Addressing

Gestational Diabetes Mellitus

A Reference Manual

Eds: Sridevi Seetharam, Anil Channakeshavamurthy, Katherine Holbrook and Jennifer Toy

Developed by

Swami Vivekananda Youth Movement

With support from

World Diabetes Foundation
This manual has been developed based on the experiences gained and information gathered during the implementation of the project *Addressing Gestational Diabetes Mellitus in rural and tribal populations in South India*. This project was implemented by Swami Vivekananda Youth Movement in H.D.Kote Taluk of Mysore District, Karnataka State from March 2009 to October 2011, with support from World Diabetes Foundation*.

**Swami Vivekananda Youth Movement** ([www.svym.org](http://www.svym.org)), established in 1984, is a development organization engaged in building a new civil society in India through its grassroots to policy-level action in Health, Education and Community Development sectors. Acting as a key promoter-facilitator in the community's efforts towards self-reliance and empowerment, SVYM is developing local, innovative and cost-effective solutions to sustain community-driven progress.

**World Diabetes Foundation** ([www.worlddiabetesfoundation.org](http://www.worlddiabetesfoundation.org)) is dedicated to supporting prevention and treatment of diabetes in developing countries. WDF focuses on the following areas:

- Awareness of diabetes
- Prevention of diabetes and its complications
- Education and training of patients and health care professionals
- Enhancement of detection, treatment and monitoring of diabetes

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*Disclaimer:* WDF has only funded the project. WDF was not involved with the writing or development of the contents of this manual and takes no responsibility of the authenticity or otherwise of the contents.
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The enthusiastic participation of pregnant women, their families and communities also make them equal partners in the success of this project.

The experiences gained from the grass-roots have richly enriched our understanding of how Gestational Diabetes Mellitus can be addressed in a comprehensive way, beyond the walls of a clinic.

A big thank-you is also extended to all the people who have contributed to this manual and / or reviewed it and offered their valuable comments.

Thank you once again!

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# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ANC</td>
<td>Ante Natal Care</td>
</tr>
<tr>
<td>ANM</td>
<td>Auxiliary Nursing Midwife</td>
</tr>
<tr>
<td>ASHA</td>
<td>Accredited Social Health Activist</td>
</tr>
<tr>
<td>AWW</td>
<td>Anganawadi Worker</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CBO</td>
<td>Community Based Organization</td>
</tr>
<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
</tr>
<tr>
<td>FBS</td>
<td>Fasting Blood Sugar</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
</tr>
<tr>
<td>GCT</td>
<td>Glucose Challenge Test</td>
</tr>
<tr>
<td>GD</td>
<td>Group Discussion</td>
</tr>
<tr>
<td>GDM</td>
<td>Gestational Diabetes Mellitus</td>
</tr>
<tr>
<td>GP</td>
<td>Gram Panchayath</td>
</tr>
<tr>
<td>Hb</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>HbA₁c</td>
<td>Glycated or glycosylated hemoglobin</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>HW</td>
<td>Health Worker</td>
</tr>
<tr>
<td>IEC</td>
<td>Information Education Communication</td>
</tr>
<tr>
<td>IGT</td>
<td>Impaired Glucose Tolerance</td>
</tr>
<tr>
<td>MNT</td>
<td>Medical Nutrition Therapy</td>
</tr>
<tr>
<td>MO</td>
<td>Medical Officer</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Government Organization</td>
</tr>
<tr>
<td>NST</td>
<td>Non-stress Test</td>
</tr>
<tr>
<td>OGGT</td>
<td>Oral Glucose Tolerance Test</td>
</tr>
<tr>
<td>PCW</td>
<td>Patient Care Worker</td>
</tr>
<tr>
<td>PHC</td>
<td>Primary Health Centre</td>
</tr>
<tr>
<td>PPBS</td>
<td>Post Prandial Blood Sugar</td>
</tr>
<tr>
<td>RBS</td>
<td>Random Blood Sugar</td>
</tr>
<tr>
<td>RCH</td>
<td>Reproductive and Child Health</td>
</tr>
<tr>
<td>SHG</td>
<td>Self Help Group</td>
</tr>
<tr>
<td>USG</td>
<td>Ultrasonography</td>
</tr>
<tr>
<td>VD</td>
<td>Venereal Disease</td>
</tr>
<tr>
<td>VHSC</td>
<td>Village Health and Sanitation Committee</td>
</tr>
<tr>
<td>WDF</td>
<td>World Diabetes Foundation</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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Preface

In contemporary times, in India, Gestational Diabetes Mellitus (GDM) has been managed almost entirely in a hospital-setting; and clinicians (diabetologists and obstetricians) have assumed the main responsibility for its management. However, outcomes of women with GDM are strongly influenced by factors outside the hospital setting and outside the purview of the clinician. Many care components of GDM like risk assessment, early screening, life style modifications, nutrition, and eating habits involve stakeholders outside the hospital. These stakeholders include family members and the immediate community. Additionally, access to these components of care is facilitated by counselors, field based health workers, administrators and policy makers. The reader of this manual will quickly realize how the clinical care components and the roles of the stakeholders are closely interwoven in GDM, thus demanding an integrated and multi-disciplinary approach.

In 2009, Swami Vivekananda Youth Movement (SVYM) undertook a two-year project to address Gestational Diabetes Mellitus in the rural and tribal populations of Karnataka. This project, funded by the World Diabetes Foundation, is a model of integrated community and hospital based care that incorporates care for GDM into regular antenatal care. In keeping with a public health approach, SVYM focused its main efforts on prevention including: prevention of GDM, prevention of complications due to GDM and prevention of developing DM later in life. Our approach stresses self-care, home-based care, and community-based care. This manual is a compilation to share our experience and to serve as a guide and resource for other programs with similar objectives.

The SVYM project has successfully increased awareness about the disease among the community and improved the capacity of government and project doctors to manage GDM. There are no universally accepted protocols for GDM. Our project developed protocols based on recommendations from the 5th International Workshop on GDM 2007, IADPSG Recommendations of 2010, ADA Position Statement on Medical care of Diabetes 2011, standard textbooks of Obstetrics and also in consultation with Obstetricians and Endocrinologists from India and USA. Some other protocols and templates were generated de novo. All these are shared in this manual. However, we are open to comments and suggestions to further improve this manual.

GDM is a significant public health concern as it is one of the major contributors to maternal and fetal morbidity and mortality. Many pregnant women in India are not screened for GDM as part of their routine antenatal care (ANC). Though the Govt of India, under the RCH strategy II, recommends the inclusion of screening for GDM in antenatal care, it is an often forgotten and ignored component. However, our project has successfully integrated screening and management of GDM into antenatal care delivered at our hospital and in the rural and tribal communities we serve. It is our hope that this project and our experience provide the impetus for introduction of mandatory screening and management of GDM into routine ANC services, not only in the state of Karnataka, but also all over India.
A. Introduction

Diabetes Mellitus and its complications are a major cause of morbidity and mortality which severely impact not only the individuals suffering from diabetes but also their families and communities. Besides contributing to complications like heart disease, kidney disease, and retinal damage, diabetes severely impacts the economy in terms of increased health expenditure, increased disability and loss of work days. People of Indian origin have a propensity for developing diabetes due to genetic factors and a diet traditionally rich in carbohydrates. With prevalence rates between 4.6% and 14% in urban areas and 1.7% and 13.2% in rural areas, diabetes is fast emerging as a major public health problem in India (1), (2), (3), (4). India has the highest number of people with Type 2 DM and it is estimated that 57 million people will have Type 2 diabetes by 2025 (5).

Gestational diabetes mellitus (GDM) is an important public health problem in India from two perspectives – as a factor influencing safe motherhood and as a precursor of Type 2 DM. GDM is an important and often inadequately recognized contributor to maternal and fetal mortality and morbidity. Since all women are not screened for GDM during pregnancy and a woman’s blood sugars may normalize after delivery, it is often hard to confirm if GDM has contributed to morbidity and mortality. But it is quite likely that a sizeable number of ‘unexplained’ or ‘sudden’ fetal losses could be attributed to GDM. With adequate screening and clinical management, this complication and many others could be avoided, for both mother and child.

The prevalence of GDM as reported from various places in India varies widely, ranging from 3.8% in Kashmiri women (6) to 6.2% in Mysore (7) to 17.9% in Tamil Nadu (8). But there are significant regional differences in the prevalence (3). The SVYM project in rural Mysore District detected a prevalence of about 1%. Whatever the prevalence rate, considering the impact of GDM on safe motherhood and fetal well-being, appropriate management of GDM should become an integral part of good antenatal care and be incorporated into all programs aiming at safe motherhood and achieving the millennium development goal of reducing maternal and fetal morbidity and mortality.

From the perspective of chronic, non-communicable diseases, many women who have GDM and their offspring are at a higher risk of developing type-2 diabetes in later life (9). Thus, appropriate management of GDM will go a long way in reducing the number of people that could be affected by Type 2 diabetes in future years.
As is true for most diseases, preventive strategies are more appropriate to address GDM, rather than waiting for it to happen and then managing it. Medical management of GDM is also a challenge, as it needs to balance life-styles, eating habits, locally available foods, economic status and available health infrastructure. An in-depth understanding of the diverse aspects of GDM helps one better appreciate the need for a comprehensive and integrated approach to improved awareness, timely seeking of antenatal care and home based care, and adherence to clinical management.

**Addressing Gestational Diabetes Mellitus**

Addressing Gestational Diabetes Mellitus involves multiple stakeholders ranging from family, immediate community, Community Based Organizations (CBOs), Non-Government Organizations (NGOs), government and non-government health workers, paramedical personnel, counselors, doctors, administrators and policy makers. This is evident for the following reasons:

1. GDM awareness and risk assessment should start with eligible couples planning to start a family, to enable the future mother to evaluate her risk and make lifestyle changes well in time, in order to reduce her chances of developing GDM during pregnancy.

2. GDM in the early stages may be completely sub clinical; hence the pregnant mother may not recognize that she has GDM. Timely antenatal care including screening for GDM, can significantly reduce the complications of GDM through early diagnosis, treatment initiation and follow up.

3. Overt diabetes, which means presence of diabetes before pregnancy, should be detected and controlled before planning pregnancy because it is associated with increased risk for adverse fetal outcomes like fetal anomalies and fetal death.

4. Economic and social barriers such as the lack or unaffordability of transportation, lack of education, and strong beliefs in traditional practices may require assistance from multiple sources to enable the pregnant mothers from seeking necessary antenatal care. Since field based health workers are the first point of contact for many pregnant women, they are positioned appropriately to provide awareness education, counseling, referral and follow up services.

5. Women’s health behaviors and health care seeking habits are influenced by the value placed on the health of pregnant women by the community they live in. Therefore influential people – members of Community Based Organizations (CBOs) like Gram Panchayath (GP), Village Health and Sanitation Committees (VHSCs), and Self-help groups (SHGs)—are important contributors to good management of GDM.
6. Efficacy of Clinical management is heavily dependent on food habits, stress-free home environment and other supportive care at home. Therefore management of GDM is not directed at the pregnant woman alone, but her family as a whole.

**Why this manual**

Complete and comprehensive information about the entire gamut of care for GDM is usually not available at one single source. A document on public health approach to GDM is also rare to come by. This manual hopes to provide this. The manual is also a compilation of the experience of Swami Vivekananda Youth Movement, in its implementation of a World Diabetes Foundation funded project related to Gestational Diabetes Mellitus in rural areas. The contents of this manual will provide a ready reference for other similar programs. The standard operating procedures, algorithms and templates of individual patient management can serve as useful and replicable models.

**Who should use this manual**

This manual highlights the integrated role of all the stakeholders and all the variables with the objective of developing awareness and skills to appropriately address GDM and contribute towards reducing the burdens due to this disease. It is meant for providers at all levels, from government field personnel to hospital-based clinicians to administrators, and emphasizes a multidisciplinary approach. This not only means that there are many different individuals and providers needed to effectively manage GDM (multidisciplinary approach, Fig A.1) but also that each individual and provider must manage GDM from many different perspectives (interdisciplinary approach, Fig A.2)

*Figure A.1 Multidisciplinary Approach*
For long, GDM has almost exclusively been managed by Obstetricians and Physicians. It is now evident that adopting an Interdisciplinary approach is more beneficial than even a multi-disciplinary approach. Therefore this manual is useful of all cadres of health care workers who could be involved in the management of GDM.

**Unique challenges in resource poor settings:**

This manual is based on experience in a rural setting in India. Therefore, it is primarily useful for programs addressing Gestational Diabetes Mellitus in similar rural and / or resource limited settings. In rural settings there are different capacities for comprehension of health information, different challenges to prioritization of health care and adherence to management plans, different challenges to access to health care. Food habits differ. Limited literacy levels make is difficult to rely on printed patient education material. The health care delivery structure in rural areas is quite different from urban areas. Moreover, most of generally available diabetes education material is directed at western or urban life styles and food styles. Socio-economic conditions make it very difficult for a GDM affected pregnant woman to plan for multiple, small meals in a single day. Therefore, it is hoped that this manual will provide useful guidance to programs in rural settings.

**How to use this manual**

This manual outlines a comprehensive approach where prevention strategies are integrated into therapeutic management. Focused attention on prevention (primary and secondary), home based/community based care, multi and interdisciplinary approaches remain recurring themes. The chapters are arranged in the manner of a public health approach to GDM,
beginning with awareness generation, health promotive and preventive measures, followed by early diagnosis and clinical management. Clinical components are detailed wherever relevant. The information content is delivered in a Frequently Asked Questions (FAQ) manner with logical numbering of the sections to make it convenient for the users to quickly find the information they are looking for. The language is kept simple and non-technical, to the extent possible, so that even readers who are not doctors can easily understand. Readers wanting more detailed and technical information can refer to footnotes on each page and to the bibliography at the end. The medical management component is more technical and directed towards hospital based health personnel. Some content may seem repetitive, but this is intentional, to make the content under each FAQ complete.

While it is recommended that a person involved with a GDM program reads all chapters, readers with limited time can choose the section of interest to them, from the contents page.

Finally, the Recommendations and Standards of Care for GDM are constantly being modified in the light of new evidence. Therefore, readers are advised to refer to latest, evidence-based, internationally accepted practice guidelines.

**Navigating this manual**

Printed copy of this manual can be navigated using the page of contents to go to the relevant section. In the electronic copy, the page of contents can be used similarly by clicking on the section of interest. The bookmarks for FAQs and Annexures are in blue color font and are hyperlinked to the relevant document, which can be accessed by clicking on the bookmark. From the hyperlinked FAQ or Annexure, the reader can return to the main text by pressing Alt+Left arrow.
B. Knowing about Diabetes

B.1 What is diabetes?

Diabetes is a condition in which the body cannot control the level of sugar in the blood within normal limits. The level of sugar in the blood is controlled by hormone (chemical) called insulin, which is secreted by an organ called the pancreas. Diabetes is also called Diabetes Mellitus (DM). The three most common categories of diabetes are Type 1 DM, Type 2 DM, and gestational diabetes mellitus (GDM). There are other less common types.

**Type 1 Diabetes Mellitus** refers to conditions in which the body cannot adequately produce insulin. Therefore, the patient has to take daily injections of insulin to control his/her blood sugar. Type 1 diabetes is usually diagnosed in childhood, though it can occur at any age.

**Type 2 Diabetes Mellitus** refers to conditions in which the body either makes too little insulin or the body is unable to sufficiently use the insulin produced. Often Type 2 diabetes can be controlled through diet and exercise alone, though some people will have to take oral hypoglycemic medications (tablets) or insulin (injections) or both. Type 2 diabetes usually occurs in older people compared to Type 1.

**Gestational Diabetes Mellitus (GDM)** is a type of diabetes or glucose intolerance that has an onset or is first recognized during pregnancy. It usually refers to diabetes in a pregnant woman who did not have diabetes before becoming pregnant. Hormonal changes in the body during pregnancy increase the tendency for the woman to have poor blood sugar control in comparison to a woman who is not pregnant. In a small percentage of pregnant women, this inability to control blood sugar manifests as clinical diabetes called gestational diabetes. Typically, this kind of diabetes resolves after delivery.

B.2 What is blood sugar?

Blood sugar, also known as blood glucose, is a carbohydrate substance present in the blood. Glucose is derived from the breakdown of complex carbohydrate substances during the process of digestion and absorption in the digestive tract. It is also derived from breakdown of carbohydrate stores within the body.
B.3 Why is it important to have glucose in the blood?

Glucose is the chief source of energy which is needed to carry out regular activities. Blood is a vehicle to transport glucose from the site of absorption or breakdown to various tissues within the body. In the tissues, the glucose is ultimately broken down to release energy. Therefore, to have an adequate supply of energy, adequate glucose is needed in the blood.

B.4 How much sugar should there be in our blood?

One must have enough blood sugar to generate sufficient energy to carry out all activities. However, too much or too little blood sugar can cause complications. Too much blood sugar is called hyperglycemia and too little blood sugar is called hypoglycemia. Blood sugar levels change based on what one has eaten and when, extent of physical activity, stress and insulin levels. The normal blood sugar levels are measured either in whole blood (capillary), whole blood (venous) or in serum or plasma (10). In a healthy person, after overnight fasting, (no food 8-10 hours prior), blood sugar level (measured in plasma) ranges from 70 to 125mg/dl. This is the normal range of fasting blood sugar. Two hours after any meal, blood sugar level should be no higher than 140 mg/dl. This is the normal range of post-prandial blood sugar. A randomly timed blood sugar should be between 70 and 199 mg/dl. This is the normal range of random blood sugar. Please refer to Table B1. The body naturally keeps blood sugar at the right level. When the blood sugar rises more than normal, the body will produce insulin, which pulls sugar from the blood into the cells to be used for energy or to be stored. When blood sugar levels fall, the body can release a different hormone called glucagon to help bring blood sugar levels back to normal range.

Table B1: Normal ranges for plasma blood sugar

<table>
<thead>
<tr>
<th>Eating state</th>
<th>Normal range in mg%</th>
<th>Normal range in mmol/L¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>70 – 199</td>
<td>3.9 - 11</td>
</tr>
<tr>
<td>Fasting</td>
<td>70 -100 OR 70 - 110²</td>
<td>3.9 – 5.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.9 – 6.1</td>
</tr>
<tr>
<td>2 hour post prandial</td>
<td>&lt;140</td>
<td>&lt; 7.8</td>
</tr>
</tbody>
</table>

¹ Formula for calculation of mg/dl from mmol/l: mg/dl = 18 × mmol/l. For instance, if plasma level of glucose is 5 mmol/l, recalculation to mg/dl is done as follows: 18 × 5 mmol/dl = 90 mg/dl
² ADA recommends 100 mg% and WHO recommends 110 mg% as the cut-off for fasting plasma glucose.
B.5 How do we interpret a blood sugar report to make a diagnosis of diabetes?

Table B2: WHO recommendations for diagnosing Diabetes based on Plasma Glucose Measurements. (11)

<table>
<thead>
<tr>
<th>Blood Test</th>
<th>Cut-off values</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting Plasma Glucose</td>
<td>&gt;=7.0mmol/l (126mg/dl) OR &gt;=11.1mmol/l (200mg/dl)</td>
<td>Diabetes</td>
</tr>
<tr>
<td>2-hr Post Prandial Plasma Glucose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting Plasma Glucose</td>
<td>&lt;7.0mmol/l (126mg/dl) AND &gt;=7.8 and &lt; 11.1 mmol/l (140 and 200mg/dl)</td>
<td>Impaired Glucose Tolerance (IGT)</td>
</tr>
<tr>
<td>2-hr Post Prandial Plasma Glucose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting Plasma Glucose</td>
<td>Between 6.1 and 6.9 mmol/l (110 and 125mg/dl) AND &lt;7.8 mmol/l (140mg/dl)</td>
<td>Impaired Fasting Glucose (IFG)</td>
</tr>
<tr>
<td>2-hr Post Prandial Plasma Glucose</td>
<td></td>
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B.6 What will happen if we don’t have enough glucose in the blood?

If the blood sugar level falls below 70 mg/dl, it is called hypoglycemia, or low blood sugar. A person with low blood sugar does not have enough energy to carry out daily activities. Common signs and symptoms of hypoglycemia include: shaking, sweating, anxiety, dizziness, hunger, racing heart, impaired vision, weakness, fatigue, headache and irritability. In extreme cases, a person may lose consciousness. It is important to immediately treat low blood sugar. If the person loses consciousness, it is an emergency and the person must be taken to the nearest health center where blood sugar can be measured and treatment administered.

Emergency Treatment of Low Blood Sugar

Glucose powder in water (2-3 tablespoons in 150-200ml or 1 medium sized glass) is the most recommended treatment for hypoglycemia. However many common foods can be given. Ideally the individual should be given food that can provide 15-20 grams of carbohydrates.

If you are at home, here are some examples of food:
- Biscuits with at least 15g of carbohydrates (Marie biscuits-2, Parle biscuits-2)
- 5-6 pieces of hard candy (avoid chocolate)^5
- 1 tablespoon of honey or sugar or jaggery

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^3 2-hr Post Prandial glucose means venous plasma glucose 2–h after ingestion of 75g oral glucose load. If 2–hr plasma glucose is not measured, status is uncertain as diabetes or IGT cannot be excluded
^4 ADA recommends 100 mg% and WHO recommends 110 mg% as the cut-off for Impaired Fasting Glucose
^5 Though chocolate and nuts contain carbohydrate, they take longer to digest because they also contain fat.
- Fruit (one orange, ½ banana)
- ½ cup or 4 ounces of fruit juice (orange, apple, mango), no added sugar
- 1 cup or 8 ounces of milk, no added sugar

When the diabetic is likely to be away from home, he/she is advised to carry at least 5 to 6 pieces of candy or a packet of biscuits to cope with this emergency.

B.7 What will happen if we have too much glucose in the blood?

Too much sugar in the blood is called hyperglycemia, or high blood sugar. It usually happens when the body doesn’t make enough insulin or the insulin doesn’t work. The three most important and most common symptoms of high blood sugar are: increased thirst (polydipsia), increased appetite (polyphagia) and increased urination (polyuria). Other signs and symptoms include: irritability, dry skin and mouth, and blurred vision. These symptoms mean the person needs immediate medical attention and should be taken to the nearest health center where a blood sugar can be measured. If the patient also has fruity smelling breath, the condition is more serious and is considered an emergency.

High blood sugar lasting for many years can cause damage to organs like the kidneys, blood vessels, skin and eyes. People with diabetes may also be at risk for frequent skin infections, urinary tract infections and wounds that won’t heal.

Sometimes the symptoms for too low blood sugar and too high blood sugar may be quite similar and difficult to distinguish. However, it is more dangerous to have too low blood sugar than too high blood sugar. Therefore, if one is not sure if the person’s blood sugar is too high or too low, it is better to give the patient some sugar (see examples above) and immediately take him/her to the nearest health center where blood sugar can be measured and appropriate treatment given.

If severe hyperglycemia is left untreated, a condition called diabetic ketoacidosis (DKA) can occur and may result in a diabetic coma. Ketoacidosis develops when the body doesn’t have enough insulin and cannot use glucose for fuel. The body then breaks down fats to use for energy, producing waste products called ketones. The body cannot tolerate large amounts of ketones and will try to get rid of them in the urine. If the body cannot release all the ketones and they build up in the blood, ketoacidosis may result. It is life-threatening and requires immediate treatment. Symptoms include: shortness of breath, breath that smells fruity, nausea and vomiting and very dry mouth. Clinically, DKA usually presents with hyperglycemia, anion gap metabolic acidosis, and ketonemia.
B.8 Will blood sugar remain the same throughout the day?

No. Blood sugar levels change throughout the day (24 hour time period) based on what one has eaten and when, levels of physical activity, stress, and insulin. Blood sugar levels are the lowest in the fasting state in the morning. Following every meal, blood sugar levels start rising steadily for an hour and then drop back to just above fasting levels after 1.5 to 2 hours. See fig 1.1 (12)

**Figure B1. Blood glucose levels for 24hr time period.**

When the blood sugar or blood glucose levels rise after eating a meal, insulin is released into the bloodstream. Insulin helps remove glucose from the blood, storing it in the cells to be used as energy. Thus, insulin lowers blood glucose levels. In graph 1.2, note how insulin levels rise when blood glucose levels are high, and as a result, blood glucose levels fall.

**Figure B2. Blood glucose and insulin levels for 24hr time period**
B.9 What are some common problems caused by diabetes?

Diabetes by itself can cause low energy, tiredness and a decreased quality of life. Over time, diabetes may cause many health problems like high blood pressure, heart disease, kidney disease, nerve damage and blindness. People with diabetes are also at risk for infection and wounds that won’t heal. Not all newly diagnosed individuals may experience these health problems. On the other hand, many people may not know they have diabetes until they have one of these complications and seek medical care. The damage caused by these problems often occurs in people whose blood sugar has been out of control for many years. One way of preventing or delaying the onset of these complications is to check on blood sugars whenever the person experiences symptoms such as frequent urination, increased thirst and/or increased hunger. Early diagnosis and appropriate treatment to keep the blood sugar under control can help prevent the occurrence of such damage.

B.10 How does a person get diabetes?

Diabetes is not contagious and cannot be passed from person to person. Hence it is categorized as a non-communicable disease. Type-1 diabetes is immune mediated and is the result of an autoimmune process. While it is not known exactly how a person develops Type 2 diabetes and GDM, it appears that both genetics and lifestyle play a role. Some people have diabetes that “runs” in the family. Presence of diabetes in a first degree relative (biological parents or siblings) is an important risk factor. Lack of exercise, poor eating habits, high blood pressure and obesity seem to increase the risk. Risk can be reduced if people lose weight, eat a carbohydrate-controlled diet, and exercise regularly. However, diabetes can occur even in the absence of any risk factor.

B.11 Is there a cure for diabetes?

Once a person is diagnosed to be a diabetic, he continues to remain a diabetic life-long. If his blood sugar is under control, he is called a ‘person with diabetes having controlled sugars’. Diabetes can be controlled by changing poor eating habits, increasing exercise, reducing weight to normal range, with oral medications (tablets) and insulin injections. Poor eating habits include eating excessive amounts of sugary food, fried food or fatty food. People with diabetes should exercise regularly. Most commonly recommended exercise is a medium paced walk. Many people who have diabetes have the ability to live a long life with minimal complications if they keep their blood sugar in good control. If controlled, diabetes is not a death sentence.
C. Understanding Gestational Diabetes Mellitus

C.1 What is gestational diabetes?

It is the type of diabetes that occurs during pregnancy. Hormonal changes in the body during pregnancy increase the tendency for the woman to have poor blood sugar control in comparison to a woman who is not pregnant. In a small percentage of pregnant women, this inability to control blood sugar can manifest as clinical diabetes. This type of diabetes, with onset or first recognition during pregnancy, is called gestational diabetes. Classically these women would have normal blood sugars before pregnancy and after delivery. It is important to screen for this condition as it is associated with increased risk of adverse fetal and maternal outcomes. Many women with GDM can also develop type-2 diabetes later in life. If a woman is already diabetic and becomes pregnant, that condition is called ‘pre-GDM’ or ‘overt diabetes’ and does not resolve after delivery. However, the implications for the maternal and child’s health and therefore clinical management remain the same.

C.2 Does every pregnant woman develop gestational diabetes?

Not every woman who becomes pregnant will develop gestational diabetes. However, all pregnant women of Asian Indian ethnicity have an increased risk of GDM (13). Over and above that risk, when the woman has certain other risk factors, the chances of her developing GDM are higher. The major risk factors include:

a) Weight that is more than normal for her height, (evaluated by BMI ≥ 23)\(^7\)

b) History of diabetes amongst her blood relatives like parents, brothers or sisters

c) History of delivering a baby whose birth weight is more than 4 kg\(^8\)

d) History of having GDM or persistent sugar in her urine during a previous pregnancy.

e) Other risk factors include: advanced maternal age, multiparity (reflecting advancing maternal age), and history of repeated fetal loss.

However it must be stressed that even in the absence of any risk factor, GDM is known to occur.

\(^7\) Traditionally, BMI > 25 is regarded as a risk factor but this is based on western / Caucasian populations. Considering the high ethnic risk for people of Indian Origin, the cut-off BMI is taken as 23 for people of Indian origin (44).

\(^8\) Traditionally, baby's birth weight of more than 4.0 kg was regarded as a risk factor. However, considering that co-morbidities like maternal anemia and under nutrition result in lesser weight gain by the fetus, 3.5 kg was taken as the cut-off by SVYM.
C.3 What can happen to a pregnant woman with gestational diabetes?

A woman with gestational diabetes will need to monitor her blood sugar closely and balance food intake, exercise, and, if needed, insulin injections to keep her blood sugar in control. If blood sugars are not controlled, she could have several problems.

a. She might have a large baby resulting in a complicated delivery (like shoulder dystocia) and higher probability of needing a cesarean section. When the baby is delivered surgically by a cesarean section (C-section), it takes longer for the woman to recover from childbirth.

b. She could develop high blood pressure leading to kidney damage or convulsions.

c. She may experience frequent infections (for example, urinary tract infections and vaginal candidiasis) or have a preterm delivery.

d. Less commonly, a woman may persist with elevated blood sugar after delivery (equivalent to Type 2 DM) and will need to manage her blood sugars for the rest of her life.

e. Lastly, women with gestational diabetes are also at risk for cardiovascular complications, especially if glucose intolerance persists after pregnancy (14).

C.4 What can happen to the baby of a woman with gestational diabetes?

Prevalence and severity of morbidities depend on gestational age at delivery as well as on metabolic factors.

a. If a woman’s blood sugars are too high during her pregnancy, the baby will grow extra large (excess fetal adiposity). This is called as **macrosomia**. Extra large babies face health problems of their own, including damage to their shoulders during birth.

b. The newborns may have very low blood sugar levels (hypoglycemia) at birth or in early neonatal period, and are at higher risk for breathing problems, hypothermia, tremors and even seizures. Other morbidities that potentially occur more frequently in infants of women with GDM include hypoglycemia, hyperbilirubinemia, hypocalcemia, erythremia, and poor feeding.

c. Additionally, if a woman is diabetic before becoming pregnant (called pre-GDM) and her sugars are not well controlled during the first trimester, when the baby’s organs are forming, the risk of congenital malformation and/or miscarriage is increased.

d. If maternal blood sugars remain uncontrolled, there is a greater chance of having a sudden intra-uterine death or stillborn baby than a woman who doesn’t have diabetes.

e. Finally, babies born to mothers with GDM are at risk for developing obesity and also getting type 2 diabetes later in life.
C.5 Why does the baby of a woman with GDM have a tendency to grow extra large?

Increased blood sugar levels in mother results in increased transfer of sugar to the fetus through the maternal-fetal circulation. The fetal normally responds by increasing its secretion of insulin. It means that when maternal sugars are high, fetal insulin levels are higher than normal. Insulin has growth factor-like action and increases the rate of growth of all organs in the fetus, resulting in **macrosomia**.

C.6 How can a pregnant woman know if she has GDM?

A pregnant woman can ask herself if she has any of the risk factors mentioned above in C.2. If yes, she must consult a doctor as early as possible during her pregnancy and undergo a ‘screening’ blood test for sugar. If she does not have any risk factors, she must undergo the blood test in her 6th month. If this test is abnormal, another ‘confirmatory’ test is performed to confirm if she has GDM. More details about the approach to screening a pregnant woman for GDM are given in Section C.7-C.10 and in Section D under **Early Screening and Diagnosis**.

Less commonly, a woman may actually experience symptoms of diabetes. The most classic symptoms are frequent urination, increased thirst and/or increased hunger. A woman might also feel fatigue or a lack of energy. Another symptom is more than usual weight gain during the pregnancy. In these situations, the woman would have had diabetes for quite some time and some irreversible changes in fetal size would have already occurred.

C.7 What blood test is done to diagnose GDM?

A variety of blood tests can be done to diagnose GDM. The tests are broadly categorized as one step method and two step method. In the two step method, the first step is a screening test, done irrespective of fasting state, called Glucose Challenge Test (GCT). If this test is abnormal, the woman is asked to undergo a second test in a fasting state, called Oral Glucose Tolerance Test (OGTT), based on which a diagnosis of GDM is confirmed. (15) **(Annexure 5)** In the one step method, the woman directly undergoes an OGTT in fasting state.(10) (16).

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9 SVYM used the two-step method. In a first step, screening is done by 50gGCT irrespective of fasting state of the woman. In the second step, for those women whose GCT is ≥130 mg/dl, a 75g OGTT in fasting state is done to confirm the diagnosis. This approach enabled SVYM to screen more women, even from remote areas, who would otherwise not have been able to access a test to be done in fasting state. Less than 20% of them had GCT values ≥130 mg/dl and those alone required more intense counseling and support for 75gOGTT. A Cut-off of 130 mg% was used as it is found to identify more than 90% of cases of GDM as compared to 140 mg%, which identifies only about 80% of cases. (17)
C.8 What is a GCT?

GCT stands for Glucose Challenge Test. It is a screening test for GDM and is the first step in the two-step method of diagnosing GDM. For this test, the woman is given a drink consisting of 50 gm of glucose powder dissolved in a large glass of water (~ 200 ml). After waiting for one hour, her blood is drawn to test the glucose level. During this one hour, the woman must be seated or lying down and not moving around. The woman need not be in a fasting state for this test. It can be done at any time of the day and it is very convenient for use among women who directly walk into the ante-natal care clinic. This test is done to assess how well the woman can maintain her blood glucose level when challenged by a glucose drink.

If the reading for this test is more than 130 or 140 mg/dl\textsuperscript{10} (per the clinician’s protocol, refer to ‘Early Diagnosis and Screening’ in D.16) the pregnant woman is asked to return for a different test, the following morning, after overnight fasting (last meal must be within 8-14 hours). This second test is called an Oral Glucose Tolerance Test (OGTT).

C.9 What is OGTT?

OGTT stands for Oral Glucose Tolerance Test. It is used to confirm the diagnosis of GDM. It is used as the second test in the two step method or as the single test in the one step method. For this test, the pregnant woman must reach the laboratory early morning, after overnight fasting. She must not have taken even coffee/tea. Ideally, the time duration between the previous night’s meal and the time of the OGTT should not be more than 8-14 hours. On arrival at the laboratory, a blood sample is drawn and she is given a drink consisting of 75 gm of glucose powder dissolved in a large glass of water (~ 200-250 ml). Two more blood samples are drawn at one hour and two hours respectively, after drinking the glucose. The time is measured from the moment she begins to drink the glucose solution. The woman must be seated during this period with minimal physical activity. She must refrain from eating or drinking anything else, until the test is completed. Refer to D.18 for more information about OGTT and for diagnostic criteria needed to diagnose GDM.

C.10 Will it harm the pregnant woman if she does not eat or drink anything else during the GCT or OGTT?

\textsuperscript{10} SVYM used a cut-off of 130 mg/dl as it increased the sensitivity of the screening test. A small proportion of women diagnosed to have GDM had GCT values between 130 and 140 mg/dl.
The quantity of glucose given to drink, during a GCT or OGTT provides the pregnant woman with sufficient calories such that there is no need for her to eat anything else until the test is completed. On the other hand, if she eats anything in addition to the quantity of glucose given, test results will be erroneous.11

**IMPORTANT!**
A common misconception is that a urine test for sugar or a random blood sugar (RBS) is adequate to screen for GDM. These tests are not adequate to identify all women with GDM and the woman must be administered a challenge test to see how her body regulates blood sugar levels in the presence of a large amount of glucose.

C.11 Can a woman with GDM prevent the problems to herself and to her baby during pregnancy?

If a woman with GDM keeps her blood sugar in good control during pregnancy, she can prevent health problems for both herself and her baby. Two important contributors to the blood sugar levels are the amount of carbohydrate based calories in her meals and the amount of exercise she undertakes to burn off excess calories. To keep blood sugar in good control and to assess/evaluate the status of management, she must follow these recommendations:

- Prepare a personal meal plan with help from a doctor or dietician (Annexure 9)
- Exercise regularly – walking, yoga, breathing exercises. A yoga expert must be consulted to determine which yogic postures can be practiced during pregnancy (Annexure 10)
- Understand weight gain recommendations appropriate for her BMI (Annexure 11A)
- Check blood sugar frequently, as ordered by the doctor and maintain a diary of all the readings (Annexure 11B)
- Monitor blood pressure, Weight gain, Urine protein & Ketone and Fetal growth by Ultrasound regularly as advised by the doctor (Annexure 11C)
- Take medicines on time, including insulin as ordered by the doctor
- Know how to adjust food, exercise, and insulin depending on results of blood sugar tests
- Control or treat low blood sugar (Hypoglycemia)

Some women may experience nausea or vomiting while drinking the glucose solution or shortly thereafter. They can be counseled and reassured regarding this. If the woman vomits in large quantities, such that a major portion of the drink is lost, the test should be repeated on the next day.
Follow up with health care provider regularly

C.12 What are some common misconceptions about GDM?

**Only women who are obese get GDM**
While obesity is one of the four main risk factors for a woman to develop GDM, a woman who is of normal weight or BMI may also develop diabetes. Therefore, it is important for all women to be screened during pregnancy.

**GDM can be diagnosed with urine sugar or a random blood sugar alone.**
In screening a pregnant woman for GDM, you must challenge the woman’s body with glucose to assess how her body is able to regulate blood sugar. Thus a woman must be administered a GCT and or an OGTT to assess if she has GDM. Urine sugar and Random blood sugar cannot pick up all cases early enough.

**GDM can be passed from mother to child.**
GDM is not a communicable disease and thus cannot be passed from mother to child. However, GDM can cause complications both for the mother and the baby. A child of a mother with GDM is also more at risk for becoming obese or developing Type 2 diabetes later in life.

**The stricter the diet management, the better GDM is managed.**
While it is important to manage diet in a woman with GDM, she must also make sure she receives adequate nutrition. Overtly strict diet management can result in a baby that is too small. This is why it is important for a nutritionist or similarly trained professional to help a woman with GDM create a diet plan that will provide her with the right balance of nutrition.

**Bigger the baby, the healthier it is!**
To some extent, it is true that more the birth weight, the healthier a baby is likely to be. However, this has a limit. If a baby is too large (more than 4 kg by western standards and more than 3.5 kg by Indian standards), it may be a sign of uncontrolled blood sugars in the mother. Babies of mothers with uncontrolled GDM may grow to be large which can cause problems for the mother and child during delivery.
D. A Public Health Approach to Gestational Diabetes Mellitus

Traditionally, management of GDM was largely in the domain of Obstetricians and Diabetologists. However, a major part of GDM management is non-pharmacological and heavily dependent on events outside the immediate purview of clinical care. Prevention and Early diagnosis are more effective when dealt with a public health approach rather than individual approach. Thus, addressing gestational diabetes requires an integrated, multi-disciplinary approach in order to be successful. The essential components of GDM management include: primary prevention (prevention of GDM from occurring), screening and early diagnosis, and good clinical management to prevent and/or delay the onset of complications. These components are ideally implemented through a mixture of community or home-based and hospital or institutional based activities and involve the efforts of a variety of stakeholders including pregnant women, eligible couples, community members and health care providers at all levels.

This section will outline the various activities that can be undertaken by different stakeholders to prevent GDM and to enable early diagnosis of GDM.

**Primary Prevention**

Primary prevention involves preventing GDM from occurring in the first place. A mainstay of primary prevention is awareness of GDM among the population and health care personnel. Awareness generation aims to educate people about: a) risk assessment, b) healthy life styles to reduce risk factors and prevent GDM, c) timely screening and d) utilization of health services for antenatal, intranatal and postnatal care in order to achieve optimal maternal and fetal health outcomes.

**D.1 What are the essential components that need to be delivered for awareness generation aimed at primary prevention?**

1) Awareness about GDM, implications for safe maternal and child health
2) Risk factors
3) Risk assessment
4) Risk reduction
5) Life style modifications and healthy eating habits
6) Integration into regular ANC
D.2 What is risk assessment?

Risk assessment is an evaluation of presence or absence of the risk factors for GDM in the pregnant woman. It enables early recognition of risk factors and early screening. It also provides an opportunity for lifestyle modification which goes a long way in preventing development of GDM. Especially in GDM, the probability of developing the disease can be predicted, to some extent, by the presence of certain risk factors.

D.3 For whom should a risk assessment be done?

Eligible couples (couples who are in their reproductive age group (usually between to 15-45 years) and have not adopted any permanent method of contraception) provide the ideal point of entry for all interventions in primary prevention. They can first be approached before pregnancy or during early pregnancy to undergo the risk assessment as detailed in D.4.

D.4 How is a risk assessment for GDM conducted?

For a woman who has never been pregnant, important risk factors include:

a) Weight that is more than that desirable for her height (technically expressed as Body Mass Index (BMI) $\geq 23$. BMI reference charts are included in the Annexure 3.

b) Presence of diabetes mellitus amongst first degree ‘blood relatives’, who include biological parents, sisters and brothers.

For a woman who has been pregnant before, additional risk factors include:

c) History of having persistent sugar in urine or a diagnosis of GDM during previous pregnancies

d) History of delivering a baby larger than 4.0 kg birth weight\(^{13}\)

e) Other minor risk factors include: advanced maternal age (more than 35 years)\(^{14}\), multiparity (reflecting advancing maternal age), and presence of hypertension, polycystic Ovarian Syndrome (PCOS) and multiple fetal losses.

\(^{12}\) Conventionally, BMI > 25 is regarded as a risk factor but this is based on western / Caucasian populations. Considering the high ethnic risk for people of Indian Origin, the cut-off BMI is taken as 23 for people of Indian origin (44) (33).

\(^{13}\) Conventionally, baby’s birth weight of more than 4.0 kg was regarded as a risk factor. However, considering that co-morbidities like maternal anemia and under-nutrition result in lesser weight gain by the fetus, 3.5 kg was taken as the cut-off in SVYM.

\(^{14}\) Maternal age less than 25 years is regarded as low risk.
D.5 What is BMI and how is it calculated? How is the result interpreted?

BMI stands for Body Mass Index and is a measure of appropriateness of weight of a person, in accordance with his or her height. In other words, it is a simple measure of a person’s ‘fatness’ or ‘thinness’. BMI is calculated using the formula: BMI=Weight in Kg/(Height in metres)² (Annexure 3).

<table>
<thead>
<tr>
<th>BMI Range</th>
<th>BMI Category</th>
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<tbody>
<tr>
<td>&lt; 18</td>
<td>Underweight</td>
</tr>
<tr>
<td>18-22.9</td>
<td>Normal</td>
</tr>
<tr>
<td>23-24.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>≥25</td>
<td>Obese</td>
</tr>
</tbody>
</table>

D.6 Why is early recognition of risk factors important?

Recognition of risk factors before a woman gets pregnant is more beneficial so that she will have an opportunity to reduce the risk factors (by modifying diet habits and lifestyle) before getting pregnant and thus begin her pregnancy in a more ‘healthy’ state. Even if she meets the health system after getting pregnant, early recognition of risk factors warrants an immediate screening for GDM with concurrent interventions to reduce the risk factors. When there are also associated clinical symptoms of diabetes mellitus, she will need to undergo blood tests to verify if she does not already have diabetes mellitus.

Even if risk factors are not present, the couple can still be encouraged to adopt a healthy lifestyle that includes regular exercise including walking, Yoga, Pranayama (breathing exercises), and eating foods with less sugar/oil/fat and with more fibre.

D.7 Who is involved in primary prevention?

A multitude of stakeholders have a role in primary prevention. The most obvious of these are pregnant women. Pregnant women must be encouraged to take responsibility for their health. They have a stake in maintaining healthy pregnancies, having healthy deliveries and protecting the health of their children. However, the ability of a woman to care for her health relies on support from her family or caregivers and the greater community she lives in.

Thus, the foremost group of stakeholders includes family members and the immediate community. Family members and community members can learn information themselves, increase awareness among the other members, assist in risk assessment, promote healthy lifestyles and support women in accessing health care. Simple gestures like modifying the daily
household menu or routine and even household traditions, to accommodate the requirements of the pregnant woman go a long way in conveying their support. While it is customary in some Indian families to accommodate and encourage cravings of the pregnant woman by providing her with plenty of sweets and fatty or fried food, such customs should be discouraged or modified to provide her with more healthy, fibre-rich or fresh fruit or vegetable based or whole grain based food.

Community members can help individual families in addressing social and financial challenges that are barriers to accessing care. Community based organizations like women’s self-help groups (SHGs), micro-credit groups, local governance bodies like Village Health and Sanitation Committees (VHSC) and Gram Panchayaths can actively support awareness generation programs, contribute resources (provide space, fund refreshments or educational materials for meetings) and encourage participation by the members of their communities.

Another important group of stakeholders includes field-based health personnel from government and non-government organizations (NGOs). The personnel from government include Medical Officers and Specialist doctors, ANMs, AWW, LHV, MHW and ASHAs. The personnel from NGOs include doctors (including hospital based specialists and private doctors), paramedics like nurses, counselors, laboratory technicians, health workers and health facilitators. These stakeholders need to be orientated to an approach that integrates GDM-related care into regular antenatal care, as GDM is one of the important factors that can influence safe motherhood. Whenever these stakeholders meet a community member, they can utilize the opportunity to increase awareness about GDM, facilitate a self-risk assessment and advise on risk reduction and adoption of healthy lifestyles. Maximum effort toward facilitating risk assessment and risk reduction is recommended.

D.8 What are the avenues for promoting primary prevention in the community?

Avenues for interventions in primary prevention include Mother’s Meetings, Self-Help Group meetings, Public meetings and gatherings, Parades, Street plays, Health exhibitions, House visits and one-to-one discussions. Samples and recommended processes are included in the Annexure 1.

D.9 What are some tools that can be used in primary prevention?

Educational tools for primary prevention include handouts, posters, wall paintings and games and quizzes. Samples of educational materials are included in Annexure 2.
Early screening and diagnosis

As in most diseases, the earlier an abnormality is detected, the sooner it can be addressed, before preventable complications set in. However, screening should be done at a time when the disease is most likely to be detected by lab tests. Therefore, timely screening is an important tool in GDM management.

D.10 Who are the stakeholders in early screening?

Early screening is facilitated by awareness about the need to screen and commitment on part of the health care personnel. Primary health care providers including doctors, ANMs, AWWs, ASHAs, health workers and counselors have an important role in educating young women, performing a risk assessment and encouraging them to seek screening test. People involved with policy and health administration also play a vital role in; a) positioning management of GDM as an integral component of approaches to safe motherhood, b) integrating screening and care components for GDM into regular antenatal care, c) facilitating training in screening, and d) providing required equipment and supplies to fulfill the demand for screening.

Concurrently, family caregivers, influential community members and groups should encourage pregnant women to get screened, provide transportation to screening appointments and accompany women to screening or provide childcare so that the mothers may attend screening sessions. Community members and groups should work closely with Government and NGO health workers to organize GDM screening camps, at optimum locations and times, and facilitate individual woman’s access to screening when needed (e.g. SHG members or the VHSC can arrange transport for the woman to the screening or assist with the costs of testing). Government health workers (ANMs, AWWs, and ASHAs) can also consider home-based screening for those women unable to travel.

D.11 When is screening done?

Before pregnancy

If the woman is not yet pregnant but has risk factors for GDM, screening should be done by a Fasting Blood Sugar (FBS) and 2-hour Post Prandial Blood Sugar (PPBS). Please refer to Table B.1 and B.2 for cut-off values. If her blood sugar is normal, she should receive counseling on lifestyle changes to prevent developing diabetes in the future. If diabetes is detected, the woman’s blood sugar must be brought under control before she plans her pregnancy, to prevent both maternal and fetal complications.
During pregnancy

With risk factors: If the pregnant woman has one of the identified risk factors (as listed in D.4), screening is done as early as possible, preferably at the first ante-natal visit.

Without risk factors: If the pregnant woman does not have any risk factors, screening is done between 24-28 weeks of gestation. It is recommended that diagnosis of GDM be made before 28 weeks and treatment initiated before 30 weeks of gestation.

D.12 How is screening done?

Screening can be done by a two-step method or one step method. Please refer to C.7, C.8 and C.9 for more details. An algorithm for the two-step method is provided in Annexure 5. Glucometers are not recommended for screening (17).

D.13 Where can screening be done?

Screening is ideally carried out in the hospital setting. However, if the woman is not able to reach the hospital, she should not miss out on screening. Screening can also be carried out in a primary health centre, community health centre, or private clinic. The place chosen for screening should have all the required infrastructure and equipment. These include trained personnel for phlebotomy and conducting blood glucose test, supply of glucose powder, facility to accurately weigh and pack the glucose powder, centrifuge, colorimeter / photometer and reagents to measure glucose accurately. If the woman is still not able to reach any of these locations due to socioeconomic reasons or travel distance, alternate efforts should be made to enable her to access screening. In such situations, field based screening can be conducted in a community setting accessible to the woman (for example Mother’s meetings or SHGs). When field based screening is conducted, after the blood is drawn, plasma must be separated on-site using a centrifuge and transported to a centralized laboratory. With field based testing, adequate attention must be given to waste management to ensure safe handling and disposal of biomedical waste. A guide for planning field-based testing is included in Annexure 4.

Blood samples should be centrifuged immediately to ensure accurate readings. For example, red blood cells do not require insulin to intake glucose from the blood. Thus, delayed separation of plasma can lead to excessive glycolysis by red blood cells in the sample with substantial reduction of glucose level. Ambient temperature at which the blood sample is kept prior to centrifuging and separation of plasma/serum also affects glucose levels. SVYM has used the following gel tubes: BD Vacutainer, LH PST II Ref 367374. On centrifugation, a gel layer separated the RBCs from the plasma. The plasma could be separated after the centrifuged sample reached the centralized lab.
D.14 Can Glucometers be used for screening?

Glucometers are not recommended for screening. Glucometer readings can show a variation of up to +/-20% as compared to plasma based laboratory measurement from a venous blood sample. Variations can be higher when the patient has eaten recently. The readings can also vary based on the hematocrit, hydration of patient, temperature of the environment etc. Therefore glucometers are recommended for use only by already diagnosed diabetics, monitoring their sugars at home, or by health care professionals in a clinical setting, to monitor the effectiveness of diabetes control. They should not be used for diagnosis of diabetes (14).

D.15 Can HbA1C be used as a screening test?

HbA1C is not recommended as a screening test because of higher red blood cell turnover during pregnancy or co-morbidities like anemia and hemoglobinopathies, which can result in erroneous results. Moreover, the tendency to develop GDM increases every progressing month of pregnancy. Since HbA1C reflects average blood glucose levels of preceding three months, it can often miss a recent onset GDM. However, after a woman has been diagnosed to have GDM, an HbA1C can be done to understand average blood glucose levels in 2-3 months prior to diagnosis.

D.16 How do we interpret screening results?

When GCT is used as a screening test, readings equal to or above the cut-off level are regarded as abnormal. A cut-off of 140 mg% will pick up about 80% of the cases. A cut-off of 130 mg% will pick up about 90% of cases (17). The cut-off value considered is dependent on the clinician’s screening protocol (16). If a woman has an abnormal GCT, it only means that she has an increased probability of having GDM. The diagnosis can be confirmed by an Oral Glucose Tolerance Test (OGTT).

When OGTT is used as a screening test, according to WHO, values ≥ 126 mg/dl (7 mmol/l) for fasting plasma glucose OR ≥ 200 mg/dl (11.1 mmol/l) for 2 hour post-prandial are considered diagnostic of GDM. (10) Confirmation is done by repeating the same test on another day, within 2-3 days of the initial screening.

16. The generally used cut-off for GCT is 140 mg/dl, though 130 mg/dl may also be used. (17) SVYM used 130 dg/ml to determine if this lower threshold results in diagnosing more cases thus improving maternal and fetal outcomes. Among 2795 women tested, 67 women had GCT values more than 130 mg% and less than 140 mg%. Confirmatory GTT was done on 36 of them and 4 of them were confirmed to have GDM. Thus, while using a cut off of 130 mg/dl may increase the burden of additional screening, it also increases the sensitivity of the GCT.

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D.17 What is the confirmatory test for GDM?

GCT is only a screening test and must be confirmed by an Oral Glucose Tolerance Test (OGTT).\(^{17}\)

D.18 How is an OGTT done?

It is recommended that an OGTT should be conducted in a hospital or PHC. The woman should arrive early to the health care facility in a *fasting* state meaning her last meal should have been 8 to 14 hours prior. This may require the woman to adjust the time of her evening meal depending on what time she is able to come for her test. For example, if she plans to come to the hospital for GTT at 8.00 am, she must have had her evening meal at around 8.00 pm and not earlier. The woman should have had no diet restrictions in the previous 3 days and participated in usual physical activity. Blood is collected in the fasting state, and then one hour and two hours after administering 75 grams of glucose dissolved in 200 ml of drinking water.\(^{18}\) Glucometers are not recommended for OGTT meant to diagnose GDM (17).

The International Association of Diabetes and Pregnancy Study Group (IADPSG) criteria were used for diagnosis. (\textit{Table D1}) (16). These criteria are also recommended now by the American Diabetes Association. (18)

\textit{Table D.1 Threshold values for diagnosis of GDM by 75 g OGTT based on IADPSG criteria}

<table>
<thead>
<tr>
<th></th>
<th>Fasting</th>
<th>1\textsuperscript{st} hour</th>
<th>2\textsuperscript{nd} hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>75g OGTT</td>
<td>92</td>
<td>180</td>
<td>153</td>
</tr>
</tbody>
</table>

Any one abnormal reading (equal to or above the threshold value) diagnoses the patient to be having GDM.

\(^{17}\) If the patient can afford it, an OGTT can be accompanied by an HbA\textsubscript{1C}, which gives information about blood sugar control in the preceding months. The cost and methodology must be considered before taking a decision. HbA1C by Column Chromatography is recommended. An HbA\textsubscript{1C} test measures the amount of glycated (or glycolated) hemoglobin in the blood. Glycated hemoglobin is a substance in red blood cells that is formed when blood sugar (glucose) attaches to hemoglobin. When there is an excess amount of glucose in the blood, the amount of glycated hemoglobin in the blood increases. HbA\textsubscript{1C} test results can provide an estimate of blood sugar control over the past 2-3 months. An HbA\textsubscript{1C} of 6% or less is normal. For the diabetic patient, HbA\textsubscript{1C} should be 7% or below.

\(^{18}\) While previously the American Diabetes Association (Carpenter and Coustan) recommended a 3 hour 100 gm OGTT to diagnose GDM, Carpenter himself now recommends a 2 hour OGTT with 75 gm glucose (42). A 2 hour OGTT has been validated for GDM diagnosis and is used around the world (43)
WHO recommends taking only two: fasting and 2-hour post-load readings. (10) Fasting blood sugar level ≥ 126 mg% OR 2-hour reading ≥ 200 mg% is diagnostic of Gestational Diabetes Mellitus. (10) In clinical care, WHO recommends that the diagnosis of diabetes should always be confirmed by repeating the test on another day unless there is unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms.

Women with a reading of random plasma glucose level greater than 200 mg/dl with signs and symptoms (polydypsia, polyurea and unexplained weight loss) or with a fasting glucose exceeding 126 mg/dl are considered to have overt diabetes (19) and should be managed accordingly.

Women with any one of the risk factors for GDM and who have a normal GCT in early pregnancy and at 24-28 weeks should be kept under close observation. Based on clinical judgment, OGTT may be done when indicated.

See Annexure 5 for “Algorithm for GDM Screening and Diagnosis.”

D.19 Where can OGTT be conducted?

Hospital based testing is recommended for confirmation of GDM diagnosis. In rare, exceptional cases, field based testing may be necessary at times when the woman is unable to come to the hospital (for example because of long distance, loss of daily wages, or lack of bus fare) and is likely to default on the referral advice.

Any center which can conduct a GCT can also conduct an OGTT. Thus, when a GCT is done in a hospital or PHC, OGTT can also be done at the same site. However, if a GCT test has been done in the field, the health worker will need to collect the report from the centralized laboratory, visit the woman at home, help her to understand the results, and motivate/counsel her to seek a confirmatory test at a hospital or PHC which has the ability and proper infrastructure to conduct OGTT.
E. Clinical Management of Gestational Diabetes Mellitus

Good management of GDM can reduce the risk of adverse health outcomes for mother and child. Like primary prevention and early screening, the ongoing management of women with GDM requires the involvement of a variety of stakeholders at different levels. This section will focus on hospital and home-based components of GDM management.

E.1 How is GDM managed?

Clinical Management of women with GDM can be considered in three stages: before delivery, during delivery and immediate postpartum, and after delivery.

Care before delivery

The objective of care before delivery is to ensure that the blood sugar levels remain as much within normal limits as possible, so that fetal growth also remains within normal limits. If the blood sugar level is not controlled and is persistently high, the fetus may grow more than normal (macrosomia) which may result in complications for both mother and baby. If the blood sugar is too aggressively controlled, there is a risk of poor weight gain by the fetus.

E.2 What is the first step in GDM management?

The clinician should first initiate Medical Nutrition Therapy (MNT). A trial of MNT and exercise is given for one week, after which a FBS and 1 hour PPBS\(^1\) are measured to determine if the woman’s blood sugar is in control. Values between 70 and 95 mg%, and < 140 mg% respectively are regarded as being ‘under control’ (20). For many women, MNT and exercise are sufficient to control blood sugar. Thus it is crucial that the woman is supported by health workers, family and community members to adhere to the prescribe diet and exercise plan. However, if blood sugar is still not within normal limit after one week of MNT, insulin therapy is initiated. Some doctors give a trial of 2 weeks of MNT before considering insulin therapy (17). Concurrently an ultrasound should be conducted to assess fetal growth. If there are any indications of macrosomia at any point, insulin therapy must be initiated immediately.

\(^1\) 1-hour post prandial readings are taken to reduce the waiting time for the pregnant woman in the hospital visit or for the health worker in the home-visit. This approach improves compliance overall. If 2-hour post-prandial readings are taken, a target of below 120 mg% is used. (20)
E.3 What is Medical Nutrition Therapy (MNT)?

MNT is a therapeutic approach to treating medical conditions using a specifically tailored diet based on the patient’s medical and psychosocial history, physical examination, weight, duration of gestation and diet history. This tailored diet should be created individually, for each patient, and monitored by a dietician or similarly trained professional. It is called medical nutrition therapy because as blood sugar level is influenced by food intake, regulating a woman’s diet is an essential part of treatment.

E.4 How is the diet planned?

There is no consensus on exact diet recommendations for women with GDM. What is known is that a fine balance is to be maintained between excess calorie intake and suboptimal calorie intake. Too many calories may lead to macrosomia but diet that is too restricted runs the risk of the baby being too small. Thus, aggressive treatment is not recommended. When the woman is on calorie restriction, she should also be monitored weekly for ketones in her urine in order to ensure adequate nutrition.

Food plans should be culturally appropriate and individualized to take into account the patient’s body habitus, weight gain, and physical activity and modified as needed throughout pregnancy to achieve treatment goals. A dietician or similarly trained health personnel should assist in drawing up a diet plan (Annexure 9). Nutrition interventions for GDM should emphasize overall healthy food choices, portion control, and cooking practices that can be continued postpartum. Field based health workers as well as family members and other community stakeholders play an important role in assisting the affected woman to plan her diet and access the necessary foods in accordance with her diet plan.

Adjusting the amount and type of carbohydrate to achieve the target for postprandial blood sugars is an important part of the treatment regimen. An ideal dietary composition is 55% carbohydrate, 20% protein, 25% fat with less than 10% saturated fat (17). Complex carbohydrates with a low glycemic index are advised (see Annexure 9E). Additionally, carbohydrate intake for breakfast should be low (about half that consumed during dinner) as GDM women usually have high post breakfast blood sugars compared to post lunch and post dinner. Training patients in ‘carbohydrate counting’ (also called ‘carb counts’), use of food records, and testing postprandial blood sugars can facilitate this goal.

20 Ketonemia has been associated with impaired psychomotor development in offspring (17)
Calorie allowance for obese women (BMI ≥ 25) is lower than the calorie allowance for women of normal BMI. See Annexure 3 for calculation of BMI. The Calorie allowance is also dependent on the extent of physical activity and energy expenditure (life-style) in daily activities. See Annexure 6 for categorization of life-style. The recommended calorie allowances appropriate for BMI and Life-style are given in Annexure 8. For women who have normal BMI (< 23), about 30 kcal/kg/day is recommended, while for women with BMI ≥ 25, a 30-33% reduction in calories is advised (17).

Summary of good dietary practices:

- Space food throughout the day to avoid long time between meals & snacks. A seven meal plan may be used – 3 meals alternating with 4 snacks.
- Choose smaller portions of meals or snacks so that the total calorie intake per day will not cross the recommended limit.
- Avoid skipping meals or snacks
- Choose a variety of foods each day
- Choose foods lower in fat and lower in glycemic index
- Avoid foods with simple sugars
- Continue iron, folic acid and calcium supplementation as for any pregnancy.

E.5 What exercises are recommended with MNT?

Planned physical activity of 30 minutes per day is recommended, based on the obstetrician’s evaluation of the patient’s capacity for physical activity. Advising GDM patients to walk briskly or do arm exercises while seated in a chair for at least 10 minutes after each meal accomplishes this goal (20). A comprehensive plan that includes flexibility and strength training, yoga, and deep breathing are some of the recommended exercises. Exercise undertaken should be comfortable, consistent and correct. Exercises may be performed in the standing, sitting or lying position. Specific examples are provided in Annexure 10. However, before performing any of these exercises it is important for the pregnant woman to consult her doctor. The doctor must effectively communicate all safety precautions to the patient. (20).

Yoga in pregnancy prepares the mind and body for labor and birth by helping the woman focus, concentrate and keep healthy. Yoga postures (asanas) are also gentle ways to keep the body active and supple. A yoga expert must be consulted about which particular asanas can be practiced. Asanas that overstretch the abdomen or involve inversion poses should be avoided. Asanas which emphasize stretching on shoulders and upper back are recommended. (21) Some examples are provided in Annexure 10.
In yoga, pranayama comprises of breathing techniques that focus on the conscious prolongation of inhalation, breath retention, and exhalation (22). Pranayama includes the complete yoga breath, humming breath, and alternate nostril breathing. Stress induces hyperglycemia. These yogic breathing exercises are claimed to be effective in GDM management as they reduce stress and help relaxation. For example, slow controlled breathing reduces the respiratory rate and subsequently levels of stress in pregnant women.

In addition, yoga nidra and meditation should be incorporated into daily yoga practice (23). Yoga nidra is a form of yogic sleep and deep yogic relaxation and meditation. It includes techniques such as listening to one’s own breath or repeating a mantra to bring about a state of self-awareness and inner calm. ‘Om’ chanting can also be incorporated.

E.6 How is MNT monitored?

The efficacy of MNT can be monitored by blood glucose monitoring. Refer to E.10-E.12 below on blood glucose monitoring.

E.7 When should insulin therapy be initiated?

Insulin should be initiated when MNT fails to maintain self-monitored blood glucose for fasting ≤ 105 mg/dl (5.8 mmol/l) or 1 hr post-prandial ≤ 155 mg/dl (8.6 mmol/l) or 2 hr post-prandial ≤ 130 mg/dl (7.2 mmol/l). (19) If two consecutive readings are abnormal, the woman will need to visit the hospital for repeat blood sugars and an evaluation by obstetrician and/or diabetologist. Throughout the pregnancy, even if fasting glucose levels are maintained ≤ 105 mg/dl, if there are any indications of macrosomia in the woman diagnosed with GDM, as indicated by asymmetric increase in fetal abdominal circumference, insulin therapy should be initiated immediately. (19) It is recommended that the woman stays in the hospital when insulin is initiated because it takes a few days for the doctor to determine the optimal dose of insulin for that particular woman. Once insulin is started, it may be necessary to continue throughout pregnancy. See Annexure 12 for instructions on the self-administration of insulin.

E.8 What are the recommended types and dosing for insulin?

Human Insulin should be used whenever Insulin is prescribed. Self-monitored blood glucose levels should guide the dosing and timing of the insulin regime. The use of Insulin analogs has not been adequately tested in Gestational diabetes mellitus. (19) While dosing recommendations are provided below, dosing should be tailored to individual patient. A specialist should be consulted for guidance.
Types of insulin used in GDM:

1. Rapid acting (e.g. Actrapid) given three times a day, before each meal
2. Long acting (e.g. Insulotard – NPH) used at bed-time to control fasting sugars
3. Pre-mix (e.g. Mixtard) given twice a day, particularly useful in rural settings

See Annexure 13 for more information about insulin types and dosing.

**Dosing:**

**Outpatient care**

The blood sugar pattern has to be analyzed. If fasting sugars are in control and post-prandial sugars are high, treatment can be started with Rapid acting Insulin analogues 3 times a day, before a meal, to assess the total daily requirement of insulin. If the patient is not compliant with 3 shots, two injections /day can be considered, using Mixtard.

Initially Mixtard [Premix Human Insulin] (30/70) is started at 4 to 8 units OD (once a day) and sugars are monitored once in three days. If the blood sugar does not come under control, a BD (twice a day) dosage is given. The doses are gradually increased until blood sugar is within normal limits. If FBS is high (> 95 mg/dl) and one hour PPBS is normal (≤ 140 mg/dl), the long-acting night dose is increased. If FBS is normal (≤ 95 mg/dl) and the one hour PPBS is high (> 140 mg/dl), the dose before breakfast is increased. Blood sugar is tested once in 3 days and the dosage adjusted.

**Inpatient care**

The same regimen outlines above is used. However, blood sugars are monitored every day in the fasting and one hour post-prandial states in the morning. If the patient can afford repeat measurements of glucose, it is useful to measure post-prandial sugars after lunch and dinner too.

If blood sugar levels do not come under control even under high doses of Mixtard [Premix Human] insulin (>80 units/day or 2 units/kg/day), then plain insulin is given in 3 doses before meals. If fasting sugar remains high despite three doses of rapid acting insulin, a long acting insulin can be added at night. This requires mandatory admission to the hospital and blood glucose is monitored three times a day until it is under control.

**E.9 Can oral hypoglycemics be administered?**
While studies are investigating the use of glyburide and metformin during pregnancy, currently oral hypoglycemic agents are not routinely recommended (24). There is a concern about their teratogenic potential as many of them cross the placenta from mother to fetus. Metformin has been shown to be of use during pregnancy. (25) However, long-term safety data for metformin is still not available. Therefore, Insulin therapy still remains the mainstay of treatment for women with GDM after failing MNT.

Additionally, exposure to oral hypoglycemics can prolong and further complicate neonatal hypoglycemia.

**E.10 What parameters need to be monitored to assess adequacy of GDM management?**

The following parameters should be monitored:
1. Blood sugar levels
2. Weight gain of the pregnant woman
3. Fetal growth

See Annexure 15 for a home-based care checklist to be given to women with GDM and Annexure 11 for other patient monitoring charts.

**E.11 How frequently should blood sugar be monitored?**

The frequency for blood sugar monitoring will depend on the recommendations of the doctor as well as the setting. In an urban hospital setting, blood sugar may be monitored as frequently as five to seven times a day. This may not be feasible for most rural women. To ensure better compliance and access to more women, especially in rural areas, alternate days or bi-weekly monitoring can be considered.

When monitoring is done at home (by the woman herself or by the health worker), a two point measurement is done using a glucometer on designated days: the first reading is taken one hour postprandial or one hour after breakfast and the second reading is taken one hour after lunch. Please note that both readings are **one hour** postprandial. They are encouraged to come to the hospital every third or fourth measurement. When monitoring is done at the hospital, fasting and one hour postprandial readings are taken using venous plasma. Glucose load is not done for postprandial measurements.

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In SVYM’s GDM project, bi-weekly or tri-weekly home-based monitoring with a glucometer was conducted and was accompanied by a hospital-based plasma glucose measurement every third or fourth reading.
E.12 What blood test should be done to monitor blood sugar?

After diagnosis, most of the monitoring can be done by glucometers. The validity of the readings on the Glucometers can be ensured by using ‘Control Solution Testing’ as specified by the manufacturer, once a month or whenever a new box of strips is opened or when there is a discordance between clinical symptoms and glucometer reading. However, periodically, hospital-based venous plasma glucose readings must be taken. Some of the options for hospital based and home based monitoring plans are given below:

Table E2: Blood Test Required for GDM Monitoring, by setting

<table>
<thead>
<tr>
<th>Setting</th>
<th>Frequency</th>
<th>Test conducted</th>
<th>Method of testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>Varies from 3-7 times daily</td>
<td>Fasting, before each meal and 1 hr PPBS after each meal</td>
<td>Capillary whole blood reading using a Glucometer, accompanied by Plasma glucose reading on an analyzer in a hospital, once a day or on alternate days</td>
</tr>
<tr>
<td>Home</td>
<td>Twice a week or alternating days</td>
<td>1 hour PPBS (1 hr PP breakfast and 1 hr PP lunch)</td>
<td>Capillary whole blood reading using a Glucometer, accompanied by Plasma Glucose reading on an analyzer, at least every 3rd to 4th reading in the hospital. After 34 weeks of gestation, weekly hospital based evaluation is recommended.</td>
</tr>
</tbody>
</table>

E.13 What are the treatment goals?

Management is monitored using Capillary blood glucose measurements and the treatment goals recommended by the Fifth International Workshop-Conference 2007, on GDM, are used (20). When two consecutive fasting readings are ≤ 95 mg/dl and two one-hour post prandial readings are ≤140 mg/dl, the woman is regarded as stabilized. When the subsequent biweekly readings are within these limits more than 70% of the time (that means 7 readings out of 10 consecutive readings), treatment is continued without any modifications. If readings are abnormal more frequently, a woman may have to be hospitalized to initiate insulin therapy or re-hospitalized to adjust the current insulin therapy. Aggressive control of blood sugar leading to very low blood sugar carries risk of intra-uterine growth retardation. Therefore, adequate care should be taken to ensure that blood glucose levels do not fall below 70 mg/dl and the average blood glucose levels remain above 87 mg%.

E.14 How is weight gain monitored?
In addition to blood sugars, weight gain of the woman must be monitored frequently as instructed by the doctor. See Annexure 11A for a table that can be used by the health care team to monitor weight gain. Below is a table in summarizing the recommended weight gain in kilograms, by BMI status and trimester.

Table E.3 Monthly Weight Gain per Pre-Pregnancy BMI

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI</th>
<th>BMI</th>
<th>Total Weight Gain (kg)</th>
<th>Rates of Weight Gain 2nd and 3rd Trimester (kg/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under-weight</td>
<td>&lt;18</td>
<td>12.7 - 18.2</td>
<td>0.45 (0.45 - 0.59)</td>
</tr>
<tr>
<td>Normal weight</td>
<td>18-22.9</td>
<td>11.4 - 15.9</td>
<td>0.45 (0.36 - 0.45)</td>
</tr>
<tr>
<td>Over-weight</td>
<td>23-24.9</td>
<td>6.8 - 11.4</td>
<td>0.23 (0.2 - 0.32)</td>
</tr>
<tr>
<td>Obese</td>
<td>≥ 25</td>
<td>5 - 9.1</td>
<td>0.2 (0.18 - 0.14)</td>
</tr>
</tbody>
</table>

Plotting weekly body weights on a weight gain grid specific to BMI classification is encouraged to facilitate recognition of inadequate or excess weight gain.

E.15 How is fetal growth monitored?

It is essential to facilitate optimal fetal growth. If GDM is not adequately controlled, it can result in macrosomia. If GDM is too aggressively controlled, it could result in growth retardation. Fetal growth is monitored by measuring abdominal circumference of the fetus using ultrasonography. Head circumference of the fetus is usually larger than the abdominal circumference.

Fetal growth is monitored regularly starting late in the second and the early part of the third trimester. If fetal abdominal growth is <75th percentile for gestational age, then continue standard metabolic management. If it is more than the 75th percentile, intensify the management and monitoring as well as insulin therapy. If it is below the 25th percentile, then

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22 Adapted from Table 1 in Institute of Medicine (May 2009). Weight Gain during Pregnancy: Reexamining the Guidelines. National Academies Press: Washington, D.C. (32) The BMI classification categories have been adjusted to reflect the local population per SVYM cutoffs. Additionally, weight has been converted from lbs to kilograms. The original calculations assume a 0.5-2kg weight gain in the first trimester.
calorie restrictions may be slightly relaxed. See Annexure 11D for fetal growth monitoring charts.

E.16 What is self-monitoring of fetus?

Sudden and unexplained fetal death is known to occur with women with GDM. For early detection of any problems, the woman must learn to assess fetal movements by learning the technique of kick count. Self monitoring of fetal movements should be done on a daily basis from Week 30 to Week 40 (or the last 8-10 weeks) of pregnancy.

The mother should plan to count kicks after meals. She should wait 30 minutes and then count the number of kicks in one hour after breakfast, after lunch, and after dinner. Normally the mother would feel 4-5 kicks in an hour. If she experiences less than 4-5 kicks in an hour or any reduction or loss of fetal movements from her norm, she should seek care immediately. For example, if a mother normally counts 8-10 fetal kicks in an hour, but only counts 4-5 the next time she monitors, this is a significant reduction or loss in fetal movement and she should seek care. See Annexure 11E for a chart that can be given to pregnant women to keep track of fetal kicks.

Training the mother in counting kicks is extremely important, as reduction in kick count is one of the early warning signs of the possibility of intra-uterine death of the fetus. Early recognition will provide an opportunity to intervene and save the baby.

E.17 How often should a woman access prenatal care in the clinic or hospital?

Clinic or hospital visits are recommended every 2 weeks up to 34-36 weeks, and then weekly from 36 weeks onward. For each clinic or hospital visit, in addition to obstetric examination, the woman must ensure that her weight and BP have been recorded, urine examined for protein (to screen for onset of gestational hypertension or pre-eclampsia) and that the doctor reviews the blood glucose measurements done at home. These readings should be entered into the monitoring charts assigned to each patient. See Annexure 11B and 11C. She should consult the nutritionist to evaluate her diet and make any diet modifications if necessary. Additionally, she must also ensure that she has a non-stress test every week from 32 weeks until the end of pregnancy, if possible. Non-stress test may not be necessary if GDM has been well managed and there is no macrosomia.

However, if a woman cannot access hospital or clinic based ANC every time, special efforts may be needed to facilitate home based glucometer readings and periodic home-based phlebotomy
for venous plasma glucose monitoring. Monitoring of maternal weight gain, blood pressure and fetal self-monitoring can also be continued at home.

**E.18 How often should the woman undergo an ultrasound scan?**

Once GDM is detected, an ultrasound scan should be conducted to assess fetal growth and to detect macrosomia, if any. Thereafter, an ultrasound is recommended once every 4 weeks. Ultrasonographic monitoring is done to detect not only macrosomia, but also congenital malformations and polyhydramnios. It is also conducted at 36-38 weeks as part of the biophysical profile assessment. Fetal ultrasound screening for congenital anomalies is recommended for women with GDM who present with HbA1C > 7.0% or fasting blood sugar of > 120 mg/dl.

Uncomplicated pregnancies usually require 1-2 ultrasound scans. A woman with GDM may sometimes undergo even 5-6 scans.

**E.19 Which part of GDM management can be done at home?**

Much of GDM management can be at home. The woman must be encouraged to take responsibility for self-care through education, counseling and support. For women receiving home based care, it is important that they understand all aspects of GDM care and self-monitoring. They must incorporate the following components of care while at home:

a) Diet and exercise ([Annexures 9 and 10](#))  
b) Self monitoring (blood glucose, weight gain, fetal kicks) ([Annexure 11](#))  
c) Self administration of insulin and adjustment of doses if necessary ([Annexure 12](#))

[Annexure 15](#) provides a check-list for self-care by the pregnant woman. Regular and timely ANC and clinical visits are still essential.

An appropriately empowered woman with support from field-based health workers and the community can accomplish a major part of her management as home-based care. This approach reduces the burden of care for the woman and enhances her adherence. Family caregivers, community members and government health workers can assist the individual in carrying out these activities. They can encourage treatment adherence, accompany the woman in exercise, locally grow nutritious food, help cook healthy meals, help with self monitoring activities, help administer medication and accompany the woman to health care visits. Additionally, they must also know when the woman requires immediate medical attention.
E.20 What is the role of field health workers in home-based GDM management?

The role of field based health workers (ANMs, ASHAs and AWW workers) includes:

- **Education**: Educate the pregnant woman regarding the details of treatment plan, teach self-monitoring and reinforce when needed.
- **Motivation**: Motivate women to adhere to treatment plan, to seek hospital based care (especially at recommended time points), to have an institutional delivery.
- **Ensure Regular follow-up**: Remind the woman by phone or by home-visit, when she misses scheduled hospital visits.
- **Home based monitoring activities**: Ensure woman is conducting self-monitoring correctly (weight gain, fetal kicks, blood sugar when applicable), conduct monitoring of blood glucose by glucometer or phlebotomy and of urine glucose and ketones using urine strips, guide appropriate biomedical waste management.
- **Administration of Insulin**: Perform insulin injections or train a family member to do the same, train the pregnant woman for self-administration of insulin injections, assess and clarify insulin administration procedures at the home.
- **Referral**: Provide referral when appropriate (e.g. uncontrolled blood sugars).

It is important to note that management should be tailored to the individual patient. Less intense management may be allowed if fetal growth is normal and blood sugar level is in good control. On the contrary, if blood sugar levels are not controlled and/or if macrosomia is detected despite good glycemic control, management should be intensified. Intensifying management may include initiating or increasing doses of insulin, lowering targets for glycemic control and increasing USGs and ANC visits with a trained professional.

**Timing and management of delivery and immediate postpartum**

E.21 What type of delivery should a woman plan for?

All women with GDM must mandatorily plan for a delivery in the hospital. GDM results in some expected and many unforeseen complications. These include obstructed labour requiring forceps or Caesarean section delivery, shoulder dystocia of the infant and maternal hemorrhage. Therefore home-deliveries may not be able to cope with the complications. Moreover, insistence on delivery in a hospital is in keeping with the current approach to safe motherhood in India.

In the last trimester, the woman, with the help of the caregivers in the family, must plan for the hospital delivery including making the required transport arrangements. Besides regular
facilities of a labour ward (delivery room), the hospital chosen for delivery must have the following additional facilities for safe institutional care related to GDM:

a) Blood glucose monitoring of both the fetus and the mother
b) Non-stress test of fetus
c) Well-equipped operation theatre facilities to support a caesarean section
d) Intensive care of the neonate

E.22 Can a woman with GDM carry the child to full term?

If there is no maternal or fetal compromise, pregnancy can continue until 38 weeks. If continuing beyond 38 weeks, fetal monitoring should be intensified. If there is risk of a preterm delivery, corticosteroids for fetal lung maturity need not be withheld. However, during that period, temporary increases of insulin or more intense blood glucose monitoring may be required. If preterm emergency induction is required, delivery should be carried out without regard for fetal lung maturity.

E.23 What if there is confirmed macrosomia?

Whenever fetal overgrowth is suspected, the decision for mode of delivery should liberally swing toward Caesarian section. Fetal size should be the determining factor in deciding delivery route to reduce the rate of shoulder dystocia.

E.24 Should insulin be administered to the woman during intrapartum period?

If the woman is on long-acting insulin, it is stopped on the day of delivery. If delivery is prolonged beyond 24 hours, blood sugar is monitored periodically and if necessary, adequate corrections are made with short acting insulin or IV dextrose.

E.25 How should the neonate be monitored immediately after delivery?

Frequent monitoring of the baby for at least 48 hours after birth is critical to prevent neonatal hypoglycemia, electrolyte abnormalities, respiratory distress and other complications which affect fetal morbidity and mortality. Hence, the mother and child should remain under institutional care for at least 48 hours after delivery.

Infants should be screened for hypoglycemia by measuring blood sugar by Glucometer at ages 1, 2, 6 and 12 hours. Less frequent measurements are appropriate if blood glucose is stable. However, for unstable blood sugar (less than 40 mg/dl) continued surveillance and more
frequent measurements may be needed until blood glucose is stable (greater than 40 mg/dl). (26) (27) (28)

Remember!
Neonatal Hypoglycemia may be asymptomatic. Hence, regular monitoring of blood sugars is necessary. Early detection of symptomatic hypoglycemia with regular sugar monitoring may avert complications.

E.26 What are the signs and symptoms of neonatal hypoglycemia?

The symptoms of hypoglycemia are nonspecific and can mimic any illness. Common symptoms include: not looking well, lethargy, weak cry, poor feeding, temperature instability like hypothermia, poor respiratory effort, apnea or cyanosis and neurologic symptoms like: excessive jitteriness, convulsions or hypotonia. The diagnosis of hypoglycemia as the cause of above mentioned symptoms can be confirmed by the Whipple’s Triad: (i) Presence of symptoms known or likely to be caused by hypoglycemia (ii) A low glucose measured at the time of the symptoms (iii) Relief of symptoms when the glucose is raised to normal (26) (27) (28).

E.27 How can neonatal hypoglycemia be prevented?

One of the most important methods to prevent neonatal hypoglycemia is to encourage early feeding. A mother with GDM should initiate breastfeeding within ½ hour of birth.

E.28 How should neonatal hypoglycemia be managed?

If the blood glucose reading is between 25 and 40 mg/dl, the infant is full-term and able to feed, then:
- Draw blood for immediate venous blood glucose measurement
- Try oral feeds – direct breast feed/expressed breast milk with a spoon or tube feeds
- Repeat blood glucose (venous sample or with Glucometer) 20 min after feeding

If the blood glucose reading is:
(a) less than 25 mg/dl, or
(b) less than 40 mg/dl and the infant is NPO (not breast feeding) or preterm, or
(c) less than 40 mg/dl after feeding, or
(d) less than 40 mg/dl and the infant is symptomatic
Then:
- Draw blood for blood glucose measurement
Give Intravenous bolus of 2 ml/kg body weight of 10% Dextrose solution (D10W)

Begin continuous infusion of D10W (using a Microdrip Infusion set), at a Glucose Infusion Rate (GIR) of 6-8 mg/kg/min, which approximates to 10 microdrops/min for a 3 kg baby.\(^{23}\)

Repeat blood glucose test after 15-30 minutes

Refer to Annexure 16A for an algorithm for treating neonatal hypoglycemia and Annexure 16B for a reference nomogram to calculate fluid requirement for a given glucose infusion rate (GIR) (29).

If still low, repeat bolus and increase GIR by 1-2 mg/kg/min or maintenance fluid by 10-20 ml/kg/day. Details to modify the GIR are provided in Annexure 16C.

The frequency and duration of continued monitoring depends on clinical features and the blood glucose value. Initial frequency may be 2 hourly and later 4 hourly and finally 8-12 hourly. Monitoring is usually done for 72 hr after birth in at risk newborns or till glucose levels remain normal for 48-72 hr. Symptomatic babies may require more frequent monitoring.

The same infusion rate of D10W is maintained until the blood glucose is stable for at least 6 to 8 hours. IV infusion of glucose should not be stopped abruptly. Once the blood glucose has been stable for 12 to 24 hours and enteral feeds have been initiated and increased as tolerated by the infant, the D10W infusion should be decreased by not greater than 1-2 mg/kg/min every 2 hours with adequate monitoring.

E.29 What are additional complications to be monitored for in the neonate?

It is also advised to monitor for respiratory distress (related to lung immaturity in a pre-term delivery), hypocalcemia (serum calcium <7mg %), hyperbilirubinemia\(^{24}\) (related to preterm birth and polycythemia with hemolysis) and cardiac hypertrophy which usually disappears by 6 months of age (30). There may not be resources in all environments to complete such monitoring. Therefore it is recommended that women with GDM deliver in a centre which can support the above mentioned monitoring.

\(^{23}\) If 10% Dextrose is not readily available, it can be prepared from 5% and 25% Dextrose using the instructions given in Annexure 16C.

\(^{24}\) All neonates should be monitored for the development of jaundice with even if there are no evident signs. If infant is going to be discharged within 48hrs of birth, get serum bilirubin done (even if there is no visible jaundice) and plot on Bhutani’s nomograms. If the value falls in high intermediate and high risk zones, do not discharge the baby. Instead monitor the baby for worsening bilirubin levels and follow NICU guidelines for neonatal hyperbilirubinemia management if necessary.
Care after delivery: post partum management of the mother and the baby

More than half of woman with gestational diabetes will develop Type 2 DM in the ensuing 20 years (17). Postpartum follow-up care aims at its primary prevention and early diagnosis.

E.30 When and how should the mother’s blood glucose be measured after delivery?

Post partum blood glucose measurement is critical after 48 hours of delivery and at 6 to 8 weeks after delivery to detect persistent or overt DM. At 6 to 8 weeks of delivery an OGTT is repeated. If the woman has an impaired glucose tolerance at 6 – 8 weeks post partum, she should continue diabetic diet and monitor her blood glucose every 6 months with FBS and PPBS. If she contains to remain labeled as IGT (fasting blood glucose 110-125; 2 hour post prandial blood glucose 140-199) even after weaning and if BMI is ≥ 23, an oral hypoglycemic such as metformin may be initiated (31). Diet, exercise and annual monitoring are recommended. It is important to educate the mother that medication may be required for life. If the blood glucose levels are within normal limits, she is advised specific diet modifications.

The timetable for postpartum blood sugar monitoring is given in Table E.4. This screening pattern will be repeated for the rest of her life in order to ensure early detection of Type 2 DM and prevent complications. If she plans another pregnancy, a pre pregnancy OGTT must be done to assess glucose metabolism.

Table E.4 Timetable for Postpartum Blood Sugar Monitoring of Mothers with GDM (20)

<table>
<thead>
<tr>
<th>Time</th>
<th>Test</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postpartum (after 48 hrs)</td>
<td>FBS / RBS</td>
<td>To detect persistent or overt diabetes</td>
</tr>
<tr>
<td>Late postpartum (6 to 8 weeks)</td>
<td>75 g 2-hr OGTT</td>
<td>To classify pre-DM / overt DM</td>
</tr>
<tr>
<td>1 year postpartum</td>
<td>75 g 2-hr OGTT</td>
<td>Assess glucose metabolism</td>
</tr>
<tr>
<td>Annually</td>
<td>FBS</td>
<td>Assess glucose metabolism</td>
</tr>
<tr>
<td>Once in 3 years</td>
<td>75 g 2-hr OGTT</td>
<td>Assess glucose metabolism</td>
</tr>
<tr>
<td>Prepregnancy</td>
<td>75 g 2-hr OGTT</td>
<td>Classify glucose metabolism</td>
</tr>
</tbody>
</table>

E.31 What are the goals for follow up care of the child?

The goal for follow up care of the child is to reduce the risk for obesity and subsequent development of Type 2 diabetes mellitus. Exclusive breast feeding during the first year of life to the greatest extent possible is recommended as it may reduce blood sugar levels and the likelihood of overt diabetes. Additionally, the child should be monitored for weight gain/BMI at 2 to 5 years in order to detect any obesity.
F. Monitoring & Evaluation of the Program

Monitoring and Evaluation (M&E) is a fundamental component of any program and thus should be included in the planning process and program implementation for any GDM project. It allows program managers and stakeholders to understand the progress of a particular program and its impact, in order to guide both current and future programs. For many organizations, M&E is often seen as a donor requirement, rather than a program management tool. However, it is as important as the actual program implementation itself and therefore needs similar care and effort in planning and implementation. The most important use of M&E should be for the organization or program to see how it is doing against objectives, whether it is having an impact, whether it is working efficiently, and to learn how to improve. While only broad guidelines are provided in this section, individual programs can develop an M&E plan tailored to their particular program.

Program managers should develop a plan for monitoring and evaluation during the design phase of a program to ensure strong commitment to and adequate resources for carrying it out. The plan should describe the goals and objectives of the program and include a framework that shows how program components will work together to reach the intended outcomes. The plan then should set forth the indicators that will measure these key components. As data about these indicators are collected and analyzed, managers can use them to monitor trends and adjust the program as needed.

F.1 What is Monitoring and Evaluation?

Monitoring and Evaluation, though usually mentioned together, actually have different purposes and processes.

Monitoring is the process of collecting data at a number of points during program implementation to ensure that the program is running smoothly and achieving its objectives according to plan. For example, if the program planned to conduct 4 mothers’ meetings and 10 street plays in each month, the monitoring team will verify if they have been conducted and reasons by variance if any. By tracking changes in performance, program managers and stakeholders can fine-tune program operations to reach desired outcomes most efficiently and effectively. While its main purpose is to assess day-to-day information about a program’s performance, monitoring can also be used to:

- to facilitate wider stakeholder awareness and participation
- to account for the use of resources against the achievement of outcomes
Evaluation is a more involved process to answer specific questions about a program’s success and impact. Evaluation is used to assess the conceptualization, design, implementation and utility of a program. The purpose of evaluation is often to determine the degree to which changes in outcomes are the result of program activities (Impact assessment). For example, the Evaluation team will assess how the mothers’ meeting have impacted health-seeking behavior either by changes in number of screenings done or by changes in attitudes and practices in the community. Evaluations typically include measures both at the beginning and the end of a program and, when possible, include a control or comparison group to help determine whether changes in outcomes result from program activities themselves, not from other influences outside the program. The process of evaluation provides information to program managers and stakeholders about how effective a program is and its impact on the target population and the program’s sustainability.

Both Monitoring and Evaluation are necessary management tools to help inform decision making around a program. While both use similar steps, they produce different kinds of information. Whereas monitoring helps to assess whether a program is on track with desired objectives (outputs), evaluation helps to determining whether or not the program achieved the desired effect on the target population (impact assessment). What monitoring and evaluation have in common is that they are geared towards learning about what a program is doing and how it is doing it by focusing on efficiency, effectiveness and impact.

F.2 What are inputs and outputs?

Inputs are usually the resources utilized or put into a program. Examples include: staff time, direct costs (transportation, cost of materials, etc) and indirect costs (use of staff not directly a part of the program, use of meeting space, etc). Outputs are usually a program’s deliverables and should provide some benefit to the organization or target population (for example number of recipients of a program’s services, number of participants at an educational program). Some templates for collecting data for monitoring outputs are provided in Annexures 1A to 1F. Additionally, an output may be the end result of program, such as a final report or a set of recommendations or guidelines. Part of the process of M&E assesses whether or not the outputs result from an efficient use of the inputs.

F.3 What are outcomes?
Outcomes are the immediate or direct effects of a program on participants. For the purpose of M&E, anticipated outcomes should be determined before program implementation and measured as an indicator of program success.

**F.4 What is the difference between outcomes and impact?**

While outcomes are the immediate effects of a program, impact looks beyond the immediate effect of a program to identify long term or unintended effects of a program, such as behavior change. For example, for a program to increase immunization coverage in underserved populations, an outcome would be the number of children vaccinated while impact would be any change in disease occurrence or the number of children vaccinated at a later time when the program is complete.

**F.5 What are the pre-requisites for M&E?**

The M&E plan starts with an understanding of the project, the goals and objectives, implementation plan and resources being utilized to fulfill the goals and objectives. For M&E to be meaningful, the goals and objectives must be SMART (Specific, Measureable, Achievable, Realistic and Time-bound). The project plan must also clearly specify who is responsible for the overall implementation of the plan as well as who is responsible for achieving each goal and objective. These will be the same people who would be acting on the recommendations or stipulations of the M&E team. Therefore, an organogram of all people with mention of assigned responsibilities in the project is essential. This will also define the path of flow of regular status reports, starting from the field workers, flowing up through middle managers or facilitators and finally end at the program manager or coordinator. The coordinator would have the overall responsibility of submitting regular status reports to the M&E team and the institution’s head.

The M&E activity can be considered at three levels.

1) The first level is a continuous, ongoing exercise by the program staff themselves.

2) The second level is a periodic evaluation by the Institution’s Head.

3) The third level is an objective evaluation by external persons (Persons not directly connected to the program or the institution).

**F.6 What is done during M&E?**

The primary role of M&E is to assess if the goals and objectives of the program are being achieved or not. Accordingly, the following questions need to be addressed during M&E:

a) Are program activities achieving the desired goals? Why or why not?
b) Will the goals be achieved according to the timeline specified in the program/project plan? If not, why?
c) Do personnel have adequate resources (money, equipment, facilities, training, etc) to achieve the goals?
d) Are the goals and objectives still realistic?
e) Do the measurable outputs adequately reflect the anticipated effect of the program?
f) Should priorities be changed to put more focus on achieving the goals?

F.7 Is it permissible to change plans?

It must be noted that project plans are guidelines. They are not iron-clad rules. Projects often need to change plans due to changes in internal and external environment, changes in availability of resources needed to carry out the original plan etc. Therefore, it is quite permissible to make some deviations as the project proceeds.

The most important aspect of changing plans or deviation from plans must be an adequate understanding of the reasons for deviation. Efforts must be made to understand what is causing the changes to be made. The acceptance of the deviations depends upon the nature of deviations, an assessment of the efforts made to achieve goals and also the environment in which the project was being implemented.

Normally, changes in timelines, responsibilities and activities are quite to be expected. But major changes in goals and objectives need more careful consideration before being allowed. When changes are made, they must be updated in the program or project plan and communicated to all relevant stakeholders. It must be noted that most donor agencies like to be kept informed of any significant deviations from plan. By conducting strong monitoring and evaluation, the program manager has data to inform decisions to deviate from a project plan.

F.8 How frequently should an M&E exercise be performed?

The frequency of reviews depends on the nature of the organization and the environment in which it is operating. A timeline must be established for the receipt of status reports, based on the intensity of the activity, anticipated rate of internal and external changes and criticality of the objectives. The more rapid the changes anticipated or more critical the objectives, the more frequently a review should be held. A suggested model to establish periodicity is given below:

**Table F.1 Periodicity for M&E Activities**

<table>
<thead>
<tr>
<th>Periodicity</th>
<th>Nature of Report</th>
<th>Prepared by</th>
<th>Submitted to</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Frequency</th>
<th>Description</th>
<th>Responsible Party</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>Weekly activity report along with listing of activities / tasks related to objectives</td>
<td>Health Worker, Health Facilitator / Middle level Manager</td>
<td></td>
</tr>
<tr>
<td>Monthly</td>
<td>Consolidated report of month’s activities of all health workers under the supervision of health facilitator</td>
<td>Health Facilitator / Middle level Manager</td>
<td>Program Manager</td>
</tr>
<tr>
<td>Quarterly</td>
<td>Consolidated report of all activities of the quarter by all health workers. This report should also include a report on Human Resource, Budget Tracking, Asset Tracking &amp; Maintenance and a Variance report of objectives planned and objectives achieved.</td>
<td>Program Manager</td>
<td>Program Coordinator</td>
</tr>
<tr>
<td>Yearly</td>
<td>Consolidated report of all activities of the entire year for the program. This report should also include a report on Human Resource, Budget Tracking, Asset Tracking &amp; Maintenance and a Variance report of objectives planned and objectives achieved, as well as overall outcomes.</td>
<td>Program Coordinator</td>
<td>Institution Head</td>
</tr>
<tr>
<td>Yearly</td>
<td>Consolidated report of all activities of the entire year, of the program. This report should also include a report on Human Resource, Budget Tracking, Asset Tracking &amp; Maintenance and a Variance report of objectives planned and objectives achieved, as well as overall outcomes.</td>
<td>Program Coordinator &amp; Institutional head</td>
<td>External evaluators</td>
</tr>
</tbody>
</table>

F.9 How should the report of M&E be written?

The M&E report should include information on:

1. Adherence to timeline
2. Trends regarding the progress (or lack thereof) toward goals, including which goals and objectives
3. Reasons for variance, if any, and analysis there of
4. Recommendations about the future course of action
5. Any actions needed by management

When project timelines are being met, the M&E team will do well to ensure that adequate reward, appreciation and communication is accorded to all parties involved. Positive feedback and acknowledgement go a long way in energizing and refreshing the approach while making future plans.

When timelines and objectives are not being met, reasons for variation as stated by the project team and as perceived by the M&E team must be reported. Care must be taken to focus on issues based on their criticality for fulfilling goals and objectives. Feedback about discrepancies must be given in a manner that will inspire the team to better achievement in future.

An M&E exercise should always conclude with suggestions and recommendations to further improve planning and implementation activities.
Annexure 1: Standard Operating Procedures

1A. Mothers’ Meetings

Description: An organized meeting of pregnant women, young mothers and their caregivers to provide health education related to safe motherhood, child health, safe delivery and some components of antenatal care.

Objectives:
1. To generate awareness among pregnant women, postnatal mothers, and their caregivers regarding antenatal care (including GDM and nutrition), institutional delivery, postnatal care, care of the newborn, and care of children less than 3 years of age.
2. To improve health seeking behaviors among pregnant and postnatal mothers in order to facilitate early diagnosis (including screening for GDM) and treatment of complications during pregnancy, delivery and puerperium (post-partum period) with special focus on high risk pregnancies.
3. To sensitize the community about and facilitate access to the various government schemes available for promoting safe motherhood and child survival.

Target population: Pregnant women, postnatal mothers and their caretakers

Individuals/institutions responsible for organizing the meeting: Government and non-government field-based health care personnel (Ex: Health workers, Health facilitators, ASHAs, ANMs, and AWWs)

Suggested venues: A local venue, within walking distance of most homes, with adequate shelter against sun and rain and space for a gathering of 15-30 women is ideal. Availability of a blackboard and drinking water are desirable, but not essential. If phlebotomy is planned for Glucose Challenge Test, power supply to operate centrifuge is essential. Hand-powered / battery operated centrifuges can also be considered. Ex: Child care centre (Anganwadi), Continuing Education Center, Community Hall (Samudaya Bhavana), PHC, local school, GP office.

Suggested timing: A day with no festivals or any other special occasions is chosen in order to maximize participation of the community. If phlebotomy is planned for GCT, choose a time when there are no anticipated power-cuts.

Duration: 2-3 hours
Materials needed: IEC materials, GDM Field-based testing kit (see Annexure 4)

IEC aids used: Television with video CDs, flipcharts, slide shows, songs

Methodology:

1. Selecting a village
   The following considerations are to be taken into account:
   - There are at least 3 pregnant women in the village. (if there are fewer pregnant women, one to one or family discussions can be held)
   - Villages where there has not been a mothers’ meeting held in the previous three months.
   - The awareness level and the proportion of institutional deliveries are comparatively low.
   - There is potential for cooperation with the community and government health staff.

2. Planning
   Planning for implementation and monitoring is done by the government field personnel (ASHA, ANM and AWW) and local NGOs or CBOs, in consultation with each other. Community members are involved to develop curriculum so that it is linguistically and culturally appropriate, keeping in consideration, the education level and literacy of target population.

3. Implementation
   Communication about the date, time and venue of the meeting is done by the ASHA, village volunteers, school children and AWW through word-of-mouth, well placed posters, announcements at school and community members, etc. Mobilization of the pregnant mothers, postnatal mothers and their guardians can also be done by the ASHAs, ANMs, and AWWs through one-on-one interactions, and announcement at SHG meetings. Participation of a doctor from the nearest PHC can also be considered to help clarify technical matters.

   The active participation of the women and their caregivers attending the meeting is a key factor in the meeting’s effectiveness. Thus educational material must be interactive and delivered in locally appropriate language that is simple and easy to understand.

Topics for discussion should include:

   a. Concepts and components of antenatal care
      - Prenatal advice (Diet, Personal hygiene, Drugs, Radiation, Warning signs and child care.)
      - Specific Health Protection with special focus on antenatal investigations (Screening for diabetes, hypertension, anemia, blood grouping with Rh typing, urinary tract
infections, sexually transmitted infections like Syphilis, Hepatitis B and HIV) and ante-natal immunization against tetanus.
- Nutrition and prevention of nutritional deficiencies
- Birth preparedness
- Government and non-government schemes available for safe motherhood
- Breastfeeding
- High risk pregnancy
- Contraceptive advice

b. Empowerment of a pregnant woman to understand and evaluate her own ANC care, including her ANC card. ANC card provided by the government health system, with link to a computerized health information system is recommended. Else the sample ANC card provided in Annexure 14 can be considered.

c. Enablement of a pregnant woman to conduct a self-assessment for risk factors for GDM.
d. Importance of screening for GDM by GCT
e. Enablement of a pregnant woman to identify components of antenatal care not received.
f. Assistance of a pregnant woman and her caregiver in accessing care at the appropriate health care facility
g. Identify doubts, clarify and verify understanding on various relevant health issues related to pregnancy
h. Motivate pregnant women and their caregivers for institutional delivery and assist in planning for delivery

Tips to enhance attendance and participation:
1. Include a video of general, culturally appropriate entertainment in the program
2. Songs with health education messages can have catchy lyrics and be set to popular tunes
3. Competitive events including quizzes on ANC and GDM with prizes
4. Distribution of nutrition supplement packets

Monitoring and Evaluation:
Indicators for on-site monitoring of the efficacy of the meeting:
   a) Number of pregnant and post-natal women in attendance (as a percentage of the total present in the village)
b) Interest levels of the women attending the meeting – paying attention to the content, seeking clarifications, sharing experiences, etc.
c) Feedback comments from participants, listing of things learned as perceived by the participants
d) Number of women able to read and understand their ANC card

Indicators for status reports:
a) Total number of participants with numerical breakdown of pregnant women, postnatal mothers and caregivers
b) Number of participants who attend mother’s meeting for more than one time
c) Number of women identified to have risk factors for GDM
d) Number of women who have completed 6 months of gestation and number of them who have undergone GCT before or undergone GCT during mothers’ meeting

This template is to be completed by the health worker during the mothers’ meeting and then promptly submitted to the program/project office after the event.

**Template for a report of mothers’ meeting:**

<table>
<thead>
<tr>
<th>Name of Event:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Village / Haadi:</td>
<td></td>
</tr>
<tr>
<td>Location: PHC / Community Hall / GP Office/ Other___________</td>
<td></td>
</tr>
<tr>
<td>Date, Time, Duration of Event:</td>
<td>Date: From: __________ to __________</td>
</tr>
<tr>
<td>List of Topics Discussed:</td>
<td></td>
</tr>
<tr>
<td>IEC Modalities Utilized:</td>
<td></td>
</tr>
<tr>
<td>Total No. of participants:</td>
<td>Total No. of pregnant women:</td>
</tr>
<tr>
<td>Total No. of post-natal mothers (delivered less than an year ago):</td>
<td>No. of pregnant women who have completed 6 months of gestation:</td>
</tr>
<tr>
<td>No. of post-natal mothers who delivered in hospital:</td>
<td>No. of the above pregnant women who have already undergone GCT:</td>
</tr>
<tr>
<td>SI No.</td>
<td>Name of the Participant</td>
</tr>
<tr>
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Name and Signature of participant
1B. Self Help Group Meetings

(Note: This SOP could be used for other Community Based Organisations too!)

Description: a meeting of the Self Help Group members in the village (e.g. women’s self help groups like Stree Shakti)

Role of SHGs in GDM management:
1. SHG members are an important population group for GDM screening as they disseminate awareness to their families and to the community.
2. SHGs are also represented in the Village Health and Sanitation Committees. They need to be empowered to actively participate in the VHSC meetings and evaluate the performance of Government field personnel (ASHAs and ANMs) in order to ensure that they appropriately screen pregnant women for GDM.
3. SHGs can also play an important role in facilitating the timely referral of pregnant mothers needing early medical intervention and also provide emotional and social support.

Objectives:
1. To raise awareness about safe motherhood and child survival measures for SHG members, their families and the greater community.
2. To sensitize members about the various government schemes available for safe motherhood and child survival to optimize maternal and child health outcomes.

Target population: SHG members and their families and immediate community.

Individuals/institutions responsible for organizing the meeting: Government and NGO based field workers (Ex: Health workers, Health facilitators, ASHA, ANM, AWW)

Suggested venue & timing: The regular venue and time when SHG meetings are convened.

Duration: One hour

IEC aids used: television, flipcharts, slide shows, interactive songs set to popular tunes with lyrics containing health education messages.

Methodology:
1. Selecting a village
   If any one of these factors is present, a SHG meeting should be held in that village.
      - Number of pregnant mothers and eligible couples is relatively high.
- Relatively low awareness of adequate ANC and available government schemes.
- Relatively low proportion of antenatal visits and institutional deliveries.
- SHGs in the village support meetings about this topic.

2. Planning
The NGO worker, ASHA, ANM and/or the Anganwadi worker will meet with the SHG to discuss the importance of the meeting. On the same day, they will collectively decide on a date, time, and venue for the meeting, as well as a strategy to motivate attendance by pregnant mothers and their caregivers.

3. Implementation
The mobilization of SHGs is done by their peer SHG members, ASHA and the Anganwadi workers through word of mouth or through local cable network or announcements through a public address system. The ANM / Health facilitator will facilitate the discussion about safe motherhood and child survival topics.

Topics for discussion should include:

a. Antenatal care and post-natal care (Some recommended educational materials are available in Annexure 3)

b. Risk factors and risk assessment for GDM

c. The importance of antenatal screening and diagnostic tests such as hemoglobin, blood grouping, and typing, GCT, HIV, VDRL, HBsAg, USG, and reading and understanding an ANC card. (Use the government provided ANC card or sample ANC card in Annexure 17)

d. Nutrition, meal plans and local cultivation of nutritious food materials (Annexure 6)

e. Importance of institutional delivery

f. Birth preparedness (see Annexure 17)

g. Special schemes available for the safe motherhood and child survival.

h. The role of SHGs in facilitating antenatal and post-natal hospital visits, institutional deliveries, etc.

i. This meeting can also provide opportunities to discuss these other topics such as health problems associated with teenage marriage, family planning options, immunizations of children and pregnant women, HIV/AIDS, and the Right to Information Act.

SHGs can be given referral cards with instructions about how to fill out the card and refer pregnant mothers to the nearest hospital in cases where the pregnant mother has not had a hospital visit for more than three months.

Monitoring and Evaluation:
Indicators for monitoring:
1. Number of members attending the meeting versus the total members in the SHG.
2. Number of members actively participating in the meeting by sharing experiences and seeking clarifications.
3. Number of pregnant mothers referred by the SHG for antenatal visits to both government and private hospitals.
4. Level of awareness about safe motherhood and child survival issues in families with SHG members as assessed post meeting.
5. Proportion of pregnant mothers who had at least three antenatal visits
6. Proportion of institutional deliveries in the families of SHGs.

Indicators for status reports:

1. Number of members attending the meeting versus the total members in the SHG
2. Total number of participants with numerical breakdown of pregnant women, postnatal mothers and caregivers
3. Number of women identified to have risk factors for GDM
4. Number of women who have completed 6 months of gestation and number of them who have undergone GCT before or undergone GCT during mothers’ meeting

This template is to be completed by the health worker during the SHG meeting and then promptly submitted to the program/project office after the event

**Template for a report of SHG meetings:**

<p>| Name of Event: |  |
| Name of Village / Haadi: |  |
| Location: PHC / Community Hall / GP Office / Other |  |
| Date, Time, Duration of Event: | Date: From: __________ to __________ |
| List of Topics Discussed: |  |
| IEC Modalities Utilized: |  |
| Total No. of Participants: |  |</p>
<table>
<thead>
<tr>
<th>SI No.</th>
<th>Name of the Participant</th>
<th>Signature/Thumb Impression of the Participant</th>
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</table>
1C. Public Meetings & Gatherings

**Description:** Village meetings are gatherings of 200 to 300 people from the village which include men, women and children. Sometimes, in smaller villages or tribal hamlets, the gathering may be as small as 10-20 people. Meetings exclusive for women can also be organized. These meetings can be organized specially for the purpose of health education. Alternatively, meetings organized by the villagers for any local festivity can also be used for the purpose of health education. Village meetings and public gatherings are good avenues for mass-education interventions. With good planning, they are effective in eliciting community involvement and stimulating behavior change on a large scale. Disadvantages are that it is difficult to cater to individual interactions and also difficult to evaluate the impact.

**Individuals/institutions responsible for organizing the meeting:** Government and NGO based field workers (Ex: Health workers, Health facilitators, ASHA, ANM, AWW)

**Suggested venues:** The location of the meeting must be decided in consultation with the local community. The local community can be motivated to provide the venue. Based on the communities’ resources, the venue can range from a playground, village square or a community hall. For warm and sunny weather, arrangements must be made for seating under a large tent.

**Suggested date and timing:** The date of the meeting must be convenient to most beneficiaries. Monsoon season, planting season, festive seasons and harvest seasons must be avoided. Dates must also consider local migration patterns. The date must be fixed in consultation with the major stakeholders in the meeting.

**Duration:** The duration of the meetings can range from 3-4 hours to day-long fairs. When meetings are held for women exclusively, the meetings are best timed from mid-morning to mid-afternoon.

**IEC aids:** Public address system, audio songs with health messages, large banners and posters, handouts, street play.

**Methodology:**

1. **Selecting a village:**

   The following factors are taken into consideration for prioritizing the village for a meeting. If any one of these factors is present, a meeting should be held in that village.
   - Number of pregnant mothers and eligible couples is relatively high.
   - Level of awareness of adequate ANC and available government schemes is relatively low.
- Proportion of antenatal visits and institutional deliveries is relatively low.
- SHGs and CBOs in the village support meetings about this topic.

2. Planning:
The organizing team must consist of at least 8-10 people, including some full-time volunteers from the villages. Contributions of resources from the community must be encouraged.

3. Implementation:
A formal dais and a formal inaugural function is the norm in most such village gatherings. Local leaders, opinion makers, health functionaries (medical officers) can be invited as guests to elicit their support for the health education program.

The formal inaugural function is a good avenue to deliver health education in the manner of a speech. Speakers with good oratory skills, knowledge of the subject, fluency in the local language and jargon and familiarity with the local cultural ethos are valuable resource persons. Encouraging the local leaders to publicly support and promote the health message is more effective in bringing about behavior change.

When the gathering is small (about 50 people are less, as is likely to happen in remote villages and tribal settlements), a workshop or a focused group discussion can also be included as an event, to help the project staff understand the status of local knowledge, attitudes and practices as well as obtain insights into barriers to seeking health care.

Beyond the speeches in the formal inaugural function and the workshops/focus group discussion, all other events in the public meeting must have plenty of physical activity or entertaining content to keep the participants interested till the end. Songs, competitions, games, drama, street plays etc can be used to deliver the health messages.

Announcement of prizes for the competition, free raffle event, provision of lunch / snacks, screening videos with health messages, etc can increase participation in the meetings.
1D. Torch Light Parade

**Description:** It is a unique event to generate awareness about a specific health issue where a designated team, along with the local community, will carry out a torch light parade along the main streets of the village or town, chanting slogans, distributing pamphlets and interacting with the local community through one-to-one and one-to-group methods around the related health issue being presented in the parade. The glow of the flames and the patterns of light attract attention of the people.

**Objectives:**

1. To generate awareness to the community about ANC, importance of institutional delivery and postnatal care.
2. To sensitize the community on special schemes available through the Department of Health for safe motherhood and child survival and to facilitate access to these schemes.
3. To improve the relationship between the community and the organization that coordinates the parade.

**Individuals/institutions responsible for organizing the meeting:** Planning for the event should be done in consultation with the government personnel assigned to the area (MO, AWW, ANM, ASHA) and local community stakeholders like VHSC members, SHGs, Youth clubs and other CBOs. **The local law-enforcing authorities should be informed about the event and permission obtained, if necessary.** The local community should be encouraged to get as actively involved in the parade as possible.

**Suggested venues:** Main streets of the village. Route to be determined ahead of time by organizers and community members.

**Suggested date and timing:** It is to be held late in the evening or after dark.

**Duration:** The parade should last at least 90 minutes from start to finish.

**IEC aids:** Pamphlets

**Methodology:**

1. **Selecting a village:**
   The following factors have to be taken into consideration:
   - Villages that are willing to actively participate in the program
   - Villages with health issues that are not well understood by the local community
2. Planning:
Planning for the program consists of the following steps:

1. Communicate with local community regarding topic, time and location.
2. Select the topic
   - The issue should be relevant to the village or specific area of the village selected. For e.g. risk assessment for GDM, healthy life styles, nutrition and meal plans in GDM, screening and confirmation of GDM, etc
   - Include supportive data/evidence as available
   - Make sure to include information about relevant government health schemes.
3. Hold brief training session for the participants
4. Create pamphlets for distribution during parade
5. Ensure availability of equipment and supplies – atleast 15 torches or lights
6. Consider coordinating with other health interventions (street play, wall painting, health exhibition)

3. Implementation:
1. Advertising the program
   - At least one week prior: at schools, religious gatherings, community meetings, posters in places where people congregate (market, bus stop, etc), information in local newsletters or bulletins
   - Day before parade: make another round of announcement
   - Include health theme, date, start and end time of parade

2. Preparation of torches or candles
   Torches can be prepared by taking sturdy pieces of a tree branch, about 2-2.5 feet long. One end is covered with strips of cloth soaked in oil, covering about terminal 6-8 inches of the stick. One decorated torch can be used to light all other torches as a ceremonial gesture.

   Candles can also be used for this purpose. Small paper cups can be used to place the candles within, to protect the flame from wind and also to collect molten wax.

3. Start of parade
   - The parade should begin with an interaction with the public gathered to address the importance of the selected health theme in context to the local area. It is important to explain the theme using data evidence and the role of public to achieve the desired outcome.
• The people participating in the parade should make rows of three people each and leave at least one meter distance between each row to avoid any injury to people from the torch.

4. End of parade
   • The parade should culminate with another round of interaction with the community with regard to the health theme.

**Monitoring and evaluation:**

Consider the following indicators for monitoring:
1. Number of people gathered for the event
2. Number of pamphlets issued
3. Number of local people involved in the parade
4. Improvement in the knowledge levels of the community with respect to the health theme that was focused in the event in particular.
**1E. Street Play**

**Description:**
A play is performed in open areas (in the middle of a street or village square) using minimal stage props and costumes. The play depicts important health issues and draws the attention of the audience to desirable and not-desirable health practices and stimulates thought-processes to bring about behavior change. The content and style of the play is adapted to local social norms and cultural practices and utilizes dramatization and humor to convey messages around a particular health issue. Overall, health messages are packaged as an entertainment event to maximize the participation of the people. This is often referred to as ‘Edutainment’. The advantages of this mode of health education is that mass-education at village level can be delivered in one shot, with minimal resources. Disadvantages are lesser opportunities for one-to-one interaction. It also needs a specially trained team of performers. Since it is akin to live-theatre, performers are needed for every performance. Replication on a large scale and ensuring completeness of content on every occasion will have limitations.

**Objectives:**
1. To generate mass awareness about Gestational Diabetes Mellitus.
2. To sensitize the people about the need for positive life styles
3. To promote community involvement in health seeking behavior, particularly related to antenatal care and screening for Gestational Diabetes

**Target population:** Entire village

**Suggested venues:**
The venue should meet the following criteria:
1. Equally accessible to most people in the village, with preference for a central location.
2. It should be devoid of garbage or any sort of environmental nuisance.
3. The place should be well illuminated.
4. The place should accommodate a sizable proportion of the village population.

**Suggested timing:**
Late evenings (after regular work hours) are ideal when people return from their work. Care should be taken to avoid overlap of dates with locally important festival or other dates, unless the street play could be incorporated into the festival as a special event.

**Duration:** One hour
Other IEC aids used: Pamphlets containing information about the health topic, public address system, flood lights / stage illuminating system.

Since finding power supply is a challenge in many villages, to enable an uninterrupted performance of the street play, SVYM has developed a model vehicle fitted with roof-top solar panels to power the illuminating system and public address system. See picture below:

Methodology:

1. Selecting a village:
The following factors have to be taken into consideration:
   - Villages that are willing to actively participate in the program
   - Villages with health issues that are not well understood by the local community

2. Planning:
Planning for the program consists of the following steps:
   1. Communicate with local community regarding topic, time and location. The community leader can also be invited to inaugurate the play.
   2. Select the topic
      - The issue should be relevant to the village or specific area of the village selected.
      - Include supportive data/evidence as available
      - Ensure to include information about relevant government health schemes.
   3. A banner can also be displayed at the venue displaying the theme of the play.

3. Implementation:
1. Advertise to the community
   a. *A week before play*: at schools, religious gatherings, community meetings, posters in places where people congregate (market, bus stop, etc), information in local newsletters or bulletins
   b. *As needed*: repeat announcements should be done in order to ensure adequate participation of the community.
   c. *Half hour before start of play*: mass announcement with a speaker mounted on a 3-wheeler or 4-wheeler, at least in the main streets

2. Preparation of space
   a. The place for the play should be chosen in such a way that it is in the center of the village (convenient enough for people from all parts of the village to congregate at), spacious enough to accommodate about 100-150 people, is reasonably clean and well-lit and doesn’t obstruct the movement of people / vehicles (especially when by the side of a main road).
   b. A playground or an open space is ideal
   c. It would be ideal if the play could be staged on an elevated area as a stage.

3. Play
   a. Songs with lyrics related to appropriate health topics should be sung in the beginning and also during the play, to maintain the attention of the community.
   b. Language should be appropriate to community and educational level of attendees
   c. Try to incorporate specifics from local culture to make it as relevant as possible

4. Post-play
   a. Thank the village elders / leaders, the crowd at large, volunteers / organizers and the sponsors (if any)
   b. Feedback should be solicited on effectives of play and what could change to make it more effective

**Monitoring and evaluation:**
Consider the following indicators for monitoring:

1. Number of people who attended as a percentage of the total population in the community
2. Number of SHG and GP members attended.
3. Improvement of ANC and postnatal care, as measured by
   a. Increased number of GCT screening from that village
   b. Increase in the number of institutional deliveries from that village.
1F. Health Exhibition

**Description:** Health exhibitions are tools to generate awareness about one or multiple issues related to health and development.

**Objectives:** To generate awareness in a community about health and its determinants in order to improve the health status of the village.

**Target population:** Selected village communities

**Suggested venues:** During regularly occurring fairs / events in the selected village.

**Suggested timing:** 8 am to 8 pm or the duration of the fair

**IEC aids used:** Television, Flip charts, Slide shows, Interactive discussion, Posters, Pamphlets, Games, Quizzes

**Methodology:**
- Coordinator should talk to community representatives to determine the best times and location. If a local fair is selected, coordinator should gain permission from the appropriate parties (e.g. Fair committee).
- Coordinator should talk to community members and other health providers in the area to determine areas to focus on for exhibits.
- Decide on type of exhibition (poster, model, etc)
- Decide on the topic. Potential topics are: Reproductive and child health, Antenatal, Intranatal and Postnatal care, Water and sanitation, Teenage marriage, Alcoholism and Nutrition
- Rope in local volunteers for manning the stall, as well as sponsors for food, etc
- Coordinate with other outreach efforts (e.g. Torch parade, Street play or unveiling of new wall painting)

**Monitoring and evaluation:**

**Indicators for monitoring:**
- Number of people attending the exhibition
1G. House visits / One-to-one Discussions

Description: field personnel visit women in their homes to talk one-on-one or with the families (one-on-group) about maternal health issues.

Objectives: To raise awareness about health and related issues to the individuals or groups in a family to improve the overall health status of the family and hence the community.

Target population: pregnant women, mothers of young children, and their caregivers/families

Individuals/institutions responsible: field health personnel

Suggested venues: target population’s homes

Suggested timing & duration: Early morning or late afternoons or evenings; 15 to 20 minutes

IEC aids used: One to One and One to Group interaction, Flip charts, case studies etc.

Methodology:
1. Selecting a household:
   Households are selected based on the following three criteria:
   1. Houses with individuals suffering from an acute medical condition who need counseling and professional medical care
   2. Houses with pregnant mothers and children under 3 years of age
   3. Houses with individuals requiring follow up care for communicable and non communicable diseases

2. Planning:
   Field personnel will have a monthly planning meeting to select villages and houses to be visited based on the above listed priorities. These meetings will involve developing an understanding of the health status of the concerned villages and houses to be visited.

3. Implementation:
   Field personnel should first build rapport with villagers before carrying out a house visit. Home visits should preferably remain casual yet informative in order to maintain local trust and relationships.
Topics that should be addressed include:

1. Disease screening and identification
2. Counseling pregnant mothers about antenatal care, intrapartum care, and postpartum care. Education should focus on women with high risk pregnancies.
3. Counseling to the parents/guardians to educate about the nutrition, prevention of ARI, Diarrhea and Malnutrition, Immunization etc.

Monitoring: Health workers who provide house visits, one-on-one or one-on-group, should note the name(s) of the participants and village name where the house visit occurred in daily work reports that must be submitted to the program/project office within 1-2 days. Daily work reports will be compiled into monthly work reports.

Template for Daily Work Report (Dairy)

<table>
<thead>
<tr>
<th>Name of Event: One-on-One or One-on-Group</th>
<th>Date: From: _____ To: _____</th>
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</thead>
<tbody>
<tr>
<td>Name of Village / Haadi:</td>
<td>Date: From: _____ To: _____</td>
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<tr>
<td>Date, Time, Duration of Event:</td>
<td>Date: From: _____ To: _____</td>
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<tr>
<td>Topics Discussed:</td>
<td>Date: From: _____ To: _____</td>
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<tr>
<td>IEC Modalities Utilized:</td>
<td>Date: From: _____ To: _____</td>
</tr>
<tr>
<td>No. of participants</td>
<td>Date: From: _____ To: _____</td>
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<td>Remarks:</td>
<td>Date: From: _____ To: _____</td>
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</tbody>
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Annexure 2: Educational Tools

A variety of educational tools can be used for community and patient education. The choice of the tool would depend on:

- the nature of the audience (small/large group, rural/urban, levels of literacy etc),
- the location where education is imparted (school / PHC/Community Hall / open-air etc)
- the facilities available at the location (power supply, blackboard, television, CD/DVD player, loud-speakers etc)
- the nature of health message that needs to be delivered

Educational tools that can be used include: Handouts, Posters, Wall-paintings, Games/Quizzes and Media

It is recommended that contextually relevant and culturally appropriate educational tools be developed for each project. Developing local educational materials is an opportunity to explore local creativity as well as encourage participation. Examples below offer some insights.

2A. Handouts

These contain health messages in some detail. They must be in the local language, with minimal technical jargon. A few relevant pictures to attract attention will be helpful. The font size of the content must be large enough for audiences of all ages. A sample handout which can be used as GDM education material for all pregnant mothers is given below. (Full content available in Annexure 18)
2B. Poster

These contain health messages in short sentences or catchy phrases with contact details if more information would be needed. The posters need to be in local language and be colorful to attract attention. Cartoon pictures help. Posters can be of medium size, to be put up on noticeboards or walls of PHCs, GP offices, anganwadis or the clinic’s patient waiting room. The size of the poster and the font size of the contents should be such that they can be easily read from a distance of 6-10 feet. Recommended size is 2x3 ft or 3x4 ft. A sample is given below.

![Poster example](image1)

Posters can also be used as an educational tool in larger mass gatherings or health exhibitions. The size of these posters and the font size of the contents should be such that they can be easily read from a distance of 40-50 ft. An example of such a poster is given below. Recommended size is 6x6 ft. The design of the poster must allow for strings to be tied at the corners to facilitate display at the venue for health education.

![Large poster example](image2)
2C. Wall Paintings

Wall paintings are pictures depicting health information on walls of public buildings where people frequently gather. The content should be developed in consultation with the local community to ensure cultural appropriateness. The advantage of this intervention is that it reaches out to a significant number of people over a long period of time (at least 2-3 years), regardless of their literacy level. The disadvantages of this intervention are that the pictures do not contain complete information and there is no interpersonal communication involved to clarify information. It is also difficult to separately evaluate the impact of this type of educational tool. This intervention should always be used in addition to or in conjunction with other interactive/interpersonal interventions.

The community must be consulted to help identify the ideal location for the wall painting, preferably on a main street or where the likelihood of people noticing it and reading it is high. These can be painted on the wall of a building or the side of a public bus or any such vehicle. The size of the wall-painting and the font size of the contents should be such that they can be easily read from a distance of 50-75 ft. The wall /surface must be relatively smooth, without cracks or unevenness. Prior permission must be sought from the relevant authorities or owner of the building before using the wall. An sample of such a wall-painting is given below. Recommended size: 10x10 feet

Wall-paintings must be commissioned in the dry season, preferably after the monsoon. The media used for the wall-painting must be water-proof (emulsion paint). A reception/party when the painting is finished is useful to further raise awareness. Else, it can be coordinated with other interventions like torch parade or street play to generate interest and awareness. Wall-paintings may need to be repainted once in 2-3 years.
2D. Quizzes and Games

Quizzes are conducted for assessing knowledge levels, with prizes as incentives for participation and expression of knowledge.

Games can be used in mother’s meetings, village meetings etc. The purpose is to make the learning more fun and interactive, enhance participation and attract a crowd. The design of games must have a built-in health message. Given below are some sample games which were most popular and widely used:

**Game-1: Throwing Balls into Buckets**

Two buckets are placed side by side one labeled ‘Blood Test GCT done’ and the other ‘Blood Test GCT not done’. The player is given five balls which she tries to throw into the bucket labeled ‘Blood Test GCT done’. The player gains points for throwing balls into the bucket labeled Blood Test GCT done, but lose points for those balls that land in the other bucket. The player with most points at the end of the game is the winner. **Message:** This game strives to explain to the player to have the blood test GCT during her pregnancy. Women who miss their GCT test are non-winners.
**Game-2: Lemon and Spoon**

The players put the handle of a tablespoon in their mouths, scoop facing upwards and hold it steady with their teeth. Then, a lemon is placed upon each spoon. The players are asked to race to touch a finish line. All players who reach the finish line without dropping the lemon are the winners. **Message:** This game can be used to deliver a variety of health messages. A) Importance of avoiding teen-marriages and teen pregnancies. Ensuring that the player reaches the finish line without dropping the lemon signifies that that woman has successfully negotiated her teenage period and avoided pregnancy until adulthood. B) Importance of birth-spacing of 3 years. Ensuring that the player reaches the finish line without dropping the lemon signifies that the woman has successfully used contraception to ensure a spacing of 3 years between two pregnancies.
**Game-3: Tossing rings onto Toys/Pegs**

Ten toys/Pegs are placed in a line each labeled with the name of a different ante-natal investigations and immunization shots. The toys/peggs are labeled as: GCT test, Hb, Blood group, TT1, TT2, USG1, USG2, HIV test, HBsAg and VDRL. The player is given ten rings which she attempts to toss onto the toys. The player must try to toss rings onto each of the ten labeled toys. The player who rings all ten is the winner. **Hint:** To make the game more attractive and fulfilling, place the pegs at a comfortable distance so that many players are able to ring them successfully. **Message:** The message embedded in this game is that a pregnant woman must undergo ALL these tests to successfully complete her antenatal care.

A variation of this game can be used to educate about risk factors for GDM. 4-5 pegs depicting the risk factors are used. If the player rings a peg, she must also explain that specific risk factor of GDM. The goal is to land rings on as many cards as possible, explain the risk factor and score points. **Message:** This game reinforces health messages about the risk factors of GDM.
**Game-4: Passing the Parcel**

The women make teams of 6-8 people each. They stand sideways, two metres apart, along lines marked on the ground with white powder or lime stone water. Each team must pass objects hand-to-hand, from a box at the start line to a box at the finish line, without dropping the object. The teams that pass on all objects, without dropping any and finishing first, are the winners. **Message:** This game can be used to depict a variety of health messages:

a) Birth spacing: The length of the line depicts the 3 years of birth spacing. The objects to be used are contraceptives like strips of oral contraceptive pills (Mala-N), Packet of Intra-uterine device like Copper-T or packets of Condoms. The player learns that a variety of contraceptives can be used for successful birth spacing.

b) Adherence to all components of ante-natal care. The length of the line depicts the duration of pregnancy. The objects to be used are toys or blocks with the names of ANC investigations or immunization shots or number of ANC visits. The player learns that a variety of components of ante-natal care must be accessed and all of them must be completed to have a healthy pregnancy.
2E. Educational Tools – Media

A wide variety of media can be used to effectively deliver health messages. These can be avenues for one-way or two-way communications.

- Television, CD/Videos
- Audio songs
- Cable TV – for making announcements, for flashing health messages, etc.
- Community radio – for making announcements, flashing health messages, transmitting panel discussions or interviews, call-in interviews
- Drama/Theatre: Street plays (refer to Annexure 1E for details)
Annexure 3: BMI Chart

Body Mass Index (BMI) is calculated using the formula in the box below.

On the next page is a Reference Chart / Ready Reckoner that health workers or pregnant women can use to easily identify their BMI based on weight and height. This chart provides only an approximation of the BMI. For more accurate determination of BMI please use the formula given below.

Calculating Body Mass Index

To calculate BMI manually, use the equation:

\[
\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}
\]

For example:
Weight = 68 kg, Height = 160 cm (= 1.60m)
Calculation: \(\frac{68}{(1.60)^2} = 26.56\)

Compare the results with the chart below to determine BMI classification.

<table>
<thead>
<tr>
<th>BMI</th>
<th>Classification</th>
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<tbody>
<tr>
<td>&lt;18.0</td>
<td>Underweight</td>
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<tr>
<td>18.0–22.9</td>
<td>Normal</td>
</tr>
<tr>
<td>23 – 24.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>≥ 25.0</td>
<td>Obese</td>
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</table>

In this case, the person is considered overweight.
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<th>Ht in Cms</th>
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BMI Reference Chart
Annexure 4: Field-based Testing to Screen for GDM

**Information for Pregnant Woman**

As part of regular antenatal care, it is important to be screened for gestational diabetes mellitus. A simple test called the glucose challenge test or GCT can be conducted. There is no preparation required prior to the test and fasting is not required.

During the test, the mother is asked to drink 50 gm glucose powder mixed with ~ 200 ml of water. She will then sit or lie down for one hour. If she does not rest during this period, the test reading may be erroneously low. After one hour, her blood will be drawn. This test evaluates how the mother’s body processes sugar. A high level of sugar in the blood may indicate that the mother’s body is not processing sugar effectively. If the results of this screen are positive, the mother is advised to come to the hospital within the next 2 days for a 75gOGTT to confirm if she has GDM. It is important to stress that not all women who test positive for the GCT test are found to have diabetes when tested with OGTT.

**Information for Health Workers**

When a pregnant woman does not have the ability to reach a hospital or PHC, she should not be deprived of screening. Homebound women can also be screened for GDM in the village by health workers.

**Conducting the test**

To ensure minimum quality standards of testing, health workers should understand how to conduct accurate glucose challenge tests used to screen for GDM.

**Target population:** High risk pregnant women in the first trimester and all other pregnant women at 6 months of gestation

**Suggested venues:** The usual venue of mother’s meetings, SHG meetings, village meetings, women’s homes

**Duration of test:** 90 minutes

**Suggested timing:** The regular time of the mother’s meetings, SHG meetings, village meetings and whenever convenient for the woman when visited at home. However, due to the time requirements of the GCT, it is important to factor this into planning the timing of the screening.
Suggested IEC Aids: Basic instructions, flip charts, handouts, short videos

Methodology:
1. *Selecting a village*: Remote villages or locations from where it would be normally challenging for pregnant women to find transportation to hospitals and PHCs
2. *Planning*: Planning is done by both government and non-government health workers in conjunction with each other and local community members involved in mother’s meetings, SHGs, and the VHSCs.
3. *Implementation*: The field based GCT screening will be conducted by both government and non-government health workers and medical officers working with local community members. VHSC may be contacted for resource support.

Supplies:
1. 50 g of anhydrous glucose powder (weighed and packed previously)
2. Safe drinking water, a large cup (~ 200 ml capacity) and a spoon to mix in glucose powder
3. Supplies to draw venous blood:
   - gloves
   - test tubes to collect blood
   - spirit
   - cotton
   - syringes (2 ml with 22G / 23 G needle)
   - tourniquet
   - protective equipment
   - pipettes and tips for plasma separation
   - screw capped cuvettes to store and transport plasma (if separated on site)
4. For disposal of needles
   - A can of 1% sodium hypochlorite solution (to disinfect the syringe and needle)
   - Plastic basin (to prepare and hold disinfecting solution)
   - Impervious waste containers for safe collection and transport of needles and contaminated waste
5. Additional Supplies

---

25 At SVYM, BD Vacutaner LH PST II Ref 367374 gel tubes are used to collect blood samples for the following reasons: 1) the blood samples can be centrifuged in the field. The gel layer separates the plasma from RBCs so that glycolysis can be prevented. 2) the centrifuged blood samples can be easily transported to a centralised lab, and 3) there is no need to further handle potentially infectious body fluids like plasma, in the field.
● health record book
● referral slips
● BMI chart
● weighing scale with digital display
● measuring tape
● electronic BP apparatus
● forceps
● marker pens

Procedure:
1. Choose a place conducive for talking to the pregnant women and counseling.
2. Explain the procedure of GCT and take consent.
3. Prepare glucose solution by dissolving 50 g of glucose in about 200 ml of drinking water.
4. Instruct the woman to drink it slowly - over 5 minutes.
5. The woman must have minimal physical activity after drinking the glucose solution. She must remain seated or lie down for one hour.
6. Exactly one hour after drinking glucose solution, with due aseptic precautions, collect 2 ml of venous blood into gel tubes (vacutainer) and mix well.
7. Centrifuge sample immediately at 3000 to 5000 rpm for 5 minutes until the plasma is separated. Blood samples must be centrifuged immediately to prevent inaccurate readings. If blood is not centrifuged, the blood cells may continue to take up glucose. Additionally, until a sample is centrifuged, temperature may affect the level of glucose.
8. Dispose off needles and contaminated waste in safe disposal container. The waste should be transported to the hospital, where they are handled appropriately.
Only phlebotomy can be done in the field. Actual glucose measurement must always be done in a centralized lab. If plasma is separated on site, it must be transported to the lab as soon as possible on the same day. If plasma is collected in gel tubes, tubes can be transported to the lab within a day or two.

Reports of the test should be made available the next working day so that the health worker can collect them and deliver them to the women and explain the results to them individually. This interaction is also an opportunity to reinforce health education related to GDM and ANC.

If the results are abnormal, the woman must be motivated to come to the hospital for an OGTT within the next two days.
Annexure 5: Algorithm for Screening and Diagnosis
PREVENTIVE SCREENING FOR GESTATIONAL DIABETES MELLITUS FOR NON-PREGNANT WOMAN

Is she having any one of these risk factors and is > 25 yrs old?
1. BMI => 23
2. Family h/o diabetes amongst 1st degree relatives
3. H/O GDM/ IGT/Persistent glycosuria in previous pregnancies
4. Documented h/o Macrosomia in previous childbirths (=3.5 kgs)

1. Provide counseling regarding risk of developing Diabetes
2. Appropriate lifestyle modifications

Assess Glucose Metabolism

STAT - 75 g OGTT (WHO non-pregnant diabetic screening)

- Fasting < 110 mg% And 2-Hr < 140 mg%
  - Normal
  - FBS once a year and 75 g OGTT once in three years

- Fasting 110 to 125 mg % OR 2-Hr 140-199 mg%
  - Impaired Fasting Glycemia (IFT) or Impaired Glucose Tolerance (IGT)

- Fasting => 126 mg % OR 2-Hr => 200 mg%
  - Diabetes Mellitus

Developed by: Vivekananda Memorial Hospital, Hanchipura Road, Saragur. Ph: 08228-265412/13
FOLLOW-UP PROTOCOL FOR PREGNANT WOMAN WHEN GCT > 130 MG%/

75 g OGTT in fasting state, on next day
Criteria: FBS < 92 mg%
1st hr < 180 mg%
2nd hr < 153 mg%

All 3 Normal

No GDM

Any 1 abnormal

GDM

Initiate Weight Monitoring & Glucose Monitoring Chart
1 week Medical Nutrition Therapy and Exercise
Followed by FBS/1 hr PPBS by Glucometer

FBS 70-95 mg%
1st Hour < 140 mg%

Insulin not required. Continue management with MNT & exercise.
Repeat Weight Monitoring, FBS/1 Hr PPBS at home or at hospital every week, until delivery. Every alternate reading will be hospital based by Glucometer AND Plasma Glucose readings.

FBS > 95 mg%
OR
1st hour => 140 mg%
Start on Insulin

After levels come under control (FBS 70-95 mg% and 1st Hour <140 mg %), monitor Weight, FBS/1st hour PPBS once in three days by Glucometer, at home or at hospital. Every 4th reading will be hospital based by Glucometer AND Plasma Glucose readings. Any two consecutive home based readings above treatment goals, Patient to consult Doctor immediately.

Developed by: Vivekananda Memorial Hospital, Hanchipura Road, Saragur. Ph: 08228-265412/13
Annexure 6: Guide to Assessment of Life-Style Category

The Life-style of the pregnant woman can be broadly categorized as sedentary, moderate and heavy work.

**Sedentary work** refers to a lifestyle that includes only light physical activity associated with typical day-to-day life that requires low levels of energy spending.

*Examples:*

A) Housewife with a maid to complete all housework,
B) A person whose job involves sitting at a desk the whole day etc.
C) An office manager who goes to work on a two-wheeler or by car.

**Moderate work** refers to a lifestyle that, besides the light activity associated with typical day-to-day like, also includes physical activity *equivalent* to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour.

*Examples:*

D) A School teacher who walks to the school, 1.5 miles away,
E) A housewife who fetches water, washes clothes, mops the floor and fetches groceries or vegetables from nearby market, on foot.
F) A nurse who is on her feet for most of the day.
G) A housewife who walks for about 2-3 miles everyday, atleast thrice a week.
H) An office secretary who goes to work, 2-3 miles away, on a bicycle.

**Heavy work** refers to a lifestyle that, besides the light activity associated with typical day-to-day like, also includes physical activity *equivalent* to walking more than 3 miles per day at 3 to 4 miles per hour.

*Examples:*

I) An agricultural labourer who carriers loads of hay or firewood over a long distance.
J) A woman involved in hand-grinding grain into flour, for long hours each day
K) A farm hand who walks to her workplace, 3-4 miles away, everyday, on foot.
L) A hospital ayah who sweeps and mops the floors all day.
Annexure 7: GDM Patient Fact Sheet

<table>
<thead>
<tr>
<th>Name of Patient</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Patient ID</td>
<td></td>
</tr>
<tr>
<td>Contact Phone No.</td>
<td></td>
</tr>
<tr>
<td>Patient Address</td>
<td></td>
</tr>
<tr>
<td>LMP : G P L A</td>
<td>EDD:</td>
</tr>
</tbody>
</table>

Previous Pregnancy details

Date of GDM Diagnosis

Date of registration in Counseling Department

Treating Doctor

Counselor 1

Counselor 2

1. Gestational age in months at first hosp visit

2. Earliest weight recording and date of recording (Pre-pregnancy weight if available, else, weight in first trimester)

3. Present weight (in Kg)

4. Height (in Cm)

5. BMI (using first trimester weight recorded OR preferably pre-pregnancy weight)

6. BMI Category (< 18 – Underweight; 18-22.9 – Normal; 23-24.9 – Overweight; ≥ 25 – Obese)

7. Life style category (Sedentary work/Moderate work/Heavy work) (Ref to Annexure 6)

8. Recommended total weight gain during pregnancy (Refer to Table in Annexure 11A)

9. Recommended daily calorie intake = Wt in kg X Recommended calorie intake/kg/day (Refer to Annexure 8)
## Annexure 8: Recommended Daily Calorie Allowance

<table>
<thead>
<tr>
<th>SI No</th>
<th>BMI range</th>
<th>BMI Category</th>
<th>Recommended Calorie intake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sedentary work</td>
</tr>
<tr>
<td>1</td>
<td>&lt; 18.0</td>
<td>Underweight</td>
<td>35 kcal/kg/day</td>
</tr>
<tr>
<td>2</td>
<td>18.0-22.9</td>
<td>Normal</td>
<td>30 kcal/kg/day</td>
</tr>
<tr>
<td>3</td>
<td>23 – 24.9</td>
<td>Overweight</td>
<td>25 kcal/kg/day</td>
</tr>
<tr>
<td>4</td>
<td>≥ 25.0</td>
<td>Obese</td>
<td>20 kcal/kg/day</td>
</tr>
</tbody>
</table>


Note: BMI Ranges are for Asian Indian population (33)
Annexure 9: Meal Planning and Sample Meal Plans

9A. A guide to meal planning

A meal plan should help the pregnant woman to choose:

1. What to eat?
2. How much to eat?
3. When to eat?

A meal plan is based on:

1. What the woman likes to eat and drink
2. What is her daily schedule
3. What is the state of her health
4. How many calories she needs
5. When and what kind of exercises she undertakes
6. What is the weather condition (Hot, dry, humid, cold etc)

Note: Meal plan should be modified whenever there are changes in the situations listed above.

Steps in meal planning:

1. Assessment of daily eating habits and estimation of calories supplied by her meals (See Annexure 9B Dietary Assessment)
2. Assessment of daily schedule and assignment of life-style category – sedentary / moderate work / heavy work (See Annexure 6 Life style Category assessment)
3. Assessment of BMI and BMI category (See Annexure 3 BMI Chart)
4. Calculation of total daily calorie requirement (See Annexure 8 Recommended Daily Calorie allowance)
5. Calculation of % calories that need to be derived from carbohydrates, proteins and fats (see E.4)
6. Calculation of total Carbs needed
7. Distribution of Carbs between breakfast, lunch, dinner and snacks
8. Assessment of foods liked and disliked
9. Customizing meal plans using the worksheet (See Annexure 9C Meal Planning Worksheet)
10. Developing sample meal plans based on glycemic index of foods and recommended calorie allowance, for patient use (See Annexure 9D Meal Plan for Patient and Annexure 9E Diet management and Sample Meal Plans)
## 9B. Dietary Assessment

<table>
<thead>
<tr>
<th>Meal</th>
<th>Contents</th>
<th>Calories</th>
<th>Carb count</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Pre-Breakfast</td>
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<tr>
<td>Breakfast</td>
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<td>Mid-morning snack</td>
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<td>Mid-afternoon/evening snack</td>
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<td>Dinner</td>
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<tr>
<td>Post-Dinner</td>
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</table>
## 9C. Meal Plan Worksheet

<table>
<thead>
<tr>
<th>Meal</th>
<th>Contents</th>
<th>Calories</th>
<th>Carb count</th>
<th>Remarks</th>
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<tr>
<td>Pre-Breakfast</td>
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<tr>
<td>Breakfast</td>
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<td>Mid-morning snack</td>
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<td>Lunch</td>
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<td>Mid-afternoon/evening snack</td>
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<td>Dinner</td>
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<tr>
<td>Post-Dinner</td>
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</tr>
<tr>
<td>Total</td>
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</tbody>
</table>
## 9D. Meal plan for the patient

<table>
<thead>
<tr>
<th>Meal</th>
<th>Contents</th>
<th>Carb count</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Breakfast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mid-morning snack</td>
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<td>Lunch</td>
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<tr>
<td>Mid-afternoon/evening snack</td>
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<tr>
<td>Dinner</td>
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</tr>
<tr>
<td>Post-Dinner</td>
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<td></td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name of Patient:  
Date:  
Family members present:  
Meal Plan prepared by:  
Meal Plan No:
9E. Diet Management, Sample Meal Plans

Glycemic Index:

The glycemic index (GI) is a numerical system of measuring and ranking a carbohydrate food in terms of how much it influences blood sugar levels. The index measures how much of a rise in circulating blood sugar, a carbohydrate triggers – the higher the index, the greater the blood sugar response. The carbohydrates that produce only small fluctuations in blood glucose and insulin levels are called ‘Low Glycemic Index Foods’ and are recommended for use by women with GDM. High GI foods trigger a dramatic spike and should be taken in limited amounts. (See picture below. (34)) A GI is 70 or more is high, a GI of 56 to 69 inclusive is medium, and a GI of 55 or less is low.

The average GI of common foods derived from multiple studies by different laboratories

<table>
<thead>
<tr>
<th>Foods</th>
<th>GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>White wheat bread</td>
<td>75</td>
</tr>
<tr>
<td>Chapatti</td>
<td>52</td>
</tr>
<tr>
<td>White rice</td>
<td>73</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>52</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>52</td>
</tr>
<tr>
<td>Cornflakes</td>
<td>81</td>
</tr>
<tr>
<td>Rice porridge</td>
<td>78</td>
</tr>
<tr>
<td>Apple, raw</td>
<td>36</td>
</tr>
<tr>
<td>Banana, raw</td>
<td>51</td>
</tr>
<tr>
<td>Mango</td>
<td>51</td>
</tr>
<tr>
<td>Potato, boiled</td>
<td>78</td>
</tr>
<tr>
<td>Vegetable soup</td>
<td>48</td>
</tr>
<tr>
<td>Milk, full fat</td>
<td>39</td>
</tr>
<tr>
<td>Ice cream</td>
<td>51</td>
</tr>
<tr>
<td>Curd</td>
<td>41</td>
</tr>
<tr>
<td>Glucose</td>
<td>103</td>
</tr>
<tr>
<td>Honey</td>
<td>61</td>
</tr>
</tbody>
</table>
Summary of food guidelines:

- An ideal dietary composition is 55% carbohydrate, 20% protein, 25% fat with less than 10% saturated fat (17). Complex carbohydrates with a low glycemic index are advised. The food pyramid and plate pictures below are useful graphic representations to help patients understand the meal plan concept. These pictures are taken from www.nlm.nih.gov/medlineplus/ency/imagepages/19836.htm and http://www.choosemyplate.gov/print-materials-ordering/graphic-resources.html

- Space food throughout the day to avoid long time between meals & snacks. A seven meal plan may be used – 3 meals alternating with 4 snacks.
- Choose smaller portions of meals / snacks
- Avoid skipping meals & snacks
- Choose a variety of foods each day
- Choose foods lower in fat
- Avoid foods with simple sugars

*Fig 2: Diabetes Food Pyramid*  
*Fig 3: Portions of Food types on the plate*
**Sample meal plan**
(taken from [www.diabetesindia.com/diabetes/veg_diet2100.htm](http://www.diabetesindia.com/diabetes/veg_diet2100.htm))

**Exchanges: 2100 Calories**

<table>
<thead>
<tr>
<th>Morning Tea / Coffee</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1/2 Milk</td>
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<table>
<thead>
<tr>
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<td>Fr</td>
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</table>

<table>
<thead>
<tr>
<th>Mid-Morning Snack</th>
<th>Fr</th>
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</table>

<table>
<thead>
<tr>
<th>Lunch</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>Mi</th>
<th>V</th>
<th>V</th>
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<td></td>
<td></td>
<td>1/2 P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Afternoon Tea</th>
<th>C</th>
<th>Fr</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Dinner</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>Mi</th>
<th>V</th>
<th>V</th>
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<td>1/2 P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bedtime</th>
<th>1/2 Mi</th>
</tr>
</thead>
</table>

*One of the Four Milk Exchanges is of Whole milk*

**Calories: 2120;**

- Carbohydrates: 63.2%
- Proteins: 18.4%
- Fats: 18.4%

**Fig 4: Sample meal plan**

More sample meal plans are available at [www.diabetesindia.com/diabetes/diet_chart.htm](http://www.diabetesindia.com/diabetes/diet_chart.htm)
Annexure 10: Sample Exercises

Adoption of a healthy lifestyle including a comprehensive exercise plan is important in the primary prevention of GDM. A comprehensive plan that includes flexibility and strength training, yoga, deep breathing, and aerobic exercise where appropriate and feasible is optimal. Specific examples are provided below. However, before participating in any of the following exercises, it is important for the pregnant woman to consult her doctor.

**A. Stretching and Strength Training Exercises**

1. **Arm/Upper Back Stretch**
   a. Raise arms over head. Keep elbows straight and the palms of hands facing each other. Hold for at least 20 seconds.
   b. Lower arms to side of body. Keep upper back straight.
   c. Bring the backs of hands together as far as possible behind back and stretch.
   d. Repeat 5 times.

2. **Pelvic Tilt (Sutter Health) (35)**
   a. Lie on back with knees bent.
   b. Inhale through nose and tighten stomach and buttocks muscles.
   c. Flatten the small of back against the floor and allow pelvis to tilt upward.
   d. Hold for a count of five and exhale slowly.
   e. Relax, and then repeat.

**Note:** Be careful not to arch back, bulge abdomen, or push up with feet to obtain motion.

3. **Neck Rotation**
   a. Relax neck and shoulders.
   b. Drop head forward.
   c. Slowly rotate head to right shoulder, back to middle, and over the left shoulder.
   d. Complete four, slow rotations in each direction.

4. **Shoulder Rotation**
   a. Bring your shoulders forward and then rotate them up toward your ears and then back down.
   b. Do four rotations in each direction.

5. **Swim**
a. Place arms at sides.
b. Bring right arm up and extend body forward and twist to the side, as if swimming the crawl stroke.
c. Follow with left arm.
d. Do the sequence ten times.

6. Thigh shift
   a. Stand with one foot about two feet in front of the other, toes pointed in the same direction.
   b. Lean forward, supporting weight on the forward thigh.
   c. Change sides and repeat.
   d. Do four on each side.

7. Leg Shake
   a. Sit with legs and feet extended.
   b. Move the legs up and down in a gentle shaking motion.

8. Ankle Rotation
   a. Sit with legs extended and keep toes relaxed.
   b. Rotate feet, making large circles.
   c. Use whole foot and ankle.
   d. Rotate four times on the right and four times on the left

B. Yoga Positions (Asanas)

<table>
<thead>
<tr>
<th>Asana</th>
<th>Visual Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toe Bending (Padaangulin Naman)</td>
<td>![Image of Toe Bending]</td>
</tr>
<tr>
<td>Ankle Bending (Gulf Naman)</td>
<td>![Image of Ankle Bending]</td>
</tr>
<tr>
<td>Exercise</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Ankle Rotation (Gulfa Chakra)</td>
<td>![Ankle Rotation Diagram]</td>
</tr>
<tr>
<td>Ankle Crank (Gulfa Ghurnan)</td>
<td>![Ankle Crank Diagram]</td>
</tr>
<tr>
<td>Knee Bending (Jaanu Naman)</td>
<td>![Knee Bending Diagram]</td>
</tr>
<tr>
<td>Half Butterfly Pose (Ardha Titali Asana)</td>
<td>![Half Butterfly Pose Diagram]</td>
</tr>
<tr>
<td>Hip Rotation (Shroni Chakra)</td>
<td>![Hip Rotation Diagram]</td>
</tr>
<tr>
<td>Full Butterfly Pose (Purna Titali Asana)</td>
<td>![Full Butterfly Pose Diagram]</td>
</tr>
<tr>
<td>Hand Clenching (Mushtika Bandhana)</td>
<td>![Hand Clenching Diagram]</td>
</tr>
<tr>
<td>Exercise Description</td>
<td>Variation I</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Wrist Bending (Manibandha Naman)</td>
<td></td>
</tr>
<tr>
<td>Wrist Rotation (Manibandha Chakra)</td>
<td></td>
</tr>
<tr>
<td>Shoulder Rotation (Skandh Chakra)</td>
<td></td>
</tr>
<tr>
<td>Neck Series (Griva Sanchalana)</td>
<td></td>
</tr>
<tr>
<td>Leg Raising (Utthanpadasana)</td>
<td></td>
</tr>
</tbody>
</table>
C. **Deep Breathing (Pranayama)**

1. Complete yoga breath
   a. Conscious breathing in the lower, middle, and upper portions of the lungs
2. Interval breathing
   a. Duration of inspiration and expiration are altered.
3. Alternate Nostril Breathing
Annexure 11: Patient Monitoring Charts

11A. Monitoring of Maternal Weight Gain during Pregnancy

During the first trimester, a maximum weight gain of 2 kg is recommended. For an underweight or normal weight pregnant woman, recommended weight gain during second and third trimester is about 2 kg per month. For overweight women, it is about 1 kg per month. For obese women, it is less than a kilogram per month. The total recommended weight gain for each category of women is given in the table below.

Table 11A: Recommended Weight Gain during pregnancy according to Pre-pregnancy BMI (Adapted from (32))

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI</th>
<th>BMI</th>
<th>Total Weight Gain (kg)</th>
<th>Rates of Weight Gain 2(^{nd}) and 3(^{rd}) Trimester (kg/week)</th>
<th>Rate of Weight Gain 2(^{nd}) and 3(^{rd}) Trimester (kg/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under-weight</td>
<td>&lt;18.5</td>
<td>12.7 - 18.2</td>
<td>0.45 (0.45 - 0.59)</td>
<td>1.8</td>
</tr>
<tr>
<td>Normal weight</td>
<td>18.5-22.9</td>
<td>11.4 - 15.9</td>
<td>0.45 (0.36 - 0.45)</td>
<td>1.8</td>
</tr>
<tr>
<td>Over-weight</td>
<td>23-29.9</td>
<td>6.8 - 11.4</td>
<td>0.23 (0.2 - 0.32)</td>
<td>1.08</td>
</tr>
<tr>
<td>Obese</td>
<td>≥ 30</td>
<td>5 - 9.1</td>
<td>0.2 (0.18 - 0.14)</td>
<td>0.92</td>
</tr>
</tbody>
</table>

In order for a woman to monitor weight gain at home, she should take the following steps:

1. With the help of a health worker, determine her Body Mass Index (BMI) (See Annexure 3)

2. Determine recommended weight gain using Table 11A above.

3. Complete the table below.

   - The health worker should fill in the recommended weight gain by month.
   - The woman should record her weight at the beginning and end of the first trimester, and at the beginning and end of each month during the 2nd and 3rd trimesters, and calculate the difference to indicate the weight gain.
Using the graph:

- The woman should calculate her weight in pounds by multiplying her weight in kilograms by 2.2. For example, if her weight is 45 kg then her weight in pounds is: $45 \times 2.2 = 99$ pounds.
- On the bottom of the graph, find the gestational age (weeks) and draw a line straight up. On the left hand side of the chart, find the weight in pounds and draw a line straight to the right. Mark where the points intersect and determine whether it falls within the normal range for the BMI status (dotted lines). If above the dotted lines, the woman is gaining too much weight.

Fig 11A: Graph to plot and monitor the trend of weight gain. (From (32))
## 11B. Blood Glucose Monitoring for GDM Women

<table>
<thead>
<tr>
<th>Date</th>
<th>GA in weeks</th>
<th>Inv No.</th>
<th>PG / G</th>
<th>Result</th>
<th>PG / G</th>
<th>Result</th>
<th>Test type</th>
<th>PG / G</th>
<th>Result</th>
<th>Remarks</th>
<th>Diet</th>
<th>Exercise</th>
<th>Insulin</th>
</tr>
</thead>
</table>

PG : Plasma Glucose  
G : Glucometer
11C. Blood Pressure, Weight & Urine Protein Monitoring

<table>
<thead>
<tr>
<th>Patient</th>
<th>Patient ID:</th>
<th>Treating Doctor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>GA in weeks</td>
<td>Systolic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diastolic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCW name</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weight in Kgs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urine Alb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urine Ketone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>USG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EFW</td>
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<td></td>
<td></td>
<td>EDD by USG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HbA1C</td>
</tr>
</tbody>
</table>

Blood Pressure, Weight, Urine Protein & Ketone, USG Monitoring
11D. Fetal Growth Monitoring

Name: ______________________________  Age: _________  Hospital No: _______

Doctor performing the scan: ______________________________


Patient History:

Single/Twins/Triplets: ______________________________  POG: ________________

Gestational Sac: ________________________  CRL: ________  Cardiac Pulsation: _________

Yolk Sac: ____________________________

**SERIAL OBSTETRIC SONOGRAPHY**

<table>
<thead>
<tr>
<th>Date:</th>
<th>POG (Menstrual Age)</th>
<th>BPD</th>
<th>POG</th>
<th>HC</th>
<th>POG</th>
<th>AC</th>
<th>POG</th>
<th>FL</th>
<th>POG</th>
<th>Composite Age</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Cl</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>AF</td>
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<td></td>
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<td></td>
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<td></td>
<td>Placental Grade</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fetal weight</td>
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### Congenital Anomalies:

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</thead>
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<tr>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>Ventricles</td>
<td></td>
</tr>
<tr>
<td>V/H Ratio</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td></td>
</tr>
<tr>
<td>Diaphragm</td>
<td></td>
</tr>
<tr>
<td>Abdominal Wall</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td></td>
</tr>
<tr>
<td>Limbs</td>
<td></td>
</tr>
</tbody>
</table>
### 11E. Fetal Kicks Monitoring Chart

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>Week</th>
<th>Week 30</th>
<th>Week 31</th>
<th>Week 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
<td></td>
</tr>
<tr>
<td>After breakfast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After dinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week</th>
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<th>Week 34</th>
<th>Week 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
</tr>
<tr>
<td>After breakfast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After dinner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Week 36</th>
<th>Week 37</th>
<th>Week 38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
</tr>
<tr>
<td>After breakfast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After dinner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Week 39</th>
<th>Week 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>S M T W T F S</td>
<td>S M T W T F S</td>
</tr>
<tr>
<td>After breakfast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Annexure 12: Self administration of Insulin

Prepare the insulin injection

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Roll the insulin bottle (vial) gently between your hands. Roll cloudy bottle until the white powder has dissolved. This will also allow the insulin to come to room temperature if you have been keeping it refrigerated. Do NOT shake bottle.</td>
</tr>
<tr>
<td>2</td>
<td>Wipe the lid of the insulin bottle with an alcohol wipe or a cotton ball dipped in alcohol. Let the alcohol dry.</td>
</tr>
<tr>
<td>3</td>
<td>Remove the plastic cap covering the needle on your insulin syringe. Do not touch the needle.</td>
</tr>
<tr>
<td>4</td>
<td>Pull the plunger of the syringe back and draw air into the syringe equal to the number of units of insulin to be given.</td>
</tr>
</tbody>
</table>
First, insert the needle of the syringe into the rubber lid of the insulin bottle at a 90 degree angle. Next, push the plunger of the syringe to force air into the bottle. Then, leave the needle in the bottle.

Drawing insulin into the syringe. First, turn the bottle and syringe upside down. Next, position the tip of the needle so that it is below the surface of the insulin in the bottle. Then, pull back the plunger to fill the syringe with slightly more than the correct number of units of insulin to be given.

Removing air bubbles. Carefully flick the syringe to remove air bubbles. Air bubbles will not hurt the patient, but it will mean an incorrect dose.

Prepare the Injection Site

1. Choose the injection site. Remember that insulin may be injected subcutaneously (or just below the skin) in the upper arm, front and side of thigh, buttocks, and abdomen.  
   a. Rotate between injection sites. Move 2-5cm from the last injection site used. Do not reuse site for two weeks. 
   b. To ensure that the proper amount of medication is absorbed, do not massage or exercise the injection area. Also, avoid heating or cooling the injection area.

2. Clean the area. If you use alcohol, allow the area to dry before giving injection.

3. Relax the muscles in the injection area.

Special considerations for pregnant women based on the week of pregnancy should be made. As stage of pregnancy advances, skin is increasingly stretched across the abdomen. This makes it more challenging to inject insulin subcutaneously. Therefore, try pinching up skin around the edges of the abdomen or injecting in alternate location.
Give the injection

1. With clean hands, slightly pinch a fold of skin between your fingers and thumb.
2. Hold the syringe like a pencil close to the injection site, keeping fingers off the plunger. Usually the syringe is at a 90-degree angle to the skin site. If you are thin, you may need to insert the needle at a 45-degree angle.
3. Quickly push the needle all the way into the pinched-up area.
4. Let go of pinched-up area.
5. Push the plunger of the syringe all the way in so the insulin goes into the fatty tissue.
6. Remove the needle slowly at the same angle that you inserted it. If bleeding occurs, apply pressure over the area using your finger, a cotton ball, or piece of gauze. Do not rub the area.
7. Replace the cover over the needle. Although syringe manufacturers do not recommend it, some people reuse their syringes until the needle becomes dull or bent.

Suggestions to Minimize Painful Injections:

1. Inject insulin at room temperature.
2. Make sure there are no air bubbles in the syringe.
3. Avoid using topical alcohol immediately before injection.
4. Keep muscles relaxed.
5. Penetrate skin quickly.
6. Do not change direction of needle during injection or withdrawal.
7. Do not reuse needles when they become dull.

Storage and Refrigeration

Current vial of insulin can be stored at room temperature (approximately 15-30°C). However, it is important to keep it away from heat and light. Extreme temperatures (<2 or >30°C) and excess shaking should be avoided to prevent loss of potency, clumping, frosting, or precipitation. Although an expiration date may be stamped on the top of the vial of insulin, a loss in potency may occur after the bottle has been in use for >1 month\textsuperscript{27}, especially if it was...

\textsuperscript{27} Some insulins have less than a 30 day life after exposure to room temperature. Consult the drug information pamphlet specific to the type and formulation of insulin used to verify shelf life at room temperature.
stored at room temperature. It is also important to check the specific instructions on the manufacturer’s label regarding storage.

**Safe Disposal**

Recapping, bending, or breaking a needle increases the risk of needle-stick injury and should be avoided. Adequate attention must be given to waste management to ensure safe handling and disposal of biomedical waste. Needles should be disposed of in safe waste disposal container filled with hypochlorite solution. The containers should be puncture resistant and leak-proof. When women are self-administering insulin at home, arrangement should be made to periodically collect all sharps and other biomedical waste and transport them to the nearest central treatment facility or to the nearest hospital which is networked to a central treatment facility.

**References** (36) (37) (38) (39) (40) (41)


Annexure 13: Types and Dosing of Insulin

In the management of GDM, insulin is used to help control blood sugar levels. Human Insulin is recommended. Different types of insulin work at different speeds. It is important that the type of insulin and dosing is adjusted to fit the needs of the individual patient.

Insulin types

- **Rapid-acting** insulin (insulin analogues) starts working in less than 15 minutes and works hardest (peaks) in about 1 hour and remains active for 3-4. *(Aspart, Lispro, Apidra, Humalog, NovoRapid)*
- **Regular insulin** starts working 30 minutes after injection. It works hardest from 2-3 hours after injection and stays in the blood from 5-6 hours. *(Huminsulin-R, Actrapid)*
- **Intermediate-acting** insulin (NPH or Lente) takes about 2-4 hours to reach the blood and works the hardest from 4-10 hours after injection and lasts 10-16 hours. *(Huminsulin-N, Insultard)*
- **Long-acting** insulin *(ultralente)* starts working several hours after injection. It stays in the blood for 20-24 hours. *(Levemir, Lantus, glargine)*

Each type of insulin has an onset, a peak, and a duration time. **Onset** refers to how soon the insulin starts to lower blood glucose after the patient takes it. **Peak** refers to the time when the insulin is working the hardest to lower the patient’s blood glucose. **Duration** refers to how long the insulin lasts and works to lower the patient’s blood glucose. See chart below

### Types of Insulin Specific to India

<table>
<thead>
<tr>
<th>Type of Insulin</th>
<th>Brand Name</th>
<th>Generic Name</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid-acting</td>
<td>Apidra</td>
<td>Insulin glulisine</td>
<td>15min</td>
<td>30-90 min</td>
<td>3-5 hrs</td>
</tr>
<tr>
<td></td>
<td>Humalog</td>
<td>Insulin lispro</td>
<td>15min</td>
<td>30-90 min</td>
<td>3-5 hrs</td>
</tr>
<tr>
<td></td>
<td>NovoRapid</td>
<td>Insulin apart</td>
<td>10-20 min</td>
<td>30-90 min</td>
<td>3-5 hrs</td>
</tr>
<tr>
<td>Short-acting</td>
<td>Huminsulin-R</td>
<td>Insulin isophane/ Regular R</td>
<td>30-60 min</td>
<td>2-4 hrs</td>
<td>5-8 hrs</td>
</tr>
<tr>
<td></td>
<td>Actrapid</td>
<td></td>
<td>30 min</td>
<td>1.5-3.5 hrs</td>
<td>8 hrs</td>
</tr>
<tr>
<td>Intermediate-acting</td>
<td>Huminsulin-N</td>
<td>NPH</td>
<td>1-3 hrs</td>
<td>8 hrs</td>
<td>8-16 hrs</td>
</tr>
<tr>
<td></td>
<td>Insultard</td>
<td></td>
<td>1.5 hrs</td>
<td>4-12 hrs</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Long-acting</td>
<td>Levemir</td>
<td>Insulin detemir</td>
<td>1 hr</td>
<td>Peakless</td>
<td>Upto 24 hrs</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
<td>-----------------</td>
<td>------</td>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Lantus</td>
<td>Insulin glargine</td>
<td>1 hr</td>
<td>Peakless</td>
<td>20-26 hrs</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Pre-mixed regular (short-acting) and NPH (intermediate acting)</th>
<th>Huminsulin 30/70</th>
<th>30% regular and 70% NPH</th>
<th>30-60 min</th>
<th>Varies</th>
<th>10-16 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Huminsulin 50/50</td>
<td>50% NPH and 50% regular</td>
<td>30-60 min</td>
<td>Varies</td>
<td>10-16 hrs</td>
</tr>
<tr>
<td>Mixtard 30</td>
<td>30% regular and 70% NPH</td>
<td>30 min</td>
<td>2-8hrs</td>
<td>Upto 24 hrs</td>
<td></td>
</tr>
<tr>
<td>Mixtard 50</td>
<td>50% regular and 70% NPH</td>
<td>30 min</td>
<td>2-8hrs</td>
<td>Upto 24 hrs</td>
<td></td>
</tr>
</tbody>
</table>

| Pre-mixed insulin lispro protamine suspension (intermediate-acting) and insulin lispro (rapid-acting) | Humalog Mix 50/50 | 50% insulin lispro protamine and 50% insulin lispro | 10-15 min | Varies | 10-16 hrs |

| Pre-mixed insulin analogue suspension of soluble insulin(rapid-acting) and protaminated insulin aspart (intermediate-acting) | NovoMix30 | 30% rapid-acting soluble insulin and 70% intermediate acting protaminated insulin aspart | 10-20 min | 1-4 hrs | Upto 24 hrs |
Annexure 14: Sample ANC Card
# Details of Antenatal care visit

<table>
<thead>
<tr>
<th>Date</th>
<th>Place of ANC</th>
<th>Gestational age in weeks</th>
<th>BP</th>
<th>Wt in Kgs</th>
<th>GPE</th>
<th>Pallor, Pedal Edema</th>
<th>Examination findings(P/A)</th>
<th>FA</th>
<th>FS</th>
<th>Calcium</th>
<th>Other medications</th>
<th>Remarks / Advice</th>
<th>Name of care Provider</th>
</tr>
</thead>
</table>

**Additional remarks / Advice:**

**Outcome of Pregnancy:** Full term / Preterm/IUD/........................Date of Delivery : ............................Place of Delivery: .................................

**Type of Delivery:** Vaginal / Assisted Vaginal / Elective Cesarian/Emergency Cesarian
Annexure 15: Checklist for Self-Care by the Pregnant Woman

<table>
<thead>
<tr>
<th>Diet</th>
<th>Calorie allowance:__________/day</th>
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<table>
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<tbody>
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<td>Length of time: □ 10 min □ 30 min</td>
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<td>Exercises:</td>
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<table>
<thead>
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<th>Blood Sugar</th>
<th>Measurement taken:</th>
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<td></td>
<td>Frequency: □ 2x/week □ 3x/week</td>
</tr>
<tr>
<td></td>
<td>*Hospital reading every 3rd-4th reading</td>
</tr>
</tbody>
</table>

| Weight Gain Check | Pre-pregnancy BMI:________ |
|                  | Frequency of monitoring:________ |
|                  | Weekly weight gain target:________ |
|                  | Monthly weight gain target:________ |
|                  | Contact health worker if over >______ |

| Fetal Kicks | Starting at 30 weeks |
|            | Frequency: 3 times a day, after meals |
|            | Length of time: 1 hour |

| Medication | Medication: |
|           | Route: |
|           | Dose: |
|           | Frequency: |

| Urine Ketones | Frequency: Once a week |

| ANC Visits | Ultrasound |
|           | 1st appointment: |
|           | 2nd appointment: |
|           | 3rd appointment: |
|           | Additional appointments: |
|           | Non-stress Test |
|           | Blood pressure check |
|           | Biophysical Profile |
Annexure 16A: Algorithm for managing neonatal hypoglycemia

**Neonatal Hypoglycemia (Blood sugar < 40mg/dL)**

- **Asymptomatic neonate**
  - Blood sugar > 25mg/L
    - Trial of Oral Feeds
      - Blood sugar normalizes
        - Frequent feed and monitor blood sugar for 48-72hrs
  - Blood sugar < 25mg/L
    - Low blood sugar despite of adequate feeds or doesn’t accept feeds well
      - IV D10W at 6mg/Kg/min
        - Monitor blood sugars
          - Blood sugar normal (>40mg/L) after 1 hour
            - Maintain the same infusion until stable for 24hrs
              - Introduce and increase oral feeds. Gradually wean IV Dextrose by 2mg/Kg/min q6h and stop once GIR is <4mg/Kg/min
          - Blood sugar low (<40mg/L) after 1 hour or any time later
            - Increase GIR by 2mg/Kg/min to maximum of 10mg/Kg/min until blood sugars are normal (Give bolus of D10W only if symptomatic)
              - If Blood sugar < 40mg/L inspite of infusion at 10mg/Kg/min
                - Consider referring the baby to higher centre for possible resistant hypoglycemia

- **Symptomatic neonate**
  - Bolus of 2mL/Kg of D10W

**REMEMBER!**

- DO NOT treat hypoglycemia only with intermittent dextrose boluses
- DO NOT give bolus either with D25W (25%D) or D50W (50%D)
- DO NOT use D5W (5%D) for infusion
- DO NOT infuse more than 12.5%D through peripheral IV line
- Feeding helps better glycemic control and should be initiated/continued with IV therapy
Annexure 16B: Nomogram to Calculate Glucose Infusion Rate

Fig 16B: Nomograph at determine the appropriate fluid requirement and strength of glucose solution to achieve the required Glucose Infusion Rate. (29)
Annexure 16C: Modification of Glucose Infusion Rate

Glucose Infusion Rate (GIR) of 6-8 mg/kg/day is the recommended infusion rate to start with. The daily fluid requirement of the baby to achieve this GIR with 10% dextrose is calculated using the formula:

\[
\text{GIR} = \left( \frac{X \times \text{percentage of Dextrose solution}}{144} \right)
\]

where \( X \) = volume of IV fluid required / kg (29)

Therefore, \( X = \text{GIR} \times 144 / \% \text{ of Dextrose solution} \)

For Example:

If the GIR required is 6mg/kg/day, then the fluid required using a 10% Dextrose solution is: \( \frac{6 \times 144}{10} = 86 \text{ ml/kg}. \)

For a neonate weighing 3 kg, fluid required = \( 86 \times 3 = 258 \text{ ml/day} \)

The rate of infusion/hour = total fluid requirement/24 hours = \( \frac{258}{24} \approx 10 \text{ ml/hour} \)

Since 1 ml = 60 microdrops, rate of infusion = 600 microdrops/hour or 10 microdrops/min.

Note: If the desired concentration of Glucose for IV infusion is not available, it can be prepared from a mixture of 5% Dextrose and 25% Dextrose, which is more commonly available. The formula for preparing 100 ml of IV fluid with a desired concentration of glucose using 5% dextrose and 25% dextrose solutions is given by the formula:

\[
5X - 25 = Y
\]

where, \( X \) is the required percentage of dextrose and \( Y \) is the amount of 25% dextrose (in ml) to be made up with 5% dextrose to make a total of 100 ml.

**Example 1:** To prepare 100ml of 10% dextrose from 5% dextrose and 25% dextrose:

\( X=10; Y= 5X-25 = (5 \times 10)-25 = 50-25 = 25 \text{ ml of 25% dextrose} \)

Make up this solution to 100 ml with 5% dextrose. i.e., \( 100-25 = 75 \text{ ml of 5% dextrose} \).

25 ml of 25% dextrose + 75 ml of 5% dextrose = 100 ml of 10% Dextrose

**How to increase GIR by 1mg/kg/min?**

Add 2 mL/kg of 25% dextrose to the volume of fluid to be infused over 8 hours

1. If GIR to be achieved in 6mg/kg/min with 10% dextrose and the 24 hour fluid intake of a 3 kg neonate is 258 ml, intake over 8 hours = \( \frac{258}{3} = 86 \text{ ml} \).

2. If GIR has to be increased to 7mg/kg/min then add 2 ml/kg of 25% dextrose to the fluid to be infused over 8 hrs, i.e., add 6ml of D25W to 86ml of D10W.

(Caveat: For this formula to work, the GIR has to be kept at or below a tenth of the total fluid intake in mL/kg/day – e.g. if the total fluid intake is 100 mL/kg/day, you cannot increase GIR beyond 10 mg/kg/min using this formula – to increase GIR beyond this limit, fluid intake has to be increased.

Reference: NNF Clinical Practice Guidelines: Management of Neonatal Hypoglycemia; Page 63 -76.
http://nnfpublication.org/Uploads/Articles/4c86270b-ac2d-4c04-b55b-abc5add3e623.pdf
Annexure 17: Birth Preparedness

Birth preparedness is preparation of the pregnant mother and her family for the birth of the baby. The team involved in the preparation includes family members, key persons in the community and health care personnel. The purpose of this exercise is to enable the woman and her family to plan ahead of time and be able to access appropriate resources on time.

Care takers in the family and the key persons in the community to respond in time and prevent complications arising out of pregnancy, delivery and the post natal period through the use of family and community level resources and local health services.

Birth preparedness is developed among the families of the pregnant mothers through regular house visits by the peripheral health field personnel such as Junior Health Assistants, ASHAs and Anganwadi workers and providing the necessary counseling and education to the mother and the family care givers. Birth preparedness counseling hence starts right from the time when the pregnant mother is detected to be pregnant.

Components of Birth Preparedness Counseling:

1. Regular hospital visits (at least 3 visits during the Antenatal period and visit for delivery and at least one visit in the Post natal period)
2. Register for the government maternal health schemes (Janani Suraksha Yojane, Madilu Kit and Prasooti Araike) in accordance with her eligibility.
3. Pro-actively opt for a hospital delivery.
4. Identify the preferred health facility which is conveniently located and where skilled antenatal, delivery and post natal care is available.
5. Collect information regarding telephone numbers, timings and transport access including ambulance facility to the preferred health facility.
6. Assess the anticipated type of delivery, in discussion with the doctor.
7. Plan for necessary funds, which include transport, health care costs, medicines and other incidental expenses. In case of financial difficulties, resources can be mobilized through the untied funds of Village Health and Sanitation Committee (VHSC) or through self-help groups, in consultation with the Junior Health Assistants and the ASHAs.
8. Plan for mode of transport to the hospital, including accompaniment person(s).
9. Learn about recognizing of the danger signs and seeking timely advice and care.
10. List essentials that would be needed by the mother and the new-born and pack the materials at least 2 weeks before the anticipated date of delivery.
11. Ensure availability of transport to the hospital as soon as labour pains start.
Flow Chart of Response to any Emergency

1. Labor pain/any sign in antenatal or postnatal period indicating need for immediate medical condition
   - Phone Call to ASHA/Junior Health Assistant/or any other Peripheral Health Worker
   - Phone Call to 108 or Hospital Emergency Number for immediate transport
   - Transporting of the mother to the nearest Health Facility
   - Treatment in the Hospital
   - Seeking home based follow up care through ASHA/ANM/Anganwadi Worker/any other Peripheral Health Worker


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