ORIGINAL RESEARCH PAPER

Medical Science

GESTATIONAL DIABETES MELLITUS (GDM) AND BIRTH DEFECTS

KEY WORDS: Birth defects; Gestational diabetes mellitus; Diagnosis; Hyperglycemia

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ABSTRACT

Gestational diabetes mellitus (GDM) is a type of diabetes that is first recognised during pregnancy, with no evidence of pre-existing type 1 or type 2 diabetes. It is stated that 2-5% of all pregnant women develops gestational diabetes mellitus during their pregnancies and noticed that prevalence has increased considerably during the last one decade. Globally, nearly 60 million women of reproductive age have diabetes and the number is continuing to increase. A recent large-scale study shows that number of pregnant women with pre-existing diabetes has more than doubled in the past 7 years, a worrying trend that engenders health risks for both mothers and newborns. Diabetes during pregnancy may affect the development of fetus, neonate, and child. The preexisting or pregestational diabetes in pregnancy may contribute to have higher risk of having a child with a major birth defect although it's depends on maternal age, geographical and ethnic background. GDM may lead to significant maternal & fetal complications if it is left untreated. Hence, the impact of GDM on maternal and infant health is of great clinical and public health concern and need to focus on management of GDM induced complications in near future.

INTRODUCTION

Gestational diabetes mellitus (GDM), is emerging as a serious public health problem, defined as glucose intolerance with onset or first recognition during pregnancy. GDM is associated with adverse perinatal outcome and increased long-term risks of type 2 diabetes mellitus, metabolic syndrome and cardiovascular disorders for both mother and offspring. Hence, the impact of GDM on maternal and infant health is of great clinical and public health importance. In 2015, the majority of 21 million live births affected by hyperglycemia in pregnancy were reported in low-and middle-income countries. SouthEast Asia was leading the field with a prevalence of 24.2 %; in comparison, rates in Africa were reported up to 11 % (Macaulay, 2014; Diabetes Atlas, 2016). In these countries, GDM poses a tremendous burden: The condition leads to significant perinatal mortality, e.g. as shown in Kenya by a perinatal mortality rate of 254 in 1000 (Fraser, 1982). Commonly, diagnosis and treatment of the condition are challenging due to insufficient financial resources and infrastructure as well as climate and geography impacting the access and availability of care. Also, the compliance of patients is hampered by lack of education, religious beliefs, superstitions and fear of stigma.

In India, rates of GDM are estimated to be 10-14.3% which is much higher than the developed countries. As of 2010, there were an estimated 22 million women with diabetes between the ages of 20 and 39 & an additional 54 million women in this age group with impaired glucose tolerance (IGT) or pre-diabetes with the potential to develop GDM if they become pregnant. In a field study in Tamil Nadu performed under the Diabetes in Pregnancy – Awareness and Prevention project, of the 4151, 3960 and 3945 pregnant women screened in urban, semi urban and rural areas, respectively, the prevalence of GDM was 17.8% in the urban, 13.8% in the semi urban and 9.9% in the rural areas (National Guidelines for Diagnosis & Management of Gestational Diabetes Mellitus Report; Government of India 2014). The incidence of GDM is expected to increase to 20% i.e. one in every 5 pregnant women is likely to have GDM. It is estimated that worldwide nearly 8 million babies or 6% of all births are at risk for birth defects when followed up to early school age. About half of them are detected immediately after birth. At least 3.3 million children younger than 5 years old die annually due to serious birth defects, the leading causes being congenital heart defects and neural tube defects (NTDs) (Lawrence et al. 2008; Christianson, 2006; Murphy, 2013) because diabetic embryopathy can affect any developing organ system, but cardiovascular and neural tube defects are more prone for glucose metabolism. Poorly controlled GDM with maternal hyperglycemia before conception and during the first trimester is associated with major birth defects in 5–10% of pregnancies and spontaneous abortion in 15–20% of pregnancies has been seen (Reece, 2012).

Despite a high prevalence of GDM in Indian women, currently screening of pregnant women for GDM is not being done universally as part of the essential antenatal package. The test is sporadically being done at district and municipal corporation level in some states as per direction of individual clinician except in the state of Tamil Nadu where every pregnant woman is being screened up to the level of primary health centre (PHC) as a part of the government of Tamil Nadu initiative. Despite the fact that GDM is a sizeable public health problem with serious adverse effects on mother & child, we do not have a standard GoI guideline for diagnosis and management of GDM. Furthermore, clear data about prevalence rate of GDM in many Indian states are not available hence there is need to conduct filed and clinical studies.

Consequences of GDM

Gestational diabetes mellitus has long been recognised as a complex problem in pregnancy due to significant levels of fetal and maternal morbidity (2, 4, 11). The prevalence of the disorder is increasing all over the world, but most noticeable in developing countries

GDM may induce some pathological conditions like nephropathy, retinopathy and neuropathy, and may develop cardiomyopathy in a developing fetus and if not monitored closely, the progression of these complications can be severely affect the pregnancy. Fetal risks include spontaneous abortion, intra-uterine death, stillbirth, congenital malformation, shoulder dystocia, birth injuries, neonatal hypoglycaemia and infant respiratory distress syndrome. Studies have shown that intensive perinatal care, including stringent glycemic control, antihypertensive therapy, regular clinical evaluations, and early identification of women at risk may improve the fetal survival rate, normal birth weight, and development without significant negative effects on maternal health.

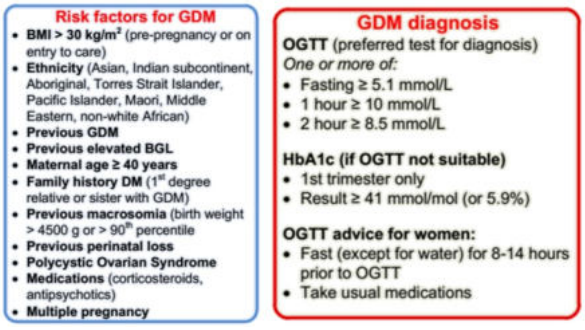
Risk factors and Diagnosis of Type 2 diabetes

According to the American Diabetes Association (ADA), testing should be considered in all adults who are overweight (BMI ≥25 kg/m2) and have additional risk factors. Additionally, all adults should be screened once they are 45 years old, regardless of risk factors. If results are normal, testing should be repeated at least at 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

Blood tests are used to diagnosis diabetes and prediabetes

because early in the disease type 2 diabetes may have no symptoms. Lab analysis of blood is needed to ensure test results are accurate. Glucose measuring devices used in a health care provider's office, such as finger—stick devices, are not accurate enough for diagnosis but may be used as a quick indicator of high blood glucose. Testing enables health care providers to find and treat diabetes before complications occur and to find and treat pre-diabetes, which can delay or prevent type2 diabetes from developing.

Any one of the following tests can be used for diagnosis:
- Hemoglobin A1c, HbA1c, or glycol-hemoglobin test
- Fasting plasma glucose (FPG) test
- Oral glucose tolerance test (OGTT)



Research in animal models has revealed that maternal hyperglycemia is a teratogen and it has been seen that GDM affected women's are more prone to develop birth defects in their developing fetus. Maternal diabetes-induced malformations have been detected in all major organ systems including cardiovascular, gastrointestinal, genitourinary and neurological systems, among which the neural tube defects such as anencephaly, holoprosencephaly and syntelencephaly were more frequently demonstrated. The mechanisms underlying the effects of maternal hyperglycemia on the developing foetus may involve increased oxidative stress, hypoxia, apoptosis, and epigenetic changes. Although, it is not well understood how altered maternal metabolism interferes with embryonic development and with neurulation in particular**.** Hence, the worldwide establishment of uniform screening and management criteria is crucial for future successes. Further, understanding the racial and ethnic disparities in GDM diagnosis, management, and outcomes is also a substantial step towards implementation of meaningful policies, clinical decision making and patient counselling leading to an improvement of maternal and child health. In this context, we advocate to address country-specific challenges and to focus on close-knit networks and shared public health efforts. Strengthened collaborations allow the exchange of epidemiological data, ideas and resources between industrialized and low-resource nations and represent an opportunity-and almost an ethical responsibility-to strengthen research endeavours and to lower the burden of GDM in underserved countries.

Management of GDM

Healthy eating, physical activity, and blood glucose testing are the basic management tools for type 2 diabetes. In addition, many people with type 2 diabetes require one or more diabetes medicines—pills, insulin, and other injectable medicine to control their blood glucose levels. Adults with diabetes are at high risk for cardiovascular disease (CVD). In fact, at least 65 percent of those with diabetes die from heart disease or stroke. Managing diabetes is more than keeping blood glucose levels under control—it is also important to manage blood pressure and cholesterol levels through healthy eating, physical activity, and the use of medications, if needed. By doing so, those with diabetes can lower their risk. Aspirin therapy, if recommended by a person's health care team and smoking cessation can also help lower risk.

Diabetes self-management education or training is an also key step in improving health outcomes and quality of life. It focuses on self-care behaviours, such as healthy eating, being active, and monitoring blood sugar. It should a collaborative imitative program in which diabetes educators can help people to educate about risk of diabetes and problem-solving and coping skills needed to successfully self-manage the disease and its related conditions. People with diabetes should see a health care provider who will help them learn to manage their diabetes and who will monitor their diabetes control. Most people with diabetes get care from primary care physicians—internists, family practice doctors, or paediatricians. Often, having a team of providers can improve diabetes care.

A team can include

- A primary care provider such as an internist, a family practice doctor, or a paediatrician
- An endocrinologist—a specialist in diabetes care
- A dietician, a nurse, and other health care providers who are certified diabetes educators—experts in providing information about managing diabetes
- An ophthalmologist or an optometrist—for eye care

The team can also include other health care providers, such as cardiologists and other specialists. The team for a pregnant woman with type 1, type 2, or gestational diabetes should include an obstetrician who specializes in caring for women with diabetes. The team can also include a paediatrician or a neonatologist with experience taking care of babies born to women with diabetes.

Conclusion:

Clinically GDM is a high risk factor for mother and child. If it is left undetected or untreated it may lead to serious complication for both mother and child. It could cause pre- eclammpsia, obstructed labour, caesarean delivery and in delayed complication due to rise in blood sugar during pregnancy. The child may become hypoglycaemic, macrosomic, shoulder dystocia or may lead to intrauterine death. Hence it becomes compulsory for all the pregnant women to undergo random blood glucose at the first antenatal visit to detect diabetes in pregnancy.

Further, there need to develop some appropriate diagnostic procedure for identifying GDM at early stage in order to avoid complication for mother and child. Every clinician must do through check -ups or follow ups GDM cases after delivery to avoid from developing type 2 diabetes.

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