note: ***TA to be given as per state Norms.

*The state need to adjust the training norms as per the training load of the district and state.

Note:

Every district programme officer needs to undertake advanced planning and budget estimates for universal screening of GDM in the district.

State programme officer needs to reflect the budgetary requirement either in the state/NHM PIP.

Necessary equipment/supplies either cash or in kind need to be made available in advance to all the health facilities in the district. Similarly training institutes also need to be provided the training budget as per the estimates in advance. Any procurement should be done through competitive and transparent bidding.

Certification of manufacturer for meeting the requirement of specifications and variations, if any by comparing the results from a regularly calibrated auto-analyser for precision and accuracy needs to be clearly mentioned for glucometer supplied.

**Diagnosis & Management of
Gestational Diabetes Mellitus**
Operational Guidelines

11. Goal, Strategic Approach and Activities

11.1 Goal of the initiative

To improve maternal and foetal outcome by universal testing of pregnant women for early diagnosis and management of GDM, through its integration in essential continuum of care package (Ante partum care, intra-partum and post-partum).

11.2 Strategic approach

The strategic approach is to integrate diagnosis and management of Gestational Diabetes Mellitus in continuum of care (ANC, intra-partum and post-partum) as shown in figure 1. The key objectives are to generate community awareness, early diagnosis, management and establishing linkages with NCD program in accordance with the National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus.

Fig. 1: Strategic approach for GDM Diagnosis and Management

Pregnant Woman	<p style="text-align: center;">Ante-partum Care</p> <p>Demand generation – Community awareness, Sensitization for GDM and client mobilization.</p> <p>Diagnosis – First GDM testing OGTT at first ANC contact and if <140 mg/dL, then second testing OGTT at 24-28 weeks of pregnancy.</p> <p>Management – If OGTT result is ≥ 140 mg/dL then start MNT and exercise on the same day. Start medical management if PPBS result ≥ 120 mg/dL in subsequent follow-up visit.</p> <p>Follow-up – PPBS monthly till delivery. Ultrasonography at 18-20, 28-30 & 34-36 weeks of pregnancy.</p> <p>Referral – As per the reasons cited in guideline.</p>	<p style="text-align: center;">Intra-partum Care</p> <p>GDM positive with controlled PPBS</p> <ul style="list-style-type: none"> • <u>On MNT</u> – Normal institutional delivery • <u>On medical management</u>– <ul style="list-style-type: none"> ◆ Monitoring dose of insulin should not be given on the day of delivery. ◆ 2 hourly monitoring of BS from start of labor till delivery. ◆ Insulin (IV) regular in NS (if required) • GDM positive with uncontrolled PPBS-if 2 hr PPBS is ≥ 120 mg/dL, she should be referred to CEMOC. 	<p style="text-align: center;">Immediate Postpartum & Early Neonatal</p> <p><u>New-born Care</u>–</p> <ul style="list-style-type: none"> • Early breastfeeding to prevent hypoglycemia. • Initiate new-born blood sugar monitoring within 1st hr of birth and then repeated every four hourly till 4 normal readings (>45 mg/dL) <p><u>Maternal Care</u>–</p> <ul style="list-style-type: none"> • Counselling for 6 weeks PP follow-up. • Healthy timing spacing of pregnancy to potentially reduce risk of GDM in next pregnancy. 	<p style="text-align: center;">Postpartum Follow-up Care</p> <p><u>Follow-up</u> at 6 weeks after delivery through OGTT and link with NCD program</p> <ul style="list-style-type: none"> • Annual screening for DM at NCD clinic if OGTT < 140 mg/dL • Refer to medical management if OGTT ≥ 140 mg/dL 	Linked to NCD for Follow-up
	Continuum of Care				

11.3 Activities

For an integrated GDM diagnosis and management service delivery, critical activities have been identified during the continuum of care for effective implementation of the program. Care for pregnant women in respect to GDM starts from awareness on the risk to mother and foetus and information on the management and availability of the GDM services.

The activities have been defined on this principle of “Packaged service delivery mechanism” for the pregnant women diagnosed at every pause point along the continuum of care to avoid any missed opportunity. Activities are aligned in such a way that GDM services are rendered to all pregnant women by leveraging existing service delivery platforms and contacts with them. Following section describes the key activities along with the potential roles and responsibilities of service providers at various service delivery platforms.

11.3.1 Antepartum Care:

The most critical component is to initiate ANC based universal GDM screening and diagnosis. States/ Union territories and districts should utilize all service delivery platforms of ANC for demand generation, GDM diagnosis and management including follow up and referral.

- **Demand generation:** Creating awareness and demand generation is a key step in mobilizing pregnant women for GDM testing. Health care providers/front line workers should utilize all opportunities of contact with pregnant women including home visits, community outreach sessions (VHSND), ANC clinics at facilities for creating awareness and demand generation on GDM services. Demand generation should be primarily done by ASHA, supported by ANM, MO, SN, LT wherever required.
- ◆ ASHAs should create awareness in the village through home visits and village meetings.
- ◆ ASHAs should prepare due list of the ANC clients and mobilize pregnant women for OGTT on VHSND and ANC day. One of the key pivotal information to be provided to the pregnant women is to prepare them for the process of GDM testing which includes intake of 75gms glucose and waiting time of 2 hrs. for the test.
- ◆ ASHA should do follow-up on the counselling of pregnant women about GDM test and refer her to ANM/MO/SN for further discussion on its necessity and possible adverse effect on mother and child.
- **GDM Diagnosis:** GDM testing requires blood sugar testing of all pregnant women post 2 hrs. of 75 gms Oral Glucose intake (OGTT).
- **At VHSND:**
 - ◆ During initiation of the program, all pregnant women, irrespective of their gestational age will be included in the line list for screening test.

- ◆ On the day of the session: ASHA should call all the pregnant women using the line list of pregnant women she has prepared for the village.
- ◆ ASHA/ANM should encourage pregnant women to bring their own glass, spoon and drinking water for testing, if potable drinking water is not available at VHSND sites.
- ◆ After counselling by ANM, ANM/ASHA should provide solution of 75gm glucose in 300 ml water to pregnant women and will record the time.
- ◆ ANM should test blood sugar using glucometer two hours after ingestion of 75gm glucose solution. After testing, ANM should inform the result to the woman and record it in MCP card and ANC register. GDM positive women details should be recorded in GDM management and follow-up register
- ◆ If GDM data field is not included in MCP card, then stamp of GDM data fields must be provided at each village.
- ◆ ANM should help ASHA to prepare line-list of GDM positive women from GDM management and follow-up register on the same day of diagnosis before the end of session.
- ◆ If 1st test is negative, then second test is to be scheduled between 24–28 weeks of pregnancy. If second test is not done during this period, then it should be done on the earliest subsequent contact with pregnant women.
- ◆ If first contact of pregnant women for ANC is at or beyond 28 weeks of gestation age, then only one OGTT needs to be done.
- ◆ SN/ANM/LT should inform field level ANM/ASHA for follow-up of blood sugar monitoring and management.
- ◆ Plan for left out pregnant women: ANM can prioritize home visits for GDM testing of left out pregnant women. ANMs to make home visits in the same village on the next day of VHND session. ANM and ASHA should plan and call pregnant women who were not tested on VHND day. Alternatively, they can counsel pregnant women to visit the neighboring village on VHND day/Sub-Health Center (SHC)/ health facility.
- **At Facility:**
 - ◆ In most of the facilities, ANC OPD day is fixed. If ASHA is accompanying the woman, then same process as done at VHSND will be followed. Other ANC check-up platforms like PMMSA can also be utilized.
 - ◆ In cases where ASHA is not accompanying the woman, ANM/LT/SN who so ever is doing the GDM tests should counsel, provide glucose solution and conduct OGTT using glucometer and record the results.
 - ◆ SN/LT should record GDM results in MCP card and in the ANC register; and GDM positive women details in GDM management and follow-up register.

- ◆ SN/ANM/LT should inform field level ANM/ASHA for follow-up of blood sugar monitoring and management
- ✎ **GDM Management:** National guidelines recommend GDM management to be done through either medical nutrition therapy or/ and with medical management (Insulin/Metformin). The post-prandial blood sugar (PPBS) level should be maintained at a level <120 mg/dL. The initial treatment is through Medical Nutrition Therapy (MNT) and follow-up testing should be done after 2 weeks. If the PPBS level remains higher than 120 mg/dl, medical therapy is added.
- **At VHSND:**
 - ◆ ANM should counsel GDM positive women for MNT, physical exercise and follow-up schedule on the day of diagnosis itself and record client details in GDM management and follow-up register.
 - ◆ ANM should use sample meal plan with locally available food / plan given in ANM flip books. All these job aids should be provided to service providers at the time of training.
 - ◆ ANM should refer the client to facility for medical management, if PPBS result ≥ 120 mg/dl in subsequent follow-up visit.
- **At facility:**
 - ◆ SN/LT/MO should counsel GDM positive women for MNT, physical exercise and follow-up schedule on the day of diagnosis itself and record client details in GDM management and follow-up register.
 - ◆ SN should use sample meal plan with locally available food / plan given in flip books. SN should refer the client to MO for medical management, if PPBS result ≥ 120 mg/dl in subsequent follow-up visit.
 - ◆ MO should initiate medical management after assessing MNT compliance. Insulin therapy can be started in any week of pregnancy while metformin can be started only at/after 20 weeks. Insulin/metformin dose should be determined after titration as per the blood sugar level of client and follow-up schedule as per the national guidelines. MO should prescribe at-least monthly requirement of insulin/metformin doses/vials/tablets and insulin syringes.
 - ◆ Pharmacist should issue insulin vials and syringes or metformin tablets as per the prescription.
 - ◆ MO/SN/ANM should train GDM positive women for self-administration of insulin injection and to replenish the stock on monthly basis.
 - ◆ MO/SN/ANM/LT should inform field level ANM/ASHA for follow-up of blood sugar monitoring and management.

Districts shall prepare food compendium based on the local eating habits and this should be used in MNT counselling for adoption.

- ✎ **Follow-up:** Regular follow-up visits are to be done as per “High Risk Pregnancy” protocol. High Risk Pregnancy recommends to conduct additional 4 ANC visits along with the routine 4 visits (at least monthly visit to be ensured).
- **At VHSND:**
 - ◆ ANM should help ASHA to prepare line-list of GDM positive women from GDM management and follow-up register on the same day of diagnosis before end of the session.
 - ◆ ASHA should mobilize GDM positive pregnant women for blood sugar monitoring
 - ◆ ANM should perform 2hrs post prandial blood sugar (PPBS) and record the result in GDM management and follow up register.
 - ◆ ANM should reinforce the key messages pertaining to management of GDM if PPBS is <120 mg/dL and refer the GDM positive women to higher facility if PPBS is \geq 120 mg/dL
 - ◆ ANM / ASHA should motivate the GDM positive women to visit facility for blood sugar monitoring every month till delivery and 6 weeks after delivery.
 - ◆ If pregnant women are started on insulin, ANM should train pregnant women in insulin injection process and follow-up visit schedule.
 - ◆ Status of GDM positivity is considered as high risk pregnancy. GDM positive women to be linked with specialized services available under Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA).

Services available under Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)

- ◆ All the pregnant women and GDM positive women should visit the Facility on PMSMA day for diagnosis as well as management of GDM as per guidelines
- ◆ All basic laboratory investigations for GDM should be performed and beneficiary should be examined by the OBGY/Medical Officer.
- ◆ **Ensure that all PMSMA sites provided OGTT services**
- ◆ A detailed history of all the beneficiaries should be taken and they should be assessed for any danger signs, complications or any other high risk status.
- ◆ All identified high risk pregnancies including GDM positive women should be referred to higher facilities for management of high risk factors.
- ◆ **A red sticker should be added onto the MCP cards of all GDM positive pregnant women to indicate the high risk status of the pregnancy.**
- ◆ All identified GDM positive women including those with complications to be managed and treated by OBGY/CEmOC/BEmOC Specialist). If needed, such cases should be referred to higher level facilities and a referral slip with probable diagnosis and treatment given should be mentioned on the slip.

- ◆ Before leaving the facility every pregnant women to be counselled, may be individually or in groups, on nutrition, rest, safe sex, safety, birth preparedness, identification of danger signs, institutional delivery and Post-partum Family Planning (PPFP).

- **At Facility:**

- ◆ MO/SN/ANM/LT should do blood sugar monitoring of GDM positive women every month.

👉 **Referral:** Referral of GDM positive pregnant women should be done in case of following circumstances

- **From VHSND:**

- ◆ ANM should refer GDM positive women if PPBS result ≥ 120 mg/dL in subsequent follow-up visit if following warning signs are present:

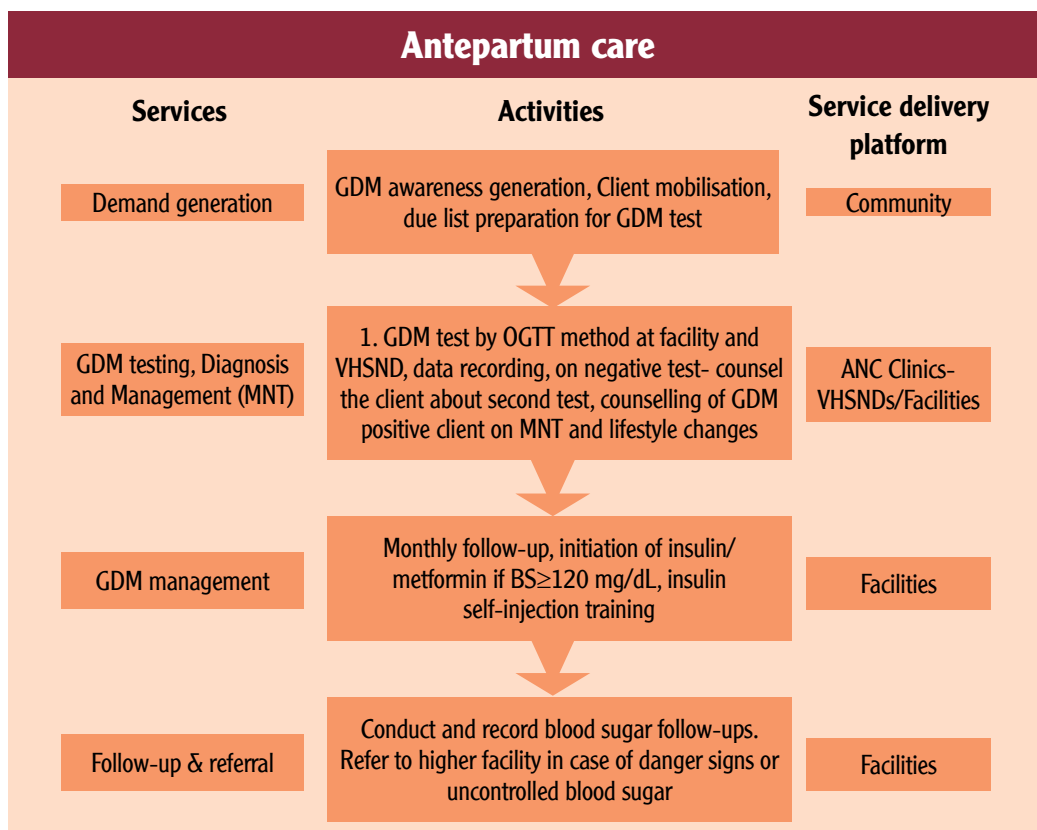
Warning Signs

- Nausea & vomiting and not able to take food orally
- If pregnant women develop symptoms of hypoglycemia like- Shivering, sweating and palpitation, excessive headache, blurring of vision
- Less fetal movements
- Pre-mature rupture of membrane
- Abdominal pain, burning micturition, fever

- **From Facility:**

- ◆ MO/SN/LT should refer GDM positive women to higher facility in case of following circumstances:

- If PPBS is more than 200 mg/dL
- Total dose of insulin (combined morning and evening dose) on each day exceeds 20 units
- If pregnant woman refuses to take insulin injection



11.3.2 Intra-partum Care:

GDM is considered to be a high risk pregnancy which requires the recommended protocols to be followed. Institutional delivery and monitoring of blood sugar level is recommended for timely management of any intra-partum complication to ensure positive outcome of pregnancy.

➡ **GDM positive woman on MNT with controlled blood sugar**

- ◆ MO/SN should start preparation for normal delivery on arrival of pregnant women for delivery.
- ◆ MO/SN should monitor GDM positive woman for complication and timely management of complication.
- ◆ MO/SN should record details of delivery, any complication and referral.

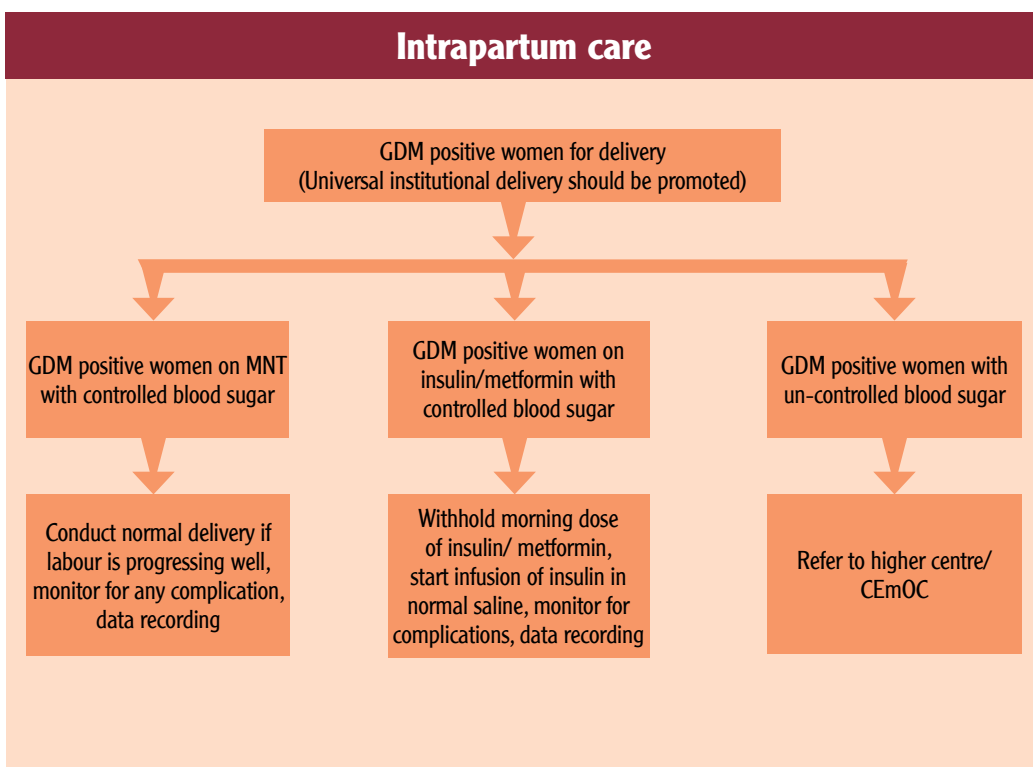
➡ **GDM positive woman on insulin / Metformin with controlled blood sugar**

- ◆ MO/SN should with-hold morning insulin/metformin dose
- ◆ MO/SN should start infusion of insulin in normal saline if required

- ◆ MO/SN should monitor GDM positive woman for any complication and should timely manage the complications.
- ◆ MO/SN should record details of delivery, any complication and referral

👉 **GDM positive woman with uncontrolled blood sugar**

- ◆ MO/SN should refer the pregnant women to higher center/ CEmOC.



11.3.3 Immediate Post-Partum and Newborn Care:

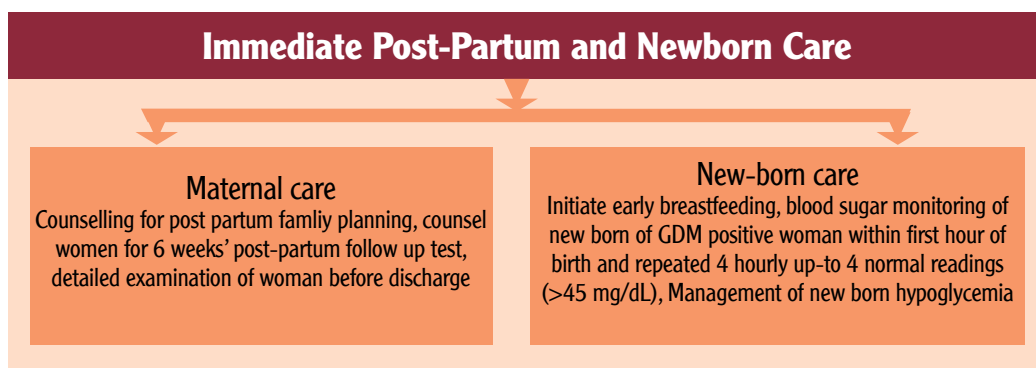
Essential Newborn care as well as maternal care is mandatory to prevent any complication after delivery. Newborn should be monitored for hypoglycemia and mother should be counselled for warning signs, importance of healthy timing and spacing of pregnancy to avoid GDM associated risk in next pregnancy.

👉 **Maternal Care:**

- ◆ MO/SN should counsel for post partum family planning to potentially reduce risk of GDM in next pregnancy
- ◆ MO/SN should perform detailed examination to assess the condition of mother before discharge
- ◆ MO/SN should encourage and counsel women for 6 weeks' post-partum follow up for OGTT.

➔ New Born Care

- ◆ MO/SN should encourage GDM positive woman to initiate early breastfeeding to prevent hypoglycemia
- ◆ MO/SN should monitor blood sugar of new born of every GDM positive woman within first hour of birth and to be repeated 4 hourly until 4 normal readings are achieved. (>45 mg/dL)
- ◆ MO/SN should manage new born hypoglycemia (if it occurs).
- ◆ MO/SN should perform detailed examination to assess the condition of the mother before discharge.

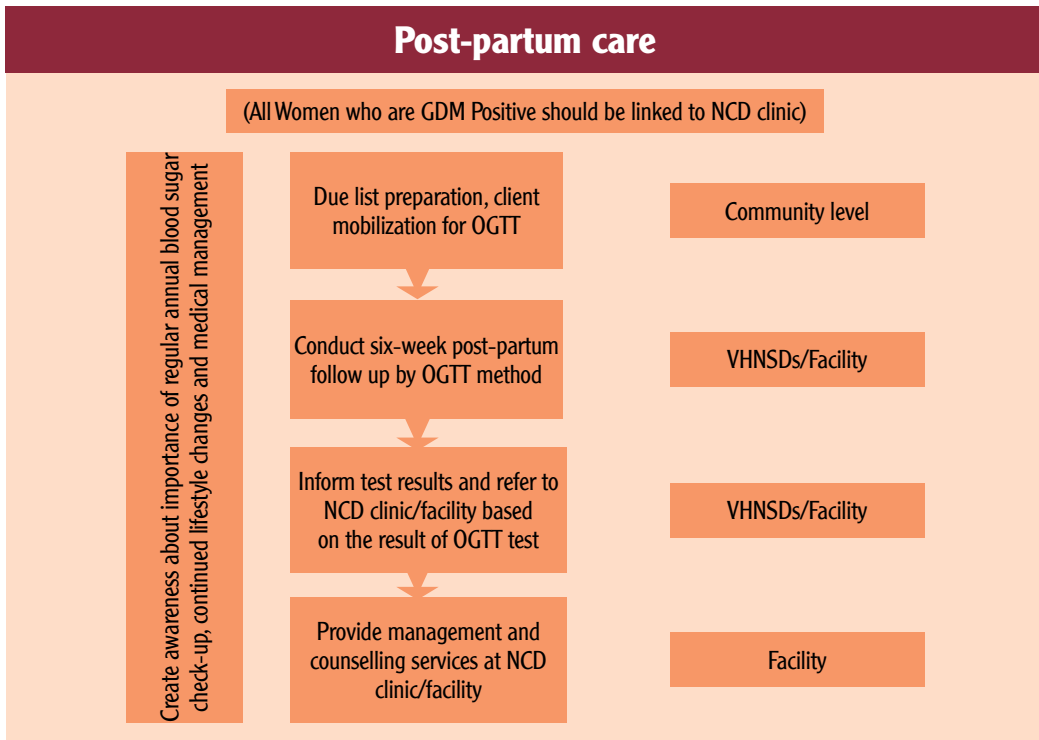


11.3.4 Post-partum care:

All GDM positive women should be tested by OGTT method at 6 weeks after delivery for impaired glucose tolerance and to be linked with NCD OPD/clinic for appropriate follow-up (annually if normal level) and management (if diagnosed with high sugar levels).

- **At VHSND:**
 - ◆ ASHA should prepare due list of all GDM positive women with the help of ANM, from GDM management and follow up register for six-week post-partum follow up.
 - ◆ ASHA should inform GDM positive woman for follow up prior to the VHSND/ANC day and mobilize her for OGTT 6 weeks after delivery.
 - ◆ ANM should conduct six weeks' post-partum follow up by OGTT method
 - ◆ ANM should inform woman about six-week post-partum test results and refer to facility based on the result of OGTT test
- **At Facility:**
 - ◆ ASHA should prepare duelist and mobilize woman same as described in VHSND section.
 - ◆ SN/LT should conduct six weeks' post-partum follow up by OGTT method

- ◆ SN/LT should inform woman about six-week post-partum test results and refer to MO based on the result of OGTT test
- ◆ MO should assess and suggest treatment based on the result of OGTT test



11.3.5 Linkages with NCD program:

This activity should be same at both facility and VHSND and will be done by ASHA/ANM/SN/LT/MO

- ☛ GDM positive women are at high risk of developing DM later in life.
- ☛ ASHA/ANM/SN/LT/MO should counsel GDM positive women about importance of regular blood sugar testing after delivery along with life style and dietary modification.
- ☛ ASHA/ANM/SN/LT/MO should counsel family members on routine blood sugar testing under NCD clinic/OPD

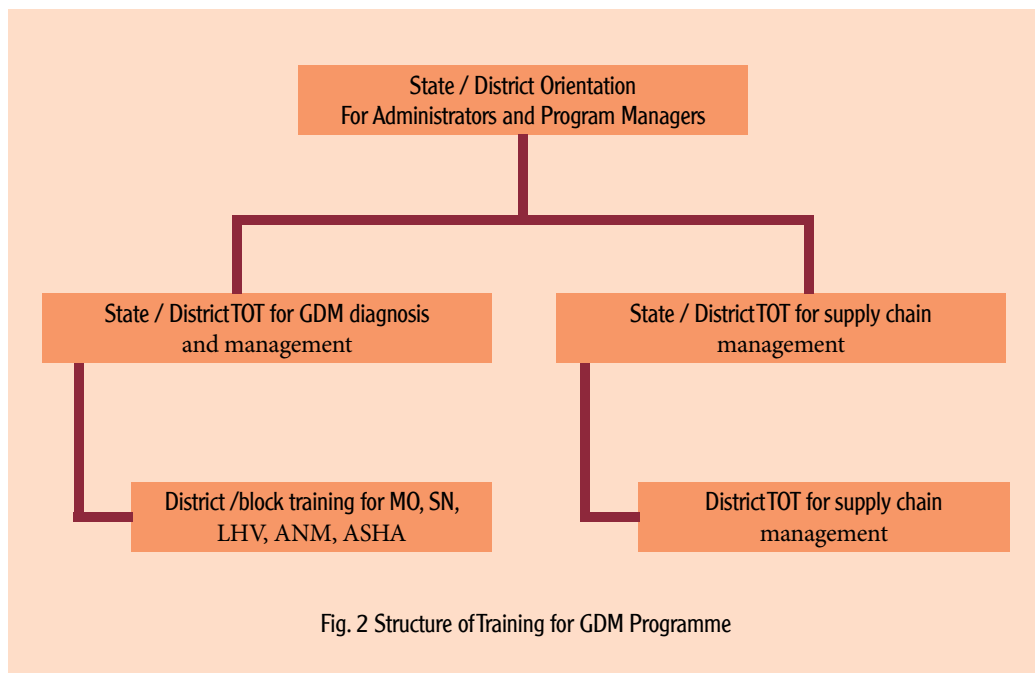
12. Operational plan for rolling out GDM program

To implement National Guidelines on Diagnosis and Management of Gestational Diabetes Mellitus, the operational plan is to strengthen capacity of health personnel, ensuring logistic availability through supply chain management and creating enabling environment.

12.1 Capacity building of Health personnel under GDM program

GDM trainings should be structured to build capacity of service providers/frontline health workers on

awareness generation and service provision. These trainings will be targeted to achieve the goal of providing continuum of care.



- ☛ State/district level Orientation of administrators and program Managers from state/district/block should be organized on GOI-National Guidelines for Diagnosis and Management of Gestational Diabetes Mellitus-2018. Performance of GDM programs running in India and their results can be shared. The agenda of orientation should be updation on GDM program and roles and responsibilities of the officials in program implementation, monitoring and evaluation.
- ☛ State/district level TOTs for all cadres (ASHA, ANM, MO, SN, PM & store in-charge) should be held to create pool of state/district master trainers on GDM diagnosis, management and supply chain management.
- ☛ Half day ASHA orientation should be conducted at district/block level and should focus on their role in creating awareness in community, mobilization of all pregnant women for GDM testing, adherence to MNT and regular follow-up.
- ☛ 2-days training of ANM/SN/LT should be conducted to train them in GDM testing through OGTT, calculation of calorie requirement of GDM positive women Medical Nutritional Therapy (MNT), Physical Exercise counselling and follow-up.
- ☛ 2 days Training of MO/Ob-Gyn/Specialists and facility based nursing staff should be organized together for better coordination. This training should cover GDM testing, MNT counselling, management by insulin/metformin, intrapartum and post-partum care. The staff from high delivery load facilities should be trained on priority to cover maximum client load. Maternity wing SN and MO of each facility should be trained on priority.

Logistic management is the backbone of GDM program implementation. Training of program managers and store in-charges should be done on supply chain management.

The table below shows the types of training, duration, participants and training content

Learning resource Package (LRP)	Duration	Participants	Content
ASHA training	Half day	ASHA/ASHA supervisor	Awareness & demand generation, need for follow up and adherence to treatment
ANM training	2 days	ANM/LT/LHV/ Supervisor/counsellor	GDM diagnosis and management
MO/SN training	2 day	Specialist/MO/SN	
Program manager & store in-charge training	1 day	Store in-charge and program manager	Logistics and supply chain management system

12.2 Post training follow-up and mentoring support

After training, service provider should initiate GDM diagnosis & management services. Supportive supervisory visits should be done for onsite mentoring, gap identification, gap filling. Supervisors/identified nurse mentors of the districts are good resources to be utilized for mentoring and supervisory visits at facility level. They should supervise that all ANCs are tested for GDM and counselled appropriately. For field mentoring; block and district officials should conduct mentoring visits during VHSND day and to Sub-health centers. Checklist for supervision (Annexure 7)

12.3 Essential supplies and commodity management

Ensuring logistics availability in all service delivery sites is one of the most critical components for provision of GDM diagnosis and management service at delivery points. State/district should make estimation of logistics according to the ANC population in the catchment area. It is also important to establish a mechanism of replenishment of the logistics and its periodicity. The following table provides list of the essential logistics:

The calculation of logistics for GDM program should be based on total ANC registrations of previous year (within the catchment area of the service delivery point). A sample calculation shown below is done for 5000 populations.

Annual Logistics Required considering 5000 population		
1	Estimated number of ANC registrations	112
2	Plasma Calibrated Glucometer	1
3	Glucometer strips and lancets	387
4	Glucose packets/pouches	264
As per actual (Total dose requirement @ client on insulin/metformin)		
1	Human premix Insulin (30/70)	7 insulin vials
2	Insulin syringe 40 IU/ml	198
3	Metformin Tablet	330

12.4 Logistics supply chain management

All processes and mechanisms of procurement, indenting and distribution of logistics required for GDM program need to be put in place for an un-interrupted provision of services. Based on the recommendations of national guidelines, a matrix for logistic planning has been designed to guide program roll out/ scale-up of GDM services. The template for logistic planning is given in Annexure 9.

12.5 Enabling environment for GDM Program:

State and district should plan and calculate budget for GDM training, logistic/supplies and IEC material and put in PIP. They should periodically review program performance to identify bottlenecks. State should integrate GDM program review and this should be an integral part of district/state review meetings.

12.6 Creating Awareness among the beneficiaries for GDM program

It is important that all opportunities and channels of communications be leveraged to promote delivery of GDM services across continuum of care. Focused IEC and BCC strategy would play a crucial role in creating awareness and demand generation among the masses for utilizing the services during and after the pregnancy period. Following are some illustrative activities that will be undertaken, either as a part of an integrated BCC strategy or as standalone interventions for promoting GDM services and linkages with NCD program.

- **Mass Media Activities such as:**
 - ◆ Design and broadcast radio and TV spots giving messages on GDM program
 - ◆ Design and disseminate posters, wall hangings, wall paintings and billboards to be displayed at the identified facilities, important roads, intersections and important markets detailing GDM program and linkage with NCD

- ◆ The program is to be advertised in various local newspapers including Hindi and English newspapers at regular intervals.
- ◆ Kiosk/ scrolling messages regarding the services being displayed at facility level
- **Mid-media activity such as:**
 - ◆ Organize folk theatre, street shows, audio visual shows, health camps, community meeting (with groups of pregnant women, GDM positive women, SHG, PRI etc) specially during VHSND
 - ◆ Work with front line workers, other community outreach workers, religious leaders, teachers, and other stakeholders to spread to women, families and communities about the importance of GDM and their routine follow-up at NCD clinic
 - ◆ Encourage peer to peer information sharing through CBOs such as Meetings with Mother Support Groups, Self Help Groups, Mahila Mandal by facilitating group meetings and providing them with IEC materials
- **Interpersonal communication activities:**
 - ◆ ANMs, ASHAs and AWWs would also play a pivotal role in mobilization of the community and potential beneficiaries in both rural and urban areas for availing of GDM services at all platforms
 - ◆ ASHA/ANM/SN/LT/MO should create awareness about importance of regular blood sugar testing after delivery amongst GDM positive women.
 - ◆ ASHA/ANM/SN/LT/MO should counsel family members on routine blood sugar testing under NCD clinic/OPD
 - ◆ Pregnant women with GDM and their offsprings are at increased risk of developing Type II Diabetes mellitus in later life. They should be counselled for healthy lifestyle and behaviour, particularly role of diet & exercise.
 - ◆ Meetings by AWWs, ASHAs and ANMs with pregnant women during their visit for Village Health and Nutrition Day as well as for collecting Take Home Ration from Aanganwadi centres.
 - ◆ Members from VHSC/RKS/PRI to be involved in identifying and orienting pregnant women and sensitization of members of the community on GDM.

Key Messages:

- ◆ About 10-14% of women who had normal blood sugar before pregnancy develop high blood sugar during pregnancy.
- ◆ GDM causes maternal and fetal risks leading to morbidity and mortality
- ◆ Single step 2 hourly 75 grams Oral Glucose Tolerance Test can help diagnose GDM

- ◆ All pregnant women need to be screened for GDM twice:
 - 1st test is done during first ANC visit.
 - If first test is negative and was done before 24 weeks, 2nd test is done between 24-28th weeks. It is important to ensure second test as many pregnant women develop blood sugar intolerance during this period.
- ◆ In most of the women blood sugar can be controlled by simple exercise and MNT. Some of the women may have to take antidiabetic drugs
- ◆ GDM positive pregnant women is at risk of getting GDM in next pregnancy and developing Type-II Diabetes later in life
- ◆ Considering high risk of developing Type-II Diabetes later in life among GDM positive pregnant women, service providers should counsel on followings:
 - Regular annual follow-up screening for Type-II Diabetes post-delivery at NCD clinics
 - To continue with advised the dietary modifications
 - To continue with advised life style changes including exercise
- ◆ All services are available free of cost at public health facilities

13. Program Monitoring

States/districts introducing GDM diagnosis and management service provision should establish recording, reporting and feedback mechanism.

13.1 Recording mechanism

For recording, GDM information data elements should be integrated in ANC register, labour room register and maternity wing case sheet. A new register “GDM management and follow up” should be printed and given to facilities and field level ANM’s, so that data on MNT/Insulin/Metformin and follow up is recorded properly.

➡ **ANC Register:** In the ANC register used by the facility/ANMs, following additional information should be included

- 1) Height (in cms) of pregnant woman
- 2) Date of first GDM test
- 3) Reading of first GDM test
- 4) Date of second GDM test
- 5) Reading of Second GDM test

➡ **GDM Management and follow up Register:** GDM management and follow up register should be used by ANM/SN both at VHSND and facility level. The purpose of this register is to record and track the blood sugar report, MNT/Insulin/Metformin information of GDM positive client. Since

this GDM screening and management program would be new for state/districts, hence new register needs to be introduced (Annexure 8) for recording readings of blood sugar monitoring of GDM positive client. This register would capture information under the following heads.

- 1) Trimester at the time of GDM diagnosis: This is important considering the GDM positive clients who were early detected.
- 2) Gestation age (in weeks) at the time of GDM diagnosis: This is important because metformin can only be started at or after 20 weeks of pregnancy
- 3) GDM management: To know which therapy (MNT, Insulin, Metformin) GDM positive client is undertaking to manage blood sugar level.

👉 Labor room Register: State/ Districts can use the existing labour room register with addition of following data elements:

- Whether the pregnant women are GDM positive: Yes / No
- If yes, type of treatment: MNT / Insulin / Metformin

👉 Maternity wing case-sheet: State/Districts can continue to use the existing case-sheet with inclusion of following data elements at appropriate sections of case-sheet:

- 1) H/O GDM in previous pregnancy
- 2) Addition of following maternal complications: Polyhydramnios, Pre-eclampsia, Prolonged labor, Obstructed labor, Uterine atony, PPH, Infection
- 3) Addition of following neo-natal complications: Spontaneous abortion, Intra-uterine death, Still birth, Congenital malformation, Shoulder dystocia, Birth injuries, Neonatal hypoglycemia, Neonatal Jaundice, Lethargic neonate, Infant respiratory distress syndrome
- 4) Blood sugar monitoring of woman every 2 hours starting from initiation of labor to delivery
- 5) Blood sugar monitoring of neonate every 4 hours starting from 1st hour of birth till four normal readings are achieved

13.2 Reporting and feedback mechanism

The state/district should establish a robust reporting and feedback mechanism which includes reporting, dashboards for decision making and review meeting. The states may follow their reporting cycle. The reporting structure is shown in the figure below:

The current HMIS has the following data fields related to GDM:

- 1) Number of pregnant women tested for blood sugar using OGTT
- 2) Number of pregnant women tested positive for GDM and
- 3) Number of pregnant women given insulin out of total tested positive for GDM.

- **Dashboard Indicators:** To improve accountability of service providers through improved recording, reporting and utilization of data, a dashboard of key indicators should be developed at every level and mechanism needs to be established for an effective and efficient decision making. The officials should monitor key indicators on a periodic basis towards ensuring improved program uptake, performance and clinical governance at the targeted facilities. Format for monthly report has been appended in Annexure 4,5.

An illustrative list of dashboard indicators:

- 1) Percentage of women screened for GDM for the first time and diagnosed with GDM
- 2) Percentage of pregnant women screened for GDM second time and diagnosed with GDM
- 3) Percentage of GDM positive women coming for follow up
- 4) Percentage of women on Medical Management (On insulin/metformin)
- 5) Percentage GDM positive who had any complication during intra-partum and immediate post-partum period
- 6) % Post-partum women diagnosed with high blood sugar level at 6 weeks
- 7) % facilities having functional Glucometer

- **Review meetings:** GDM program review shall be an integral part of monitoring in monthly meetings at block/ district/ state level. Following point could be part of meeting agenda:
 - ANM wise review of records, ANC clients tested against ANC registered, and monthly achievement should be done at block level review meetings.
 - Block wise review of GDM program performance at district level.
 - District wise performance review at state level.

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Annexures

Annexure 1: BMI Chart (Ideal height weight chart)

Body Mass Index (BMI) Chart for Adults

Class (18.5)
 Overweight (25-30)
 Normal (18.5-25)
 Underweight (<18.5)

HEIGHT in feet/inches and centimeters

WEIGHT	4'0"		4'1"		4'2"		4'3"		4'4"		4'5"		4'6"		4'7"		4'8"		4'9"		4'10"		4'11"		5'0"			
	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs		
160 (352.7)	58	128	59	130	60	133	61	135	62	138	63	140	64	143	65	145	66	148	67	150	68	153	69	155	70	158	71	160
165 (363.8)	59	131	60	133	61	136	62	139	63	142	64	145	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169
170 (374.9)	60	134	61	136	62	139	63	142	64	145	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172
175 (386.0)	61	137	62	139	63	142	64	145	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175
180 (397.1)	62	140	63	142	64	145	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178
185 (408.2)	63	143	64	145	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181
190 (419.3)	64	146	65	148	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184
195 (430.4)	65	149	66	151	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187
200 (441.5)	66	152	67	154	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190
205 (452.6)	67	155	68	157	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193
210 (463.7)	68	158	69	160	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196
215 (474.8)	69	161	70	163	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199
220 (485.9)	70	164	71	166	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202
225 (497.0)	71	167	72	169	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205
230 (508.1)	72	170	73	172	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208
235 (519.2)	73	173	74	175	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211
240 (530.3)	74	176	75	178	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214
245 (541.4)	75	179	76	181	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217
250 (552.5)	76	182	77	184	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220
255 (563.6)	77	185	78	187	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223
260 (574.7)	78	188	79	190	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226
265 (585.8)	79	191	80	193	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229
270 (596.9)	80	194	81	196	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232
275 (608.0)	81	197	82	199	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235
280 (619.1)	82	200	83	202	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238
285 (630.2)	83	203	84	205	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241
290 (641.3)	84	206	85	208	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244
295 (652.4)	85	209	86	211	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247
300 (663.5)	86	212	87	214	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250
305 (674.6)	87	215	88	217	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253
310 (685.7)	88	218	89	220	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256
315 (696.8)	89	221	90	223	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259
320 (707.9)	90	224	91	226	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262
325 (719.0)	91	227	92	229	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265
330 (730.1)	92	230	93	232	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268
335 (741.2)	93	233	94	235	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271
340 (752.3)	94	236	95	238	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274
345 (763.4)	95	239	96	241	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277
350 (774.5)	96	242	97	244	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280
355 (785.6)	97	245	98	247	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280	110	283
360 (796.7)	98	248	99	250	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280	110	283	111	286
365 (807.8)	99	251	100	253	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280	110	283	111	286	112	289
370 (818.9)	100	254	101	256	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280	110	283	111	286	112	289	113	292
375 (830.0)	101	257	102	259	103	262	104	265	105	268	106	271	107	274	108	277	109	280	110	283	111	286	112	289	113	292	114	295
380 (841.1)																												

Annexure 2: MNT & Sample diet chart

The meal plan composition:

- ☛ The recommended composition of the diet for GDM positive mothers is ~50%-60% calories from carbohydrate, 10-20% from protein, 25-30% from fat.
- ☛ The distribution of calories, particularly carbohydrate, makes a difference in the postprandial blood sugars. The total intake of carbohydrate should be controlled and monitored and carbohydrate foods with a lower glycemic index should be emphasized
- ☛ A mixed meal consisting of carbohydrate, protein, fat, fiber eaten together results in slow blood sugar rise.
- ☛ Food items that increase blood sugar rapidly like sweets, processed fruit juices, aerated sweetened drinks, rice, potato, fried food, red meat should be avoided.

Important tips for planning meals for GDM positive mother

- ☛ A mother should follow discipline regarding meal timings. Eating heavy at one meal or skipping any meal or fasting for long hours should be avoided. She should include all food groups in her daily diet i.e cereal, pulses, milk and milk products, fruits, vegetable, and fats. For non-vegetarian mothers, eggs, low fat meat like well-cooked fish or chicken can be included. Meal plan should be divided in to 3 major meals (breakfast, lunch and dinner) and 2-3 mid-day snacks.

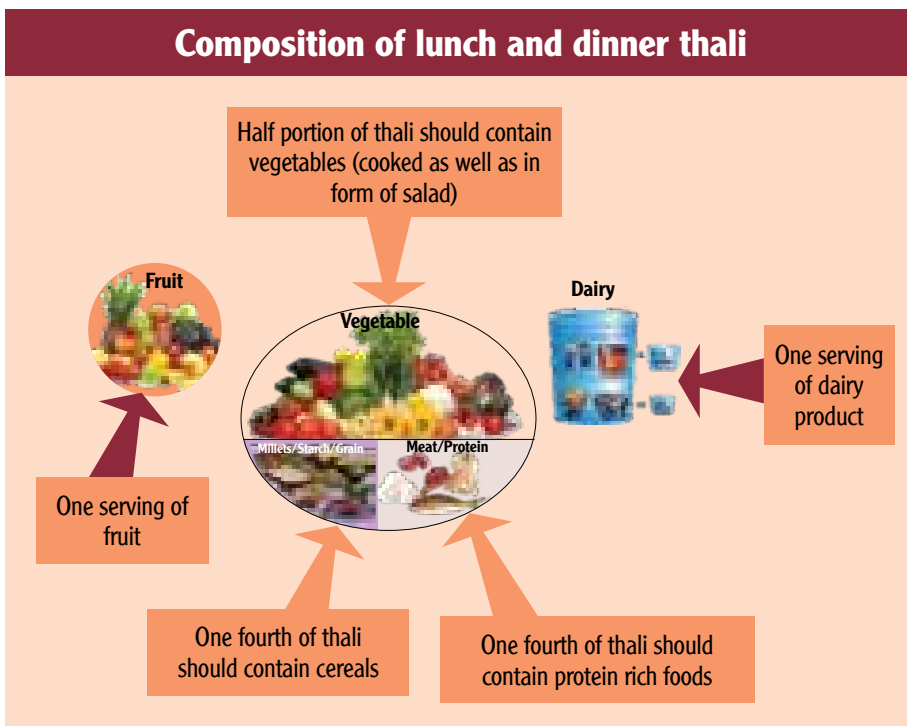
Breakfast

- ☛ A pregnant woman should start her day with a healthy breakfast. She should never skip her breakfast. Breakfast should consist of 1-2 carbohydrate servings (like chapati/dalia/sandwich/poha/idli etc) as mentioned in exchange list along with one serving from protein rich foods (like milk/curd/paneer/egg etc.)

Lunch/dinner

- ☛ In lunch and dinner the thali/plate can be divided in two halves
- ☛ Fill the first $\frac{1}{2}$ with vegetables like bottle gourd, ridge gourd, lettuce, broccoli, spinach, carrots, green beans, tomatoes, celery, cabbage, mushrooms etc. as vegetable provide fiber which helps in controlling post prandial sugar level.
- ☛ The remaining half should be divided into two equal $\frac{1}{4}$ th parts.
- ☛ The $\frac{1}{4}$ portion of the plate can be filled with protein rich food like dal, soy nuggets, tofu, eggs, paneer, chicken, fish etc

- ☞ The remaining ¼ can be filled with chapati, brown rice, millets, cereals etc.
- ☞ Mother should have at least 1 serving of low fat, sugar-free yoghurt, curd or milk.
- ☞ It is also important for a mother to have at least 1 serving of fruits like guava, apple, berries or any citrus fruits.
- ☞ Carbohydrate serving in lunch and dinner should be between 2 to 3. Taking heavy meals should be avoided.
- ☞ Skipping lunch and dinner and taking meal at irregular time should be avoided.



Mid day snack

- ☞ Along with major meals a pregnant woman should consume at least 2-3 healthy mid-day snacks.
- ☞ One to two carbohydrate serving can be taken in mid-day snack.
- ☞ A mother should maintain 2-3 hour gap with major meal when taking mid-day snack.
- ☞ Eating fried foods or junk foods or food with high amount of free sugars should be avoided.
- ☞ Some options for snack could be murmura chat, sprouts, vegetable dalia, vegetable poha, idli, vegetable uttapam, besan chilla with less amount of oil etc.

General tips

- ☛ Fried foods should be avoided rather mother should steam, boil or sauté food in less oil.
- ☛ Whole fruits should be preferred over juices.
- ☛ Prefer fish or chicken over red or organ meat.
- ☛ Fiber should be increased in the diet by including salad, beans, non-starchy vegetables, whole fruit, whole grain cereals/millet, whole pulses.
- ☛ A mother should drink water, buttermilk, home-made soups, soya milk sattu and other unsweetened healthy beverages instead of soda or fruit juices.

Sample Meal plan

Sample meal pattern for pregnant woman are planned using cup measures. 1 cup measure and equivalents are as follows

1 cup= 240 ml (8 oz or 227 gm) = 16 table spoon=48 tea spoon

½ cup= 120 ml (4 oz or 113 gm) =8 table spoon=24 tea spoon

1/3 cup= 80 ml (2.6 oz. or 76 gm) =5 table spoon= 16 tea spoon

¼ cup=60 ml (2 oz. or 57 gm) = 4 table spoon= 12 tea spoon

1 table spoon = 3 tea spoon

1 tea spoon = 5ml



1800 Calories sample meal plan for GDM

Meal	Menu	Amount	Number of carbohydrate serves as per exchange list
Breakfast (7-8 am)	Dalia/Porridge/Oats	½ cup	2 Other varieties can be included in meal plan as per the exchange list
	Milk	1 cup	
Mid- Morning (10-10.30 am)	Mung bean sprouts (ankurit mung)/Roasted Mung	½ cup	1
Lunch (1-1.30 pm)	Chapati	2	2-3
	Or chapati + Rice	1+1/3 cup	
	Vegetables	1 cup	
	Yogurt/Curd	¾ cup	
	Soya nugget (soya badi) curry/Dal	½ cup	
Evening (4.30-5 pm)	Seasonal fruit (medium size)	1	1-2
	Murmura chat with vegetables/idli with sambhar	1 ½ cup/1	
Dinner (8-8.30 pm)	Chapati	2	2-3
	Or chapati + Rice	1+ 1/3 cup	
	Vegetable	1 cup	
	Dal	½ cup	
	Or Fish (curry/grilled/steamed)	½ cup	
Bed time (10-10.30 pm)	Milk	1 cup	1
	Brown bread	1	
Total fat/d		4 tsp/d	

* Meal plan containing 1800 kcal approximately provides 70 gm protein, 60 gm fat and 247 gm carbohydrate

2000 Calories sample meal plan for GDM

Meal	Menu	Amount	Number of carbohydrate serves as per exchange list
Breakfast (7-8 am)	Whole grain Bread (Brown Bread)	2	2
	Egg bhurji/egg omelet	1	
Mid- Morning (10-10.30 am)	Vegetable Dalia	½ cup	1
Lunch (1-1.30 pm)	Chapati	3	3-4
	Or chapati + Rice	2+1/3 cup	
	Vegetables	1 cup	
	Yogurt/Curd	¾ cup	
	Soya nugget curry/Dal Or Chicken/fish curry	½ cup 1 cup	
Evening (4.30-5 pm)	Seasonal fruit (medium size)	1	1-2
	Vegetable Poha/vegetable upma	½ cup	
Dinner (8-8.30 pm)	Chapati	2	2-3
	Or chapati + Rice	1+ 1/3 cup	
	Vegetable	1 cup	
	Dal	½ cup	
Bed time (10-10.30 pm)	Milk	1 cup	1
	A bowl of cut mixed fruits	1	
Total fat/d		5 tsp/d	

* Meal plan containing 2000 kcal approximately provides 80 gm protein, 65 gm fat and 270 gm carbohydrate

2200 Calories sample meal plan for GDM

Meal	Menu	Amount	Number of carbohydrate serves as per exchange list
Breakfast (7-8 am)	Veg uttapam/Besan chilla with green chutney	2	2
	Veg Raita	1 cup	
Mid- Morning (10-10.30 am)	Vegetable sandwich (whole grain bread)	½	1
Lunch (1-1.30 pm)	Chapati Or chapati + Rice	3 2+1/3 cup	3-4
	Vegetables	1 cup	
	Yogurt/Curd	¾ cup	
	Soya nugget curry/Dal Or Chicken curry	½ cup 1 cup	
Evening (4.30-5 pm)	Seasonal fruit (medium size)	1	1-2
	Thepla	2	
Dinner (8-8.30 pm)	Chapati or Or chapati + Rice	3 2+ 1/3 cup	3-4
	Vegetable	1 cup	
	Dal Or	½ cup	
	Fish (curry/grilled/steamed)	½ cup	
Bed time (10-10.30 pm)	Milk	1 cup	1
	Whole grain biscuits (sugar free)	3	
Total fat/d		6tsp/d	

*Meal plan containing 2200 kcal approximately provides 85 gm protein, 70 gm fat and 300 gm carbohydrate

2400 Calories sample meal plan for GDM

Meal	Menu	Amount	Number of carbohydrate serves as per exchange list
Breakfast (7-8 am)	Vegetable stuffed chapati (sabji bhari roti) Curd/ Raita	3 1 cup	3
Mid- Morning (10-10.30 am)	Vegetable poha	½ cup	1
Lunch (1-1.30 pm)	Chapati Or chapati + Rice	3 2+1/3 cup	3-4
	Vegetables	1 cup	
	Yogurt/Curd	¾ cup	
	Soya nugget curry/Dal Or Chicken curry	½ cup 1 cup	
Evening (4.30-5 pm)	Seasonal fruit (medium size)	1	2
	Idli With green chutney	2 As desired	
Dinner (8-8.30 pm)	Chapati or chapati + Rice	3 2+ 1/3 cup	3-4
	Vegetable	1 cup	
	Dal Or	½ cup	
	Fish (curry/grilled/ steamed)	½ cup	
Bed time (10-10.30 pm)	Milk	1 cup	1
	A bowl of cut mixed fruits	1	
Total fat/d		7tsp/d	

*Meal plan containing 2400 kcal approximately provides 90 gm protein, 75 gm fat and 330 gm carbohydrate

**Any food item in above mentioned meals can be substituted with other food item as per the amount mentioned in the exchange list

Annexure 3: Food exchange list

Food Exchange list

Cereal/starch food exchange list is a comprehensive guide to make you understand amount of particular food to be taken in place of other food without affecting the total amount of carbohydrate.

For example – if you are taking one cup of rice (cooked) and want to change with idli, as per list, one third cup of white rice will be equal to one three inch round idli or 1 chapati.

Food Groups	Food	Portion	
Cereal/Starch Exchange Serving Choose any serving of the food mentioned here, each serving will provide – 75 calories 15 gm carbohydrates 2 gm protein 0-1 gm fat	Bread	1 slice (1oz)	
	Idli (plain)	3” round - 1	
	Naan	½ of 8”x2”	
	Dosa (plain)	1	
	Rice white or brown (cooked)	1/3 cup	
	Roti (atta, bajra, corn, juwar)	1 (6”)	
	Murmura (puffed rice)	¾ cup	
	Millet (cooked)	1/3 cup	
	Museli	¼ cup	
	Oats (cooked)	1/3 cup	
	Pasta (cooked)	1/3 cup	
	Pop-corn (no fat)	3 cups	
	Biscuit (2 ½” across)	1	
	Chowmein noodles	½ - 1/3 cup	
	Muffin (small)	1 piece	
	Poha (cooked)	1 cup	
	Starchy vegetables:	Potato (baked or boiled)	1½ cup
Potato (mashed)		½ cup	
Yam, sweet potato (plain)		1 small; ½ cup	
Fruit Exchange Serving Choose any serving of the fruits mentioned here, each serving will provide – 45 calories 10 grams carbohydrate 1 gm protein Negligible fat		Apple (medium)	1 (4 oz)
		Apricots (dry)	3 pieces
	Cherries	15-20 pieces	
	Blueberries	¾ cup	
	Dates	3	
	Grapes	¾ cups (10-12 nos)	
	Guava (medium)	1	
	Mango (medium)	½ cup	
	Orange (medium)	1	
	Papaya (cubes)	1 cup	
Peaches (medium, fresh)	1 (6 oz)		

	Pear (medium) Pineapple (fresh) Plums (small) Sapota, Chikoo (medium) Strawberries (whole) Watermelon (cut and diced) Kiwi (medium) Banana	1½ ¾ cup (2 slices) 2 ½ approx 24 in nos. 2 cups 1 ½
Pulse Exchange Serving Choose any serving of the fruits mentioned here, each serving will provide – 100 calories 17 grams carbohydrate 7 gm protein	All lentil/dals cooked Sprouted pulses Soya nuggets	1 cup ¾ cups ¼ cup - 10 chunks
Vegetable Exchange Serving 1 serving = ½ cup cooked (100 gms-150 gms) or 1 cup raw vegetables . Choose any serving of the food mentioned here, each serving will provide- 30 calories 2.5-3.5 gms carbohydrate 2-3 gms protein 0 gm fat	Amaranath (chaulai) Bathua French beans Bean sprouts (moong) Beets (chukander) Bitter gourd (karela) Bottle gourd (lauki) Broad beans (pardi) Broccoli Brussels sprouts Cabbage Carrots Cauliflower Cluster beans (guvar) Cucumber Drumsticks (surgavo) Eggplant (brinjal) Fenugreek leaves Green onion Green papaya Jack fruit (kathal) Lady's finger (bhindi) Mustard leaves (sarson) Onion Parwal Peas	

	Pumpkin Radish Ridge gourd (torai or turia) Salad greens Spinach (physical activity levelak) Tomatoes fresh Zucchini	
Milk Exchange Serving Choose any serving of the food mentioned here, each serving will provide – 180 calories 12 gms carbohydrate 8 gms protein	Skim and very low fat milk (1-3gm fat) Skimmed milk powder Non-fat buttermilk (chaaj) Yogurt (plain) Paneer Whole milk (buffalo) Whole milk (cow's milk) Goat's milk Lassi, regular	1 cup ¼ cup 2½ cups 1 cup ¼ cup (40 gms) (200 ml) <1 cup 1 cup (240 ml) 1 cup 1 cup

Annexure 4: Monthly GDM Reporting format for State & District Programme managers

Monthly GDM Reporting format for State & District Programme managers for month of, year.....

Name of State:

Name of District:

Estimated no of pregnant women:

Estimated no of deliveries:

Total no of ANC conducted (including all 4 ANC visits) in reporting month:

No of new GDM cases diagnosed in the reporting month:

No of GDM cases diagnosed in 1st trimester in reporting month:

No of new GDM cases on treatment in the reporting month:

No of GDM cases started on metformin in the reporting month:

No of GDM cases started on metformin + insulin therapy in the reporting month:

No of GDM cases started on insulin in the reporting month:

Cumulative no of GDM cases on metformin in the reporting month:

Cumulative no of GDM cases on metformin + insulin therapy in the reporting month:

Cumulative no of GDM cases on insulin in the reporting month:

Supplies (metformin, insulin & glucometer) available in all districts-Yes/No

If No, identify district & reflect requirement in PIP

Note:

Districts will report to their States

Information will be compiled at State level for sending information to GOI

Annexure 6: Migration form

Migration form for pregnant women with GDM

Name:

Husband's/Father's Name:

Present Address:

Health Facility attended:

Migration Address:

Address of Health Facility to be attended:

Diagnosis of GDM: Date Period of gestation: weeks

Treatment given:

Information about migration given to:

Name:

Designation:

Mobile no/Telephone no:

Place of work:

Signature of Doctor

Annexure 7: Supportive Supervision Checklist (SSV)

Supportive Supervision Checklist			
Name of Facility/VHSND:		Name of Block:	
Date of Visit:		Name and Designation of the person making visit:	
Availability of Registers and Logistics			
1	ANC Register	Yes	No
2	GDM Management and Follow up Register	Yes	No
3	Condition of Glucometer	Functional	Non-Functional
4	Calibration of glucometer done in last one month <i>(if No then ask for calibration as soon possible)</i>	Yes	No
5	Number of glucose pouches / packets available at ANC and in stock at the time of visit		
6	Number of glucose strips available (along with expiry date, if any) in stock at the time of visit		
7	Number of premix 30:70 insulin vials available in stock at the time of visit (only for facility)		
Interview with ANM/LT/Staff Nurse/MO			
8	Name and Designation of the Service Provider		
9	Whether service provider know when to conduct the GDM screening tests (at the time of registration and at 24-28 weeks) and what is the cut-off reading?	Yes	No
10	Whether service provider know the blood sugar monitoring schedule for GDM positive women on MNT & on insulin/Metformin?	Yes	No
Interview with ASHA			
	Question	ASHA 1	ASHA 2
11	Whether ASHA know when to conduct the GDM screening tests	Yes / No	Yes / No
12	Whether ASHA know when to conduct the GDM screening tests (at the time of registration and at 24-28 weeks)	Yes / No	Yes / No
13	Whether ASHA know signs/symptoms of hypoglycaemia	Yes / No	Yes / No
14	Whether ASHA know when to conduct blood sugar test after delivery of GDM positive woman (Six Week postpartum)	Yes / No	Yes / No

Annexure 8: GDM Management and Follow-up Register

S.No	Name of woman with husband or Father's name	Age	Unique identification Number (Aadhar /RCH portal no. / Eligible couple no.)	Address & Mobile number, (ASHA's mobile number can be written)	Trimester at the time of GDM diagnosis please V as appropriate			GDM Management Therapy please V as appropriate			Blood Sugar Monitoring	Month and Year: Jan 2018	Month and Year:				Remark (if any)		
					First	Second	Third	MNT	Insulin	Metformin			Blood sugar monitoring						
													1 st Test	2 nd Test	3 rd Test	4 th Test		1 st Test	2 nd Test
1	Seema Avind	28	000000000000000000	Village ABCD district XXXX, 98000000000 (ASHA)	6	7	8	9	10	11	12	A	B	C	D	A	B	C	D
					V			V			Date	10	25						
											V if >= 120 mg/dl		V						
											V if < 120 mg/dl	V							
											V if Referred	V							
Total					1	2	2	5	2	2		5							
Total Number of women tested															5				
Total Number of women tested and having reading >= 120 mg/dl															1				
Month and Year:		Month and Year:		Month and Year:		Month and Year:		Month and Year:		Month and Year:		Delivery Information		OGTT at 6 weeks Post-partum		Remark (if any)			
Blood sugar monitoring 1 st Test	Blood sugar monitoring 2 nd Test	Blood sugar monitoring 3 rd Test	Blood sugar monitoring 4 th Test	Blood sugar monitoring 1 st Test	Blood sugar monitoring 2 nd Test	Blood sugar monitoring 3 rd Test	Blood sugar monitoring 4 th Test	Blood sugar monitoring 1 st Test	Blood sugar monitoring 2 nd Test	Blood sugar monitoring 3 rd Test	Blood sugar monitoring 4 th Test	Date of Delivery	Type of delivery	Date of test & reading mg/dl	Linked with NCD program				
A	B	C	D	A	B	C	D	A	B	C	D	13	14	15	16	17			

Annexure 9: Logistics Requirement Calculation for 5000 Population

1) **Plasma Calibrated Glucometer** – 1 Glucometer should required

2) **Strips and lancets** –

Step	Description	Calculation	Value
a.	2 X Estimated number of ANC registration	2 X 112	224
b.	6 X 14% of estimated number of ANC Registration	6 X 112 X 0.14	94
c.	18 X No. of women on insulin	18 X 1	18
d.	14% of estimated number of ANC registrations	112 X 0.14	16
e.	10% Wastage factor of sl. No. a to d	352 X 0.10	35
Total	Addition of Sl. No. a to e	352 + 35	387 Strips and lancets for a year

3) **Glucose packets/pouches** :

Step	Description	Calculation	Value
a.	2 X Estimated ANC registrations	2 X 112	224
b.	14% of estimated ANC registration	0.14 X 112	16
c.	10% wastage factor of a+ b	0.10 X 240	24
Total	Addition of Sl. No. a to c	224+16+24	264 Glucose packets / pouches would be required

4) **Medical management (Requirement as per actual no. of client)** :

Step	Description	Calculation	Value
a.	Human premix Insulin 30/70		
	6 X No of women on insulin + 10% wastage factor	6 X 1 + 10%	7
b.	Insulin syringe 40 IU/ml:		
	180 X No of women on insulin + 10% wastage factor	180 X 1 + 10%	198
c.	Metformin tablets (500mg)		
	300 X No. of women on metformin + 10 % Wastage factor	300 x 1 + 10%	330

Annexure 10: Checklist for Calibration of Glucometer

Place a '✓' in case box if task/activity is performed satisfactorily, an 'X' if it is not performed satisfactorily, or N/O if not observed.

Satisfactory: Performs the step or task according to the standard procedure or guidelines

Unsatisfactory: Unable to perform the step or task according to the standard procedure or guidelines

Not Observed: Step, task or skill not performed by learner during evaluation by facilitator

S. No.	STEP/TASK	Cases				
A.	Pre-calibration tasks					
1.	Ensures that all equipment and all supplies are available and ready to use <ul style="list-style-type: none"> • Plasma glucometer • Control solution • Code chip, it is already in the glucometer • Battery, it is already in the glucometer • Test strips in test strip container • Pair of clean gloves • Spirit/alcohol wipes 					
2	Examines the display screen to see if it is clean. If dirty, wipes it using a cloth or clean cotton swab moistened with cold water					
3	Examines the test strip guide to see if it is clean. If dirty or error (E-4) message is displayed, dabs the cover and test strip guide on the outside with a moist cotton swab					
B.	Steps of performing a calibration test					
4	Reads the package insert which comes with the control solutions before performing the calibration					
5	Opens a bottle of control solution					
6	Holds the bottle downwards at an angle and gently squeezes the bottle until a small drop is formed at the tip of the bottle.					
7	Inserts the test strip in the glucometer. Brings the indicator portion of the test strip close to the tip of the bottle with the drop when the sign of blood drop symbol blinks on the glucometer					
8	Ensures that the drop of control solution is sucked by the test strip					
9	Notes the test result of the control test that appears on the display in about 5 seconds					

S. No.	STEP/TASK	Cases				
10	While the result of the control test is being displayed presses the M button once. Symbol for control is displayed. This marks the result as a control test result					
11	Compares the result of the control test with the code on the label of the test strip container. Repeats the test with control solution 2 using a fresh test strip and notes the result					
12	Ensures that the test result is compared with the concentration table range of the relevant control solution used (1 and 2) on the test strip container and to the unit of measurement displayed by the glucometer (mg/dl or mmol/l)					
13	Checks that the test result is within the specified concentration range					
14	Removes the test strip from the glucometer					
15	Discards the used test strips in a red coloured waste bin					
	Tasks Performed Satisfactorily					

If the result of the calibration test is outside the specified concentration range, repeat the test. If the result of the second test is also outside the calibration range, check your answers to the questions below.

Possible sources of error

Did you take the test strip from the test strip container which the code chip in the glucometer belongs to?	YES
Did you perform the control test according to the User's manual?	YES
Did you use a used test strip?	NO
Did you apply the control solution gently from the tip of the bottle on the test strip?	YES
Did you apply control solution after the blood drop symbol began flashing on the display?	YES
Did the test strip indicator suck sufficient amount of control solution?	YES
Did you bend or move the test strip before or during the test?	NO
Did you perform the test within the correct temperature range (8-42° C)?	YES
Did you compare the test result with the concentration range corresponding to the control solution (1 or 2) used?	YES
Has the control solution been open for less than 3 months?	YES
Are the test strip guide and measurement window clean?	YES
Are the test strips and control solution within the expiry date?	YES

If your answers correspond to the responses given in column 2, and the test result are still out if the desired range then do not use the glucometer. To know the correct cause, check with the manufacturer.

Note: Instructions for calibration may vary from manufacturer to manufacturer; calibrate as per the manufacturer's technical specifications.

Annexure 11: Glucometer Specification

Glucometer specification

Construction - Hand-held

Blood volume – should be <1µL

Sample of blood used - Fresh whole blood

Measuring time – should be less than <10 seconds

Reported result range 20–600 mg/dL

Unit of measure - mg/dL

Haematocrit - 30–55%

Assay method - Glucose oxidase biosensor

Should be able to work at high altitude up to 10,000 feet

Test strip storage conditions - 2°C to 35°C

Meter storage temperature range -25°C to 70°C

System operating conditions - 5°C to 45°C

Relative humidity operating range - 10% to 90%

Memory capacity of glucometer - 500 plasma glucose results with time and date

Automatic power off

Power supply - One replaceable battery

Calibration – should be plasma-equivalent

Calibration – calibration strips/fluid should be provided along with it.

Automatic shutoff 2 minutes after last action

Annexure 12: FAQs for Glucometer Calibration

Q1. What is glucometer calibration?

- ☞ Calibration means checking accuracy and correctness of glucometer
- ☞ It should be done regularly to check correctness of glucometer

Q2. Why we need to do calibration of glucometer?

- ☞ Glucometer needs to be calibrated regularly to ensure accurate results

Q3. What will happen if we do not calibrate regularly?

- ☞ It may give incorrect reports which may be higher or lower than actual plasma glucose report

Q4. How frequently glucometer should be calibrated?

- ☞ It is important to calibrate the glucometer periodically as per the instructions of the manufacturer
- ☞ After every 20 measurements of blood sugar
- ☞ A new vial of test strips is used
- ☞ Whenever the machine is dropped

Q5. What to do if glucometer calibration shows out of range result?

- ☞ It should not be used for testing
- ☞ It should be sent back to manufacturers for calibration corrections

Q6. How to do calibration?

- ☞ It is carried out by calibration strip or calibration fluid
- ☞ It will be demonstrated during training of glucometer use

Q7. Who will do calibration?

- ☞ Calibration is very simple and can be done by the person who is using it

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