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REVIEW ARTICLE

Gestational Diabetes Mellitus: A Frequent Problem In Obstetrical Practice.

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ABSTRACT

Gestational diabetes mellitus (GDM) is a frequent problem encountered in obstetrical practice and its complications may influence both the mother and the fetus. Being the major cause of implications associated with pregnancy, screening and appropriate management of diabetes during the gestational period is an essential requirement. The incidence of perinatal mortality and morbidity is high in untreated diabetic pregnancies. Excessive thirst, polyuria, weakness, nausea, blurred vision, etc. are observable symptoms of GDM. The disease results in several health issues including excessive weight, hypoglycemia, and respiratory distress in fetuses and development of type -2 diabetes mellitus in mother as well. An increase in resistance of target cells for the action of insulin is the prime pathological event responsible for the prevalence of the disease. The review article focuses on relevant risk factors, health consequences, and screening with appropriate strategies for the management of GDM.

Keywords: Gestational diabetes mellitus, perinatal mortality, Type -2 diabetes, Respiratory distress

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INTRODUCTION

Gestational diabetes is defined as the situation in which a high blood glucose level is reported in the gestational period especially during the second or third trimester of pregnancy. It is a metabolic disorder that nearly affects 3 to 9 % of total pregnancies; the frequency of gestational diabetes is about 1% below the age of 20 and 13 % above the age of 44. The condition has a setback on the physical health and mental status of pregnant women and results in the progression of persistent Type-2 diabetes mellitus [1]. Pregnancy is already a sophisticated situation for a woman that becomes even more complicated when conditions like gestational diabetes mellitus occur, the problem of gestational diabetes has evolved as an issue of global concern, and in context to same even WHO has presented its recommendations for the diagnosis of gestational diabetes. The large population of women suffering from GDM shows no observable symptoms, moreover the pregnant woman may not be aware of the fact that she is suffering from such pathological complications unless screened for glucose intolerance. The test is performed between 24 to 28th weeks of pregnancy [2-4]. The symptoms such as excessive thirst, weakness, dry mouth, polyuria, etc. are associated with and discussed here [5-6].

Excessive thirst: The woman having GDM may have the feeling of excessive thirst even if there is the absence of situations like heavy workouts or episodes of consumption of salty food [7].

Weakness: Gestational diabetes may result in excessive weakness in women; the patient may have a sensation of fatigue even during the early morning [8].

Dry mouth: This is a disturbing situation for women; that problem results in excessive consumption of water sometimes more than 5 liters which are followed by frequent urination [9].

Polyuria: Although, frequent urination is a common sign observed in pregnant women. The condition may become pathetic when the blood glucose level is high. The increased frequency of urination is an alarming signal for underlying complications of gestational diabetes [10].

Nausea: Even regular meals consumption may result in nausea and the body of the patient is unable to utilize glucose as a prime source of energy during gestational diabetes and initiates the breaking of fat for the production of energy. The metabolic reaction results in the production of ketone bodies that are found to be causative factor for nausea [11].

Blurred vision: It is a less common symptom that is associated with gestational diabetes. The reason is the fact that elevated glucose level in blood withdraws fluids from the lens of the eye that results in blurring of vision [10].

Itching in hands and feet: Burning sensation in hands and feet is common in women suffering from gestational diabetes, the chief cause for the situation may be due to the enhanced circulation of glucose in the blood that is responsible for the damage of nerves and nerve endings [11].

Pathophysiology

A normal pregnancy is characterized by the enhanced in-sensitivity of maternal tissues towards the effect of insulin. The possible reason for the same is the hormones secreted by the placenta and also due to weight gain and other features associated with pregnancy [12]. In normal situations, the overall disposal of glucose gets declined and in order to maintain the normal level of glucose nearly a 200 – 205% increase in insulin secretion is observed in the body of pregnant women [13]. The common symptoms of GDM are observed when the body fails to secrete the increased amount of insulin. The case is not the same in women suffering from GDM complications even the exact pathophysiology is also not the same for all body types. Figure 1 gives the comparative schematic representation of normal pregnancy and GDM affected pregnancy.

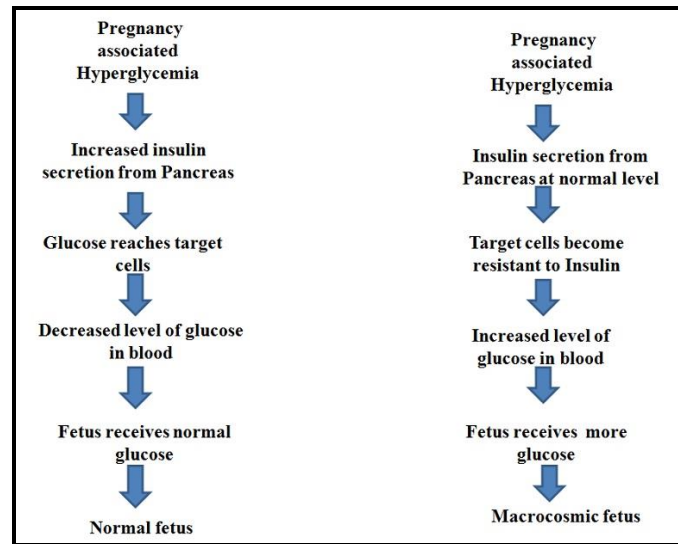


Figure 1: Comparative schematic representation of normal pregnancy and GDM affected pregnancy

Risk factors for developing GDM

It is of paramount importance to identify gestational diabetes at the initial stages and to design an optimal treatment regimen. The delay in the identification of GDM may result in maternal and fetal health complications [14]. The additional long-term complications of GDM pregnancies lead to an increase in the incidence of type 2 diabetes and associated conditions in both the mothers and their affected offspring [15]. Table 1 describes both low high-risk categories and their clinical features related to GDM.

Table1: Risk category for GDM

Risk category	Clinical features
Low risk	Age < 25 years at the time of pregnancy No previous history of abnormal glucose tolerance test Normal pregnancy weight No previous birth complications Belongs to a low-risk population
High risk	Age > 40 years at the time of pregnancy Obesity Diabetes in the first-degree relative Previous history of GDM Previous history of a macrosomic fetus

Consequences of GDM

It has been found that nearly 2 to 10 % of pregnancies are characterized with gestational diabetes every year; many conditions increase the chances of disease i.e. women with a family history of diabetes, overweight body type, women belonging to Asia, Africa, America, or Hispanic origin, prior history of high blood glucose level, but not characterized as diabetes, women had earlier given birth to a baby with weight more than 9 pounds, women had given birth to a baby with certain defects, and age more than 35 years [16-17].

Consequences on the health of the baby

The baby born to the woman suffering from gestational diabetes is believed to have several complications like

Excessive weight: The newborn may be overweight and the reason for the same may be that the excess glucose circulates in the bloodstream of the mother reaches the developing baby via the placenta. In

response of which the pancreas of the developing baby starts secreting more insulin. The condition is referred to as macrosomia. The complication may lead to C- section as the oversized baby may get staged into the birth canal [18].

Hypoglycemia: The baby born from a woman with gestational diabetes has greater chances of hypoglycemia as the insulin production is high in such babies as a result the newborns encounter episodes of low blood glucose level and the situation may result in seizures in babies [19].

Respiratory distress syndrome: Newborns may experience respiratory distress syndrome. The situation makes breathing difficult due to immature lungs, it is mainly observed in babies who are born earlier than 28 weeks of pregnancy. In such conditions, the lungs of the newborn are not capable of making sufficient surfactant that is a prime requisite to make the lungs expanded enough so that the newborn can breathe in the air after birth [20].

Type 2 diabetes: Newborns to mothers with gestational diabetes are more susceptible to have Type2 diabetes mellitus in later stages of life [21].

Consequences on the health of the mother

Preeclampsia: It is a health state that is results in high blood pressure during pregnancy. The condition results in damage to vital organs of the body like the liver and kidney. The pathophysiological condition can also cause blood clotting and edema, and if untreated may result in the death of the mother and infant [22].

Type 2 diabetes: The possibility of developing diabetes in the near future is more with women suffering from gestational diabetes [23].

Global prevalence and screening

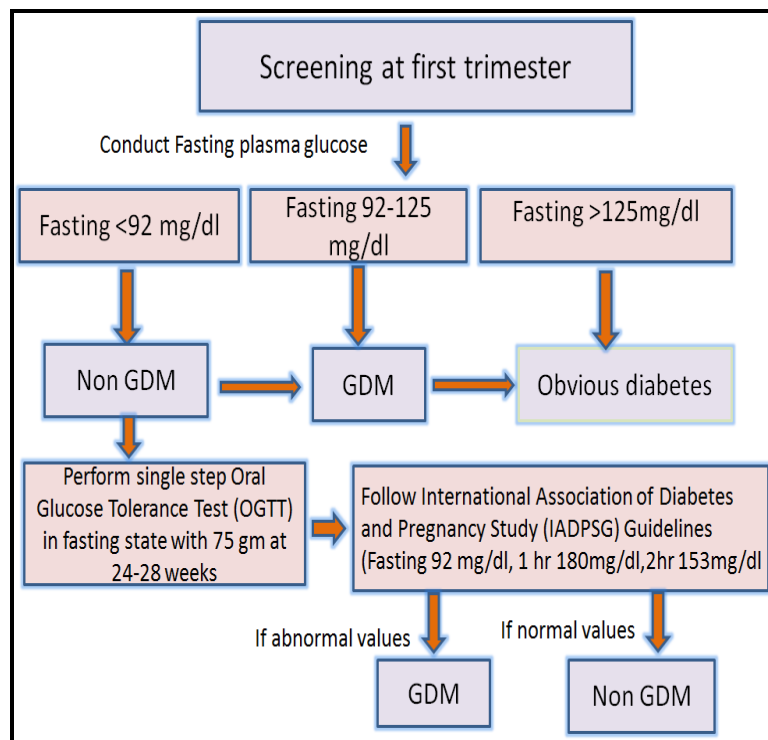


Figure 2: Screening adopted for GDM

GDM is a zone of robust clinical investigation paralleling its garish rise, controversies, and newer findings across the globe. A significant and authorized strategy is recommended for appropriate screening, correct diagnosing, and appropriate management of GDM [24]. Perusal literature estimates that the global prevalence of GDM varies along the globe depending upon races and ethnicity in a country i.e. 3.9 % in white women American, 8.7 % Asian, 2.3 % Chinese, 2.9 % Japan, 4.7 % in Australia, and 3.6 % in Europe. Asian women have 11 times high risk of glucose intolerance equated to Caucasian women. Consistently increased pattern of GDM exhibits alarming state as it directly affects both mother and her

neonate. Records congregated from the Pregnancy and Risk Assessment Monitoring System have publicized during 2005 -2009, the frequency of GDM amplified from 9.5% to 11.5% [25-26]. Practically all pregnant women (24-28 weeks of gestation) should endure airing for glucose intolerance as in the first-trimester fetal beta cell distinguishes and retorts to maternal glycemic level. If the measurement is reported as negative, further screening test requires to be conducted during the 24th – 28th week and 32nd -34th week [27-28]. Figure 2 explains the screening adopted for GDM. In spite from increased prevalence of gestational diabetes mellitus, few pre-post investigations interpret little clinical improvement in the estimated contrary outcomes. Studies on nineteen GDM sufferer women of diverse social and cultural state revealed following of confused or unorganized treatment guidelines [29-31]. Thus a systemic diagnosis plan based on emotional and psychosocial experiences should be executed that comprises various stages investigational data i.e. initial time of diagnosis, after diagnosis, at delivery and post-delivery. Organized investigations on diverse demographical, multicultural and high participated GDM sufferer pave the way to design acceptable valid methodology [32-33].

Strategies or approaches for the management of gestational diabetes

The selection of the right treatment for the GDM patient is crucial and requires proper nursing with an appropriate diet, suitable exercise, and accurate medication (figure 3). Patient records are compiled related to their height and weight, basal metabolic index, and waist to hip ratio before to commencement of treatment/ therapy [34-35].

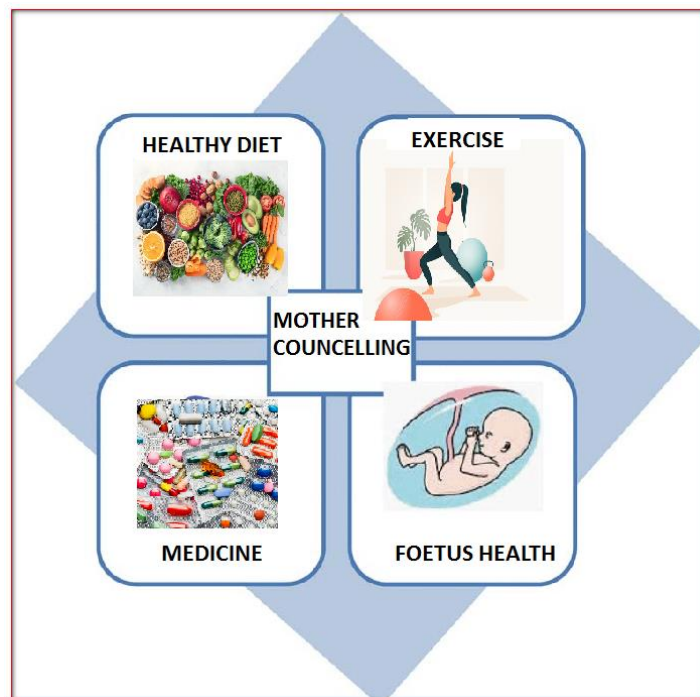


Figure 3: Quintet management model for gestational diabetes

Exercise has been considered one of the beneficial and as important therapeutic tools during pregnancy. In the late 18th century maternal exercise was thought to precede an easier baby delivery. Further, in the 20th century, scientific data began to advocate exercise for healthy delivery [36-38]. There are several prenatal physical activities to facilitate easy labor, improved fetal oxygenation, strong muscle tone, and for the desired post-partum weight loss. Reports suggest that after regular physical activity, 17 out of 20 women who were previously insulin-dependent were capable of regulating normal glucose levels and did not require insulin and showed improved health status [39-42]. Physical activity of approximately 150 min should be carried out in a week to control body weight. Moreover, GDM patients are not advised to extend their pregnancy beyond 40 weeks as it may proceed towards cesarean delivery [43]. Despite several advantages of physical activity during pregnancy, few precautions are also recommended for the health of both mother and fetus. The American College of Obstetricians and Gynecologists (ACOG) has advised limiting recreational sports including forceful contact of falling,

basketball, rugby, gymnastic, horseback riding, etc. after the first trimester [44]. The exercise should immediately terminate as it may cause vaginal bleeding, chest pain, preterm labor, amniotic fluid leakage, decreased fetal movement, etc. It is important to recover the stability of the mother and fetus as soon as possible [45-46]. It is advised to daily intake 30 kcal/ kg with BMI ~ 25, 24 kcal/ kg with BMI ~29, and 15 kcal/ kg with BMI ~30. In routine diet composition ~ 40% carbohydrate, ~ 35% fat, and ~ 20% protein are monitored that generally leads to normalizing glycemic index up to 80% sufferer. Dietary fibers (14g fiber/ 1000 kcal) and whole grains food are advised along with intake of prenatal vitamin (600 mcg folic acid) daily [47]. If the patient is not controlled after the management of nutrition and daily exercise, they must be switched over to oral medication and insulin therapy. Recent medication order involves the use of oral antidiabetics, this strategy is safe and easy to administration but their efficiency varies as sometimes perinatal mortality testified. Usually, biguanides (metformin) and sulfonylureas (glibenclamide) are prescribed in high-risk individuals to control hyperglycemia owing to their feature to cross the placenta. Biguanides reduce peripheral insulin resistance and thus check the process of gluconeogenesis. Additionally, better patient compliance is reported due to lessening the chances of perinatal complications and neonatal hypoglycemia [48-49]. By contrast, sulfonylureas increase insulin hormone secretion and hepatic clearance. But both the categories are found to be insufficient to maintain normal glucose levels typically in postprandial periods. Insulin therapy is another approach to manage GDM, which reduces the risk of macrosomia and other neonatal complications. Special attention is required to decide insulin dose during pregnancy and after delivery. Neutral protamine Hagedorn (NPH), insulin detemir, and insulin glargine are frequently recommended to manage hyperglycemia in pregnancy [50]. Two strategies are involved to start insulin therapy, one is measuring fasting glucose concentration (> 90 mg/dl) and the second one is the determination of postprandial 1 hr glucose level (>120 mg/dl). Disadvantages with insulin therapy are associated with complexity in administration, expensive, and delivery of inappropriate dose due to insulin pump failure [51]. GDM patients should be engaged in a follow-up program where several physicals, neurological and fundoscopic investigations are executed. Regularly plasma glucose and hemoglobin alpha 1(HbA1) levels are measured and monitored. Consequences of planned diet suggested exercise, and anti-diabetics are evaluated to check any complications in maternal and fetal health [52]. Ultrasonography for the development of polyhydramnios and the weight of the fetus are regularly examined for the patients who receive insulin therapy [53-55].

Health approach

The rapid advancement in information technology and the application of web platforms have evolved as a healthcare facility for women. The job of monitoring the blood glucose level has now become easy with the use of mobile apps like Glucose Buddy, Glucose Wiz, Fooducate, MySugr, Beat diabetes, One-touch reveals, etc. Telemedicine and the ease of availability of healthcare professionals for online consultation have made the journey easy for patients suffering from GDM [56-58]. All these have led to decreased cases of C- section births, increased patient satisfaction, and also a positive effect on mental health, moreover being cost-effective the approach aids in the improvement of patient compliance [59-60]. Artzi et al. (2020) developed a machine learning approach that predicts gestational diabetes on retrospective data of Israel and Jerusalem of 588,622 pregnancies. Their comprehensive e-health records were generated that predicted high accuracy even at the initial stage of pregnancy (auROC, 0.85). Moreover, they successfully uncovered risk factors including outcomes associated with previous pregnancy glucose/sugar challenge tests. Their model was cost-effective, easy, and allowed early-stage interventions with high-risk factors [61-62].

CONCLUSION

The management of gestational diabetes is a challenging task. Efforts and strategies are required to be planned in a manner that helps in the identification of complications and designing of an effective treatment regimen. The inter-professional team approach that includes all health care providers and collaboration with other disciplines would help in the reduction of metabolic disorders linked with gestational diabetes. The use of e-health technologies provides online platforms for health monitoring exhibits a promising modern approach for the management of GDM.

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