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Stillbirth Society of India

International Stillbirth Alliance Member

Theme of the Month:
Gestational Diabetes Mellitus

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From the Editor's Desk

Dear Readers,

I am greatly honoured to be entrusted the work of editing the e-newsletter of the Stillbirth Society of India. The theme for this e-newsletter is **"Gestational Diabetes Mellitus" [GDM].**

GDM is the most common metabolic complication associated with pregnancy. It has seen a continuous increase over the past few decades; partly attributed to lifestyle, dietary and stress related factors and partly to improved screening and diagnostic tools. Our editorial team has put in efforts to bring forth important articles on GDM for you.

The first article, **'Preconception Care of Women With Diabetes'** focusses on preconception management of diabetes including dietary, lifestyle and therapeutic measures in order to prepare the mother for improved outcome when she becomes pregnant.

The second article, '**Indicators of Glycemia in Pregnancy**' introduces

different methods of assessment of glycemic status of a woman.

The third article **'Causes of Stillbirth in Diabetes'** deals with different causes of stillbirth in women with diabetes. **'Hypertrophic Cardiomyopathy'** in infant of diabetic mothers discusses the pathophysiological effect of diabetes on cardiac status of babies. **'Medical Nutrition Therapy in Gestational diabetes mellitus'** extensively covers the dietary management of diabetic mothers. Management considerations are discussed in detail in '**Obstetric Decisions for stillbirth prevent in gestational diabetes mellitus: a multidisciplinary approach '.**

We wish our readers a happy reading!!!

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Pre-Conception Care of Women With Diabetes

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Preconception care in diabetics: what clinicians need to know

With the increasing prevalence of diabetes in the developing world, there is a resultant rise in pregnancies complicated by diabetes, endangering both the mother and the foetus. Presence of type 1 or type 2 pregestational diabetes in women increases the risk of adverse pregnancy outcomes when compared with the euglycemic maternal population. These risks include a greater than threefold rise in congenital heart disease, fourfold rise in neural tube defects, and a fourfold rise in perinatal death in the offspring. Maternal risk includes retinopathy and nephropathy secondary to the negative influence of hyperglycaemia. These complications are found to be directly related to elevated HbA1c during the first 10 weeks of pregnancy.

Women with diabetes should undergo preconception care to ensure the safest possible pregnancy outcomes. Preconception care should include not only assisting patients in achieving better glycemic control,

but also optimising the pharmacological means by which glycemic targets are achieved, monitoring for retinopathy progression, screening for nephropathy, and discontinuing medications that may affect foetal development. Although some aspects of preconception care will differ depending on whether a patient has type 1 or type 2 diabetes, the overall management strategies for both remain the same.

What do the guidelines say?

- Utilize a multidisciplinary team: Diabetic women contemplating pregnancy should be assessed by a multidisciplinary team (which may include an obstetrician, endocrinologist, family physician, diabetic educator and dietician), with evaluation of previous medical and obstetric history to assess for risks.
- Preconception counselling:
    - It should be a part of routine diabetes care for all women with diabetes who are in the reproductive age group.
    - Patients should be informed about risk of miscarriage, congenital malformations and perinatal mortality with poor metabolic control and unplanned pregnancy.
    - Patients should also receive counselling about the effective use of contraception in order to plan pregnancies with good glycaemic control.

- Clinicians should encourage smoking cessation and reduction in alcohol intake.
- Advise regular exercise and management of weight to achieve a BMI < 27kg/m^2.
- Commence folate supplementation of 5 mg daily pre-conceptually until 12 weeks gestation to prevent neural tube defects.
- Encourage diet with high levels of complex carbohydrates, soluble fibre and vitamins and reduced levels of saturated fats.

- Contraindications to pregnancy:
  - HbA1C >10%
  - Impaired renal function, creatinine > 0.2 mmol/L (increased risk of progression to dialysis during pregnancy)
- Thyroid screening: Recommended by the ADA for women with Type 1 Diabetes.
- Treatment of Diabetes:
  - Oral hypoglycemic agents

The majority of individuals with type 2 diabetes who before pregnancy will be treated with oral hypoglycemic medications (OHAs).

Individual studies have been small or of poor quality, reporting contradicting results, or failing to account for major confounding factors, therefore definitive conclusions on the safety of OHAs have yet to be obtained. Despite the variability of the data, one meta-analysis of first-trimester exposure to several OHAs, including metformin, glyburide, and glipizide, found no increase in the incidence of significant congenital deformity. A prospective database study comparing fetal outcomes among women with type 2 diabetes treated with diet, insulin, or sulfonylureas (chlorpropamide, glyburide, glipizide) in the first trimester found no significant difference in the incidence of major or minor congenital anomalies in the three treatment groups.

The safety of newer OHAs such as dipeptidyl peptidase-4 (DPP-4) inhibitors, sodium-glucose linked transporter 2 (SGLT2) inhibitors, and injectable glucagon-like peptide-1 (GLP-1) receptor agonists has not been explored adequately for pregnancy. Ideally, physicians should shift patients with type 2 diabetes on these OHA to insulin therapy prior to conception.

- Insulin

Intensive insulin therapy, either by basal-bolus injection or continuous subcutaneous insulin infusion, is the recommended method of achieving the necessary preconception glycemic targets. While type 1 diabetes patients will already be on insulin, most type 2 diabetes patients will need to be switched to insulin prior to conception.

Two rapid-acting insulin analogues (lispro and aspart), in addition to human regular insulin, appear to be safe to use during pregnancy. NPH insulin and detemir are safe to use as a basal insulin during the pregnancy. Glargine insulin has not been tested in randomised control trial for safety in pregnancy. However, observational studies have not revealed any significant safety issues with glargine in pregnant women.

- Evaluation and treatment of diabetic complications:
    - All guidelines recommend management of diabetic retinopathy prior to pregnancy since pre-existing retinopathy may progress rapidly in pregnancy. Fundus examination should occur ideally before pregnancy or in the first trimester, and then patients should be monitored every trimester and for 1 year postpartum as indicated.
    - Patients with pre-existing microalbuminuria are more likely to develop pre-eclampsia and thus require management for nephropathy.
    - Assessment of hypertension to be done, with SIGN guidelines setting a target BP of <140/80 in patients with pre-existing nephropathy.
- Review of current medication:
    - Replacement of ACE inhibitors, ARBs, Statins, Diuretics, Beta blockers.

- Assessment of metabolic control and blood glucose management:
    - Measure HbA1C monthly until control is achieved.
    - HbA1C should be < 6.5%.
- Blood glucose management:
    - Patients should be instructed about blood glucose self-monitoring with targets of pre-meal of <95 mg/dL and 2-h postprandial glucose <120 mg/dL.
    - Blood sugar should be maintained within normal range without hypoglycaemia.
    - Patients to be educated about hypoglycaemia awareness and management
    - ADA recommends HbA1c of < 6.5% prior to conception.

There are numerous international guidelines that address the preconception care of diabetes with varying degrees of thoroughness (including the ADA, NICE, SIGN and ADIPS guidelines), however all the recommendations are consistent in the need for preconception counselling about the risk of congenital malformation related to uncontrolled blood sugar and the use of effective contraception until good blood sugar control is achieved, along with a multidisciplinary approach and coordination for an uneventful pregnancy.

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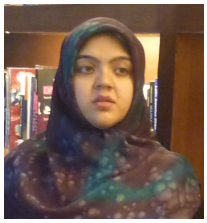
Indicators of Glycemia in Pregnancy



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Introduction

Strict glycemic control is essential during pregnancy as two generations are at risk- the mother and the fetus. There is increased risk of several maternal complications. Moreover, glucose intolerance during pregnancy predisposes the offspring for increased risk of developing glucose intolerance in the future. This vicious cycle is likely to influence and perpetuate the incidence and prevalence of glucose intolerance in any population. The primary prevention is likely to reverse or halt this trend. Timely action taken now in screening all pregnant women for glucose intolerance, achieving euglycemia and ensuring adequate treatment will help in not only maintaining the health of mothers and infants in the short term, but will also help to maintain the long-term health of mothers and the future generation. Clinical chemistry plays an important role in the diagnosis and treatment of diabetes.

Blood glucose measurement

Blood glucose measurement is required for diagnosis and assessment of glycemic control during pregnancy. Self-monitoring of plasma glucose (SMBG) and continuous glucose monitoring (CGM) can be used to maintain glycemic control in order to avoid the perinatal problems to mothers and infants. Majority of available international guidelines for the diagnosis and management of gestational diabetes have adopted the International Association of the Diabetes and Pregnancy Study Groups criteria, while other guidelines recommended alternatives.

Before 2010 virtually all diabetes societies recommended blood glucose analysis as the exclusive method to diagnose diabetes. Not with standing these guidelines, over the last few years' physicians have been using hemoglobin A1c to screen for and diagnose diabetes . Although considered the "gold standard" for diagnosis, measurement of blood glucose is quiet laborious and subject to several limitations, many of which are not widely appreciated. Therefore, it is necessary to evaluate glycemia using indicators of glycemic control both traditional and nontraditional. Each of these indicators has different characteristics as well as advantages and disadvantages. Furthermore, there are both appropriate and inappropriate indicators of glycemic control during pregnancy. The following sections give an outline of these indicators of glycemic control.

Glycated Haemoglobin (HbA1c)

HbA1c is widely accepted as an index of mean glycemia, a measure of risk for the development of diabetes complications, and a measure of the quality of diabetes care. Futhermore, it is less cumbersome than OGTT, provides an integrated measure of glycemia that is less susceptible to short-term modulation than blood glucose and is useful for tracking therapy within individuals with diabetes. Thus, supplementation with HbA1c, as is common outside pregnancy, seems appropriate. Although the HbA1c reference intervals for the general population are well established, reference intervals for healthy pregnant women are not clearly defined and are generally established from the non pregnant state. Studies have shown that HbA1c concentrations in healthy pregnant women are lower than the non pregnant women. The changes that result in these decreased levels of HbA1c in healthy pregnant women could be because of the fact that the concentration of HbA1c is influenced not only by the glucose levels but also by the formation rate and lifespan of erythrocytes. Besides there are number of factors, that can either falsely lower HbA1c test results or raise HbA1c test results independent of glycemia and pregnancy. These includes structural hemoglobinopathies, thalassemia syndromes, and chemical alterations of hemoglobin. Iron deficiency has been reported to increase HbA1c test results by altering the structure of the hemoglobin molecule and making it easier to glycate.

Racial and ethnic differences in HbA1c have also been described that do not appear to be explained by differences in glycemia. Thus although measurement of HbA1c for diagnosis is appealing in pregnancy but it has some inherent limitations and the non glycemic factors that affect assays need to be more clearly defined and laboratories and clinicians should be aware of them.

Fructosamine

Serum fructosamine values can be used clinically as markers of recent changes in glycemic control as they reflect mean blood glucose concentrations over the previous two to three weeks. Fuctosamine is not affected by the food eaten during the day so it can be measured at any time during the day, an aspect very useful in pregnancy. Studies have shown a good correlation between HbA1c values and serum fructosamine. In addition, fructosamine assays are cheaper and easier to perform than HbA1c assays. Also fructosamine is not influenced by abnormal haemoglobin and iron deficiency anaemia. The clinical data thus supports that fructosamine assay can provide a good index of glycemic control especially in diabetic pregnant patients due to their reliability, technical simplicity, low cost, and reduced analytical time. Limitations to their use include higher within-subject variation and non reliability in conditions leading to altered protein metabolism.

Moreover as fructosamine assays measure all glycated proteins therefore, lacks specificity and is influenced by serum protein concentration and dilution of serum.

Glycated Albumin (GA)

GA is similar to serum fructosamine in many aspects including its formation and utility as an index of glycemic control but overall GA is superior to fructosamine assays. GA reflects the short-term status of glycemic control (during the past 2 to 3 weeks) and is strongly associated with HbA1c and fasting glucose levels. GA has several advantages for monitoring of glucose control in management of hyperglycemic disorders of pregnancy. Firstly, GA provides a more accurate assessment of recent glycemia. Secondly, unlike fructosamine, GA is not influenced by dilution anemia during pregnancy. Thirdly, as compared to HbA1c, GA reflects postprandial plasma glucose and glucose excursions more accurately. In pregnancy, for the management of hyperglycemia, evaluation of mean plasma glucose level at a time point nearer to the time of consultation with a doctor and evaluation of postprandial plasma glucose level are vital, and GA proves really useful in this respect. Lastly, as opposed to HbA1c, GA is not influenced by abnormal RBC lifespan and iron deficiency anemia or iron deficiency state.

As iron deficiency is very common in pregnancy especially by the third trimester, so the factitious interpretation of glycemic control by HbA1c can be avoided with the use of GA as an index of glycemic control.

GA as an indicator of glycemia has several advantages but as it is influenced by albumin metabolism, so has anomalous values in diseases that result in abnormal albumin metabolism. Because of its several advantages, GA has been found to be a particularly useful indicator of glycemic control in pregnancy and few authors have recommended it to be the most reliable indicator in pregnancy. Although interesting and lucrative, these proposals are based on scarce clinical data. Moreover the normal range of GA and its time course during pregnancy has not been established in populations of different races and ethnicity; hence there is need of large scale population based epidemiological before confirming any proposals.

1,5-Anhydroglucitol (1,5-AG)

1,5-AG is a naturally occurring monosaccharide, derived mainly from dietary sources with a small amount of de novo synthesis also. During euglycemia, serum 1,5-AG concentrations are maintained at a constant steady state and when serum glucose level exceeds the renal threshold for glucosuria, urinary glucose suppresses reabsorption of 1,5-AG via SGLT4 at proximal tubules of kidney, leading to a loss of 1,5-AG in the urine and a rapid reduction in serum levels.

Serum 1,5-AG indirectly reflects episodes of hyperglycemia during the past 24 h and can be used as an indicator of very short-term glycemic control. Utilizations of 1,5-AG as an index of glycemic control has several advantages, including retained metabolic inertness, steady-state levels in all tissues, and negligible influence of sampling conditions such as collection time, body weight, age, sex, and food intake of the subjects. However, serum 1,5-AG levels may be influenced by several physiologic factors or diseases associated with altered or impaired renal function.

Conclusion

Hyperglycemia accounts for one of the most common medical conditions women encounter during pregnancy. Stringent glycemic control is essential during pregnancy and even mild abnormality of glucose metabolism can increase the incidence of complications. Strict glycemic control cannot be attained without a reliable glycemic control marker, which is lacking till now for pregnancy. Although the determination of blood glucose is the sine qua non for both detection and treatment of hyperglycemic disorders of pregnancy, it is subject to several limitations, many of which are not widely appreciated. Acceptance of supremacy of HbA1c as glycemic control metric outside pregnancy has attracted attention for its use in pregnancy also but owing to the limitations of the HbA1c assay in pregnancy, the interest is growing towards alternative glycemic biomarkers.

Studies have postulated them as useful tools for monitoring of glycemic control in pregnancy but little data is available from clinical studies. Large-scale epidemiological studies among populations of different races and ethnicity are required in order to confirm any proposals.

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Causes of Stillbirth in Diabetes

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Stillbirth can be caused by maternal factor, fetal disorder or result of maternal-fetal interaction. Number of causes for stillbirths in women with diabetes has been identified but hyperglycemia is the commonest factor leading to most of the complications. Hyperglycemia causes hyperinsulinemia in fetus which leads to lactic acid accumulation, anaerobic metabolism, hypoxia, acidosis and fetal death. The extensive work up is needed to reach the exact cause of fetal death which includes autopsy, placental examination, genetic evaluation etc. The cause of fetal death in diabetes can be categorized as

1. Lethal Congenital malformation
2. Placental cause
3. Growth disorders
4. Associated maternal conditions like HDP and Obesity
5. Intrapartum complication

Congenital malformation

An intrauterine hyperglycemic environment may produce oxidative stress in developing foetuses and raise the chance of congenital abnormalities. Diabetes before pregnancy has been linked to a higher risk of adverse maternal and newborn outcomes. Diabetes has been recognized as a major risk factor for congenital malformations such as congenital heart disease, mouth clefts, and anomalies of the central nervous system, digestive system, genitourinary system, and musculoskeletal system in previous epidemiological investigations; however the impact on specific birth defect is unknown. Pre pregnancy diabetes has higher risk (RR 2.44) then the gestational diabetes mellitus (1.28).

Placental cause

In diabetes the placental development is affected structurally and functionally depending upon the glycemic control at various stages of placental development. Various mechanisms at molecular or cellular level are involved to alter the vascular permeability and angiogenesis in diabetic placenta. This altered placental development is one of the major contributors to stillbirth.

Growth disorder

Diabetic mother can have fetal growth retardation or macrosomia, both are at high risk of stillbirth. Diabetes with vascular disease are at risk of fetal growth retardation or small for gestational age whereas poor glycemic control in later half of pregnancy leads to macrosomia.

Maternal conditions

Diabetes mellitus is one of the major risk factor for preeclampsia. The incidence of preeclampsia in non diabetic population is relatively low (2-7%) in comparison to diabetic women which range from 10 to 20%. Preeclampsia itself is the one of the major contributor to stillbirth and in association with diabetes it poses more threat to the fetus. Obesity is another condition which is risk factor for diabetes, pre eclampsia and stillbirths.

Intrapartum complications

Most of the stillbirth in diabetes occur at term and are ante partum, occurs before the onset of labour. However suboptimal intrapartum monitoring can lead to intrapartum stillbirths in diabetic mothers .These women require continuous electronic fetal monitoring and timely intervention and management of shoulder dystocia or cesarean delivery whenever indicated.

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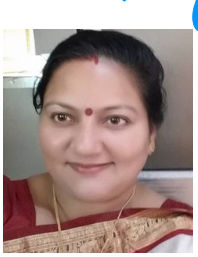
Hypertrophic Cardiomyopathy in Infant of Diabetic Mothers



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Gestational diabetes mellitus (GDM) is the most common medical complication seen during pregnancy .Maternal diabetes is of many types like pregestational (i.e., type 1 or type 2 diabetes which is being diagnosed before conception) or gestational (i.e., diabetes diagnosed during pregnancy).The fetal outcome is usually related to the age of onset and duration of glucose intolerance during pregnancy and severity of the mother's diabetes.

Despite the recent advances in perinatal care around the world, infants of diabetic mothers (IDMs) still remain at risk of multiple of problems in the immediate neonatal period that includes various physiologic, metabolic, and congenital complications namely preterm birth, birth asphyxia, macrosomia, respiratory distress including hyaline membrane disease and transient tachypnea of newborn (TTNB), hypoglycemia, hypocalcemia, hyperbilirubinemia, polycythemia and hyperviscosity, hypertrophic Asymmetrical septal hypertrophy and **hypertrophic cardiomyopathy in infant of diabetic mother.**

Infant of diabetic mothers are prone to have Hypertrophic cardiomyopathy (HCM) .it is a well-recognised complication in infants of diabetic mothers and is attributed to a compensatory increase in fetal insulin secretion. It primarily affects the interventricular septum, but can extend to the myocardium in more severe cases.

Myocardial hypertrophy has been reported in both pregestational diabetes and GDM with a wide range of frequencies (between 25% to 75% of infants born to diabetic mothers) The incidence was lower in case of pure GDM comparing to pregestational diabetes. The most recent studies showed that good maternal glycemic control does not entirely prevent interventricular septum hypertrophy and minor fetal cardiac function impairment, regardless of the type of diabetes.

The **diabetic cardiomyopathy** is usually characterized with significant thickening of the interventricular septum leading to reduction in the size of the ventricular chambers, causing transient hypertrophic sub aortic stenosis. There can be associated biventricular hypertrophy also and sometimes rarely right ventricular hypertrophy. Aortic outflow obstruction is aggravated by anterior systolic motion of the mitral valve. Usually the infants are asymptomatic, but 5-10% have respiratory distress or signs of poor cardiac output or heart failure. The **chest radiograph** shows cardiomegaly and cardiac hypertrophy ,which is best detected by **2D echocardiography.** The echo shows hypertrophy of ventricular septum, the right anterior wall and left ventricular posterior wall.

The **diabetic cardiomyopathy is transient** and this property makes it unique over other cardiomyopathy. It usually resolves with normalization of plasma insulin levels. The affected infants usually recover within 2 to 3 weeks of supportive care, and echocardiographic findings shows normalization within 6-12 months.

Supportive care includes increased intravenous fluid administration and beta blockers like propranolol. Inotropic agents like dopamine and dobutamine are contraindicated as they are prone to decrease ventricular size and further obstruct cardiac outflow.

Pathophysiology

Infants with congenital hyperinsulinism have excessive prenatal and postnatal insulin secretion due to defects in pathways of insulin secretion.

The fetal hyperinsulinemia, leads to increase in the synthesis and deposition of fat and glycogen in the myocardial cells.It is usually seen in mothers with poor glycemic control during pregnancy. The finding of a very similar HCM in infants with congenital hyperinsulinism is consistent with a causal role for fetal hyperinsulinaemia in this cardiac abnormality. The mechanisms by which insulin causes ventricular hypertrophy have not been delineated, but the heart is an important insulin target, and expression of functional insulin receptors by the cardiomyocyte is comparable with that of other insulin-sensitive cells.

Downstream of the insulin receptor, glycogen synthase kinase-3β negatively regulates cardiac hypertrophy. Since expression of this enzyme is inhibited by insulin, it is a potential mechanism for HCM in the hyperinsulinaemic fetus. The finding of HCM only in patients requiring pancreatectomy, suggests that the more severe the hyperinsulinism, the more likely is the occurrence of a disturbance in cardiomyocyte growth. Under basal conditions, KATP channels are closed in cardiomyocytes and only activated with a lowered ATP/ADP ratio, as occurs in the setting of metabolic stress. By preventing excessive calcium entry and contraction, this channel activation is considered cardioprotective.

Routine echocardiogram and electrocardiogram of the newborn infants with congenital hyperinsulinism, particularly in the setting of a murmur or respiratory difficulties, should be considered. Optimal blood sugar control is key factor in prevention of all perinatal and neonatal complications.

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Medical Nutrition Therapy [MNT] in Gestational Diabetes Mellitus

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Gestational diabetes is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.

Diagnosis of gestational diabetes if:-

2-hour plasma glucose level	≥ 140 mg/dl
or	
Fasting plasma glucose level	≥ 92 mg/dl

All Pregnant women who test positive for GDM for the first time should be started on Medical Nutrition Therapy (MNT) and physical exercise/ walk for 2 weeks for 30 mins a day.

After 2 weeks on MNT and physical exercise, 2 hrs PPBS (post meal) should be done.

DIPSI TEST

75 gm of glucose is dissolved in 200 ml of water and consumed over 15 min. Venous sample is taken after 2 hours.

Values of plasma glucose help to determine glucose intolerance and gestational diabetes mellitus

early self-monitoring of blood glucose or 75 g 2-hour OGTT as soon as possible after first visit. Further 75 g 2-hour OGTT at 24–28 weeks (if first OGTT are normal).

Gestational glucose intolerance is observed with plasma glucose level of 120-140 mg/dl.

Glycosuria (1 occasion ≥ 2+ / >2 occasions ≥1+ detected during routine ANC(may indicate undiagnosed gestational diabetes).

Medical nutritional therapy (MNT)

MNT involves a controlled balanced meal plan along with physical exercise which promotes:

- Optimal nutrition and Adequate energy for appropriate gestational weight gain.
- Achievement and maintenance of normoglycemia.
- Individualised nutrition assessment

Nutritional assessment includes Body Mass Index (BMI) or percentage of desirable pre-pregnancy body weight and optimal pattern of weight gain during pregnancy. Medical nutrition therapy aims to Individualize weight gain, calorie needs, monitoring ketone levels and determining protein, fat and micronutrients.

Physical activity such as walking, swimming, and prenatal exercises along with adequate hydration, for a duration of 30 minutes helps to increase insulin sensitivity.

MNT, together with physical exercise, weight control, and implementing a self-control strategy, should begin as soon as possible after diagnosis.

Self monitoring of blood glucose of fasting and postprandial is recommended and Repeat after 2 weeks. If blood sugar level is <120mg/dl continue MNT and monitor blood sugar level.

an ideal dietary composition is

Energy	-	1200-1800 kcal(if BMI >30kg/sqm)
	-	2000-2500 kcal (≈30 kcal/kg body weight)
Carbohydrate	-	55 % (200-250 g)
Protein	-	20% (1.5g/kg body weight)
Fat	-	25% (<10 % is saturated fat).

Energy:

As per Indian ICMR guidelines, for an average weight gain of 10-12 Kg:

Addition of 350 kcal/ day above the adult requirement is recommended during second and third trimester. Energy requirement does not increase in the first trimester unless a woman is underweight.

Energy requirement (kcal/d)= BMR ×PAL

BMR= Basal metabolic rate ; PAL = Physical activity level

BMR for females (18-30 yrs)= 14×B.W (Kg) + 471

BMR for females (30-60 yrs)= 8.3×B.W (Kg) + 788

B.W= body weight (pre pregnancy weight)

However to ease at field addition of 350 kcal can be made for pregnant women after calculating the energy requirement. Addition of 500 calories per day is recommended for Underweight women with BMI <18.5. Deduction of 500 calories per day is recommended for Obese women with BMI >25 or 30% of estimated energy needs.

Foods sources of carbohydrate include cereals ,pulses, starchy vegetables, fruits, sweets, juices etc. Spreading carbohydrate foods over 3 small meals and 2–3 snacks each day than taking 3 large meals will prevent sudden increase in glucose levels.

Complex carbohydrates (like whole-grain cereals like oats, bajra, jowar, ragi, whole pulses, vegetables and fruits with skins) should be preferred over simple carbohydrates.

Aim should be for 2–3 carbohydrate serves at each major meal and 1–2 carbohydrate serves at each snack. (One serve = approximately 15 grams of carbohydrate).

Protein:

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

Fibre:

Soluble fibre helps to control blood sugar by delaying gastric emptying, retarding the entry of glucose into the blood stream and lessening the postprandial rise in blood sugar. Soluble fibre in flax seed, psyllium husk, oat bran, legumes, and pectin and forms in root vegetables.

Dietary cholesterol should be less than 300 mg/day. In obese and overweight patients, a lower fat diet overall can help slow down the rate of weight gain.

Therefore the dietary plan should be divided into 3 major meals (breakfast, Lunch and Dinner) and 2-3 mid day snacks. Breakfast should include 1-2 carbohydrate serving along with one serving of protein rich food. Lunch / Dinner should include half with vegetables, one-fourth with protein and one fourth with carbohydrate. One serving of fruits and yogurt or milk should also be included. Fasting and heavy meals are to be avoided. 1-2 carbohydrate serving can be taken in mid day snack.

Reason of IUD in GDM

Hyperglycaemia, poor glycemic control and ketoacidosis can lead to fetal death.

Fetuses of diabetic women with poor glycaemic control are chronically hyperinsulinemic which increases the fetal metabolic rate and oxygen requirement of fetus and decreases umblical and placental blood flow

Fetal hyperglycaemia and hyperinsulinemia causes fetal hypoxia and fetal death

Other factors such as preeclampsia and maternal vasculopathy also contributes to decreased placental blood flow. The risk of neonatal death is also greater for obese women.

Role of MNT in controlling IUD

Medical nutrition therapy helps to control blood glucose level and decreases the no of women in need of insulin therapy. GDM treated with diet had less rate of stillbirth when compared to GDM treated with Insulin as it improves glycaemic control maintains oxygenation to fetus and decreases the risk of fetal metabolic acidosis and fetal hypoxia.

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Obstetric Decisions for Stillbirth Prevention in Gestational Diabetes Mellitus: a Multidisciplinary Approach

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Gestational Diabetes Mellitus is now a global health concern .In India ,GDM affects around 5 million women annually[1]and prevalence is growing with increasing rates of advanced age or elderly pregnancies. In the last decade the incidence of GDM has increased and rates may be higher in specific ethnic or racial subgroups[2,3,4]. GDM is associated with an increased risk of obstetrical complications to mother like preeclampsia, Cesarean delivery and adverse fetal outcomes which include, stillbirth, macrosomia, and hypoglycemia.

Stillbirths attributed to diabetes mellitus is a matter of concern to obstetricians worldwide with stillbirth rate of 12.8 per 1000 births to all women with diabetes[5]. Stillbirths are generally associated with pre-gestational diabetes and not with true GDM, but the exact classification is at times difficult due to several confounding factors. However, it is particularly important to detect undiagnosed pre-gestational diabetes in pregnancy as the risk profile differs for the mother and the foetus. Clear understanding of the causes of stillbirth in GDM is needed to decrease the fetal death rates.

Higher risk of fetal death occurs in non-Hispanic black women (11.56/1000 births), teenagers, women over the age of 35, unmarried women (8.25/1000 births), and in multiple gestations (twins, 16.52/1000 births)[6]. O'Sullivan and colleagues reported a higher perinatal mortality rate of 64/1000 births was noted (12/187) in women who had GDM[7]. The risk of fetal death was much greater in type 2 diabetes than type 1 diabetes (approximately 34/1000 births versus approximately 12/1000 births)[8]. This may be due to the increased risk posed by obesity, essential hypertension, and maternal age.

Key Measures for Prevention of Stillbirth Associated With Diabetes in Pregnancies

Multidisciplinary approach

It includes consultation with perinatologists, dieticians, and high-risk prenatal nursing staff for pre-conceptional care and intensive management of type 1 diabetes, decreases the risk of still birth or IUD.

Achievement and maintainance of euglycemia

Improved & controlled serum glucose levels with decreased hemoglobin A1c levels have a directly proportional relationship with improved pregnancy outcomes. ''Aggressive management'' of diabetes includes checking blood sugar readings seven times per day in GDM & timely and intensive use of insulin in pre-gestational diabetic females, It is associated with fewer stillbirths and other fetal complications (macrosomia, and intrapartum injury to the neonate). Multiple doses of insulin (more than twice a day) has been shown to provide better glycemic control with hyperglycemic and hypoglycemic episodes.

GDM is managed initially with MNT and if it is not controlled with MNT, insulin therapy is added to the MNT[9](National Guidelines for Diagnosis & Management of Gestational Diabetes Mellitus). As per Indian ICMR guidelines for an average weight gain of 10-12 Kg, an addition of 350 kcal/day above the adult requirement is recommended during second and third trimester.

During MNT, large amounts of carbohydrates should be avoided as it can lead to high blood glucose level. It is better to spread carbohydrate foods over 3 small meals and 2–3 snacks each day rather than taking 3 large meals. Complex carbohydrates (e.g., whole-grain cereals like oats, bajra, jowar, ragi, whole pulses, vegetables and fruits with skins) are preferred over simple carbohydrates. Protein requirement is also increased (additional 23 g/d) to allow for fetal growth[9].

Insulin therapy should be started when capillary blood glucose levels exceed 105 mg per dL(5.8 mmol per L) in the fasting state and 120 mg per dL(6.7 mmol per L) two hours after meals. Reducing extremes in blood sugar readings is an important tool for reducing the risk of stillbirth.

Antepartum fetal surveillance

A fetal anatomical survey by USG should be performed at 18-20 weeks to rule out gross congenital anomalies. Fetal growth scan should be performed at 28-30 weeks gestation & repeated at 34-36 weeks gestation. In patients with good blood glucose control, routine antenatal care is given. In patients having uncontrolled blood glucose level or any other complication, antenatal visit should be done every 2 weeks in second trimester & every week in third trimester.

All women should be counselled regarding the use of fetal movement (fetal kick counts).

Though the evidence is limited that these measures conclusively reduce the risk of stillbirth in diabetic women, this simple noninvasive technique seems reasonable, inexpensive, and may have other benefits such as improved maternal bonding with fetus.

Non stress testing (NST), with or without determinations of amniotic fluid volume, and biophysical profile is the mainstay of antenatal fetal surveillance. Predictive factors for emergent cesarean delivery for non-reassuring fetal tracings included spontaneous decelerations, nonreactive NSTs, and both findings together.

Doppler velocimetry of the fetal or maternal vessels is another tool to assess fetal condition in-utero. Gradations of abnormal fetal blood velocity are associated with an increased risk for fetal acidemia. Fetal umbilical blood flow becomes increasingly retrograde with increasing placental resistance, such that reversed end diastolic blood flow is a strong predictor of subsequent fetal death. Umbilical artery Doppler velocimetry was more sensitive than biophysical profile for fetal academia and hypercarbia[10]. Elevations of the systolic/diastolic ratio noted on Doppler velocimetry of the fetal umbilical artery was significantly associated with maternal vasculopathy associated with hypertension and renal insufficiency, as well as intrauterine growth restriction and neonatal metabolic complications, but not hyperglycemia[11]. Doppler studies are better in identifying diabetic pregnancies that ended adversely than NSTs or biophysical profiles[12].

Timing of delivery

The ultimate goal is to deliver a live and healthy infant, with an acceptable risk of cesarean delivery. GDM is associated with delay in lung maturity of the fetus; so it is not recommended to routinely delivery prior to 39 weeks. Induction of labour should be scheduled at or after 39 weeks pregnancy in case spontaneous labour does not occur[9]. The common indications for decision for delivery include non-compliance treatment regimens, hyperglycemia inspite of intensive efforts to gain control, abnormal fetal surveillance (NST, biophysical profiles, Doppler velocimetry), fetal growth restriction (less than 10% in women who have diabetes), and suspected fetal macrosomia.

In case patient is requiring early delivery between 24-34 weeks of gestation, antenatal steroids should be given for fetal lung maturity as per guidelines i.e. Inj. Dexamethasone 6 mg IM 12 hourly for 2 days. Blood glucose levels should be monitored vigilantly for next 72 hours following injection and dose of insulin to modified as per requirement.

Vaginal delivery should be preferred and LSCS only to be done for obstetric indications. Primary cesarean section can be considered at 39 weeks in case of fetal macrosomia (estimated fetal weight > 4 Kg) to avoid shoulder dystocia[9].

Intrapartum fetal surveillance

Intrapartum fetal monitoring is a major contributing factor towards decreasing the risk for intrapartum stillbirth. Intrapartum fetal monitoring should be used in every women who have diabetes, along with strict monitoring of maternal blood sugars during the course of labor. The morning dose of Insulin is to be withheld on the day of induction/labour and the patient is put on 2 hourly monitoring of plasma glucose[9]. Target values are 90 to 120 mg per dL.

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Stillbirth Society of India

www.stillbirthindia.org

GDM Committee Webinar

Date: 20th November, 2021
Time: 07:00 pm - 08:30 pm

Chair of Committee : Dr Bharti Maheshwari
Secretory of Committee : Dr Dalia Rafat

International Expert

Dr Torvid Kiserud
Senior Professor OBGYN
University of Bergen

Chairperson

Dr Anuj Maheshwari
Diabetelogist,Lucknow

Programme

1.	Welcome: Dr Neelam Aggarwal	2 mins
2.	Introduction to GDM Committee: Dr Tamkin Khan	2 mins
3.	Introduction of International Expert: Dr Nuzhat Aziz	2 mins
4.	Why do big babies die: Dr Torvid Kiserud	20 + 10 mins
5.	Hypertrophic cardiomyopathy in babies of diabetic mothers: Dr Bharti Maheshwari	15 mins
6.	Prediction & prevention of stillbirths in GDM: Dr Uma Ram	15 mins
7.	Discussion and Q&A	10 mins
8.	Vote of Thanks: Dr Dalia Rafat	2 mins

Dr Neelam Agarwal
President
SBSI, India

Dr Nuzhat Aziz
Vice President
SBSI, India

Dr Tamkin Khan
Secretary
SBSI, India

Dr Asna Ashraf
Joint Secretary,
SBSI, India

Dr Ayesha Ahmad
Joint Secretary,
SBSI, India

Dr Neetika Garg
Treasurer
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December 2021 Calendar

Theme of the Month: Stillbirths in Pregnancies With Fetal Growth Restriction

December 2021						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	


Born
In
Heaven