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REVIEW ARTICLE

Gestational Diabetes Mellitus and its Effects on Mothers Health

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ABSTRACT

Gestational Diabetes Mellitus (GDM) is a common metabolic disease that makes pregnancy more difficult for millions of women around the world. GDM is a disease that makes it challenging for the body to deal with sugar. During pregnancy, it can have very long-term adverse effects on the health of both the mother and the baby. People live in different ways now, parents are becoming older, more people are overweight, and screening is getting better. GDM can cause major short-term concerns, like high blood pressure, too much amniotic fluid, early birth, increased cesarean sections, and metabolic issues in neonates. After giving birth, both women and their children are at an increased risk of developing type 2 diabetes, metabolic syndrome, and cardiovascular disease. In this review, we consolidate current knowledge about the epidemiology, etiology, clinical symptoms, diagnostic methodologies, maternal complications, newborn outcomes, and long-term health consequences of GDM.

KEYWORDS: *Gestational Diabetes Mellitus, Insulin, Pregnancy*

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INTRODUCTION

Gestational Diabetes Mellitus (GDM) is a major clinical issue in contemporary obstetrics. It is characterized by carbohydrate intolerance leading to hyperglycemia, initially identified during pregnancy. During pregnancy, it's common for women to be resistant to insulin. GDM arises when insulin resistance surpasses the functional capacity of pancreatic β-cells. According to data, the worldwide percentage of this increase each year. There are various factors, such as sex, age, obesity, and hormonal imbalance, responsible for this. In developing countries like India, GDM percentage is also increasing faster, where obesity, not enough exercise, genetic factors, later stage marriage are all on the rise.[1,2]

The increasing incidence of GDM poses significant public health concerns. Uncontrolled hyperglycemia during pregnancy harms the mother's health, baby's growth, and the birth itself. The woman and her unborn child are both more likely to get metabolic diseases because the effects last long after the pregnancy is over. Many women don't get tests and follow-up care, even though they are very important. This could lead to problems that could have been avoided. This review covers the diverse effects of GDM on pregnant women by their impact on pregnant women by integrating recent studies from clinical, metabolic, and epidemiological perspectives.[1,3]

Factors contribute in predisposing pregnant women to GDM

GDM is growing more widespread over the world, yet it is different in different places. This is due to both biological and lifestyle factors. Epidemiological data consistently demonstrate that women of Asian heritage, particularly those from South Asia, possess a disproportionately heightened susceptibility to GDM compared to other ethnic groups. This higher risk is partly because to an inherent tendency to become resistant to insulin and a weaker β-cell compensatory response, even in people with a normal or low body mass index.[4,5] South Asians typically demonstrate increased visceral adiposity, altered adipokine profiles, and an earlier onset of metabolic dysfunction, all of which synergistically augment their vulnerability to glucose intolerance during pregnancy.[6]

The rapid changes in Asia's economy and society, along with genetic and metabolic factors, have made GDM worse. Urbanization has caused people to be less active, sit more, and eat more Western-style foods that are high in refined carbs, saturated fats, and ultra-processed foods.[7] These changes to your life can make women gain too much weight during pregnancy and make them insulin resistance, which makes GDM even more likely.[8] Also, changing fertility patterns, such as older mothers and more cases of obesity and polycystic ovarian syndrome (PCOS), make the number of cases of GDM go up in many Asian communities.[9] All of these parts together indicate how genetic vulnerability,

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metabolic phenotype, and environmental exposures all work together to make GDM more or less common in different parts of the world.[10] We need to know these things so we can design screening programs, preventive measures, and public health policies that work for different groups of people. This will help us lower the number of people with GDM around the world.

The Pathophysiology and Etiology of GDM

The mother's body changes a lot throughout pregnancy to make sure the baby gets adequate food. The placenta releases hormones such progesterone, estrogen, cortisol, placental growth hormone, and human placental lactogen during pregnancy, especially in the second and third trimesters. These hormones make it challenging for insulin receptors to send messages and for the mother's cells to take up glucose. When the body stops responding to insulin, the pancreas's β-cells normally create more of it. GDM happens when a woman's blood sugar levels rise because her β-cells aren't working hard enough to keep them stable.

Genetic predisposition plays a substantial role in the development of GDM. Women with a genetic predisposition to type 2 diabetes, a history of GDM. Many genetic polymorphisms linked to β-cell development, insulin secretion, and glucose metabolism, especially in TCF7L2, GCK, KCNJ11, and MTNR1B, show strong links to GDM. These changes make it harder for the β-cell to trigger the hyperinsulinemic response needed during pregnancy. Additionally, epigenetic alterations resulting from maternal diet, early-life nutrition, or environmental exposures may exacerbate the compromised insulin secretory response. These links between genes and the environment make it more likely that someone will have GDM and make β-cell dysfunction worse.[2,11]

Hormones, inflammation, and metabolism all work together to keep GDM from responding to insulin. The placenta makes hormones such progesterone, cortisol, human placental lactogen, and placental growth hormone. They stop GLUT4 from moving and IRS-1 from being phosphorylated, which makes it harder for the body to obtain glucose. This is how they modify the way insulin sends messages between cells. Women who are pregnant and overweight or have a lot of visceral fat are more likely to have insulin resistance. Adipocytes that are hypertrophic generate and release more TNF-α, IL-6, leptin, and other pro-inflammatory cytokines than normal. These cytokines activate inflammatory pathways such as NF-κB and JNK, which impede the signalling of insulin receptors. The inflammation makes it tougher for the liver to break down glucose and for skeletal muscle to take it in. This raises blood sugar levels even higher, get worse when a woman is pregnant and overweight or obese.[12]

Screening and Diagnostic Approaches

There are many ways to screen in different countries. The World Health Organization and the American Diabetes Association both suggest that everyone should get checked out between the ages of 24 and 28 weeks. People who are at high risk should, on the other hand, be tested sooner.[13]

A. The OGTT, or Oral Glucose Tolerance Test

Patient should get a 75-g OGTT test if they are fasting. The patient should do a glucose test after one hour and again after two hours. The first test is a glucose challenge test with 50 grams of glucose. If the results aren't normal, the next step is a 100-g OGTT to discover what's wrong.[14]

B. Symptoms-based diagnosis

Women with numerous risk factors may undergo screening for undiagnosed type 2 diabetes during the first trimester. Recent studies show that CGM can better predict changes in blood glucose levels and help with the individualized treatment. It's really important to acquire a diagnosis fast so that mothers and babies don't have to deal with bad things.[10,15]

Adverse Effect of GDM

GDM affects almost every area of a woman's body, which can make it hard to get pregnant, give birth, and take care of the baby once it is born. Women with GDM demonstrate increased incidences of gestational hypertension and preeclampsia, attributable to analogous pathophysiological mechanisms, including endothelial dysfunction and inflammation. Maternal hyperglycemia leads to fetal polyuria, which in turn results in the accumulation of amniotic fluid. This condition increases the likelihood of the newborn being malpositioned, the cord becoming displaced, and the membranes rupturing prematurely. GDM substantially increases the probability of cesarean delivery owing to macrosomia, labor dystocia, and fetal distress. Microbes thrive in environments with elevated glucose levels.[2] More women are acquiring infections in their urinary system and vulvovaginal candidiasis. Metabolic illnesses and obstetric problems elevate the probability of spontaneous or medically necessitated preterm birth. When a woman is pregnant, her body has a harder time breaking down sugar. This is quite hard with GDM. Insulin resistance gets worse as the pregnancy goes on. Insulin therapy is necessary for certain women to maintain stable blood sugar levels.[16,17] It doesn't happen very often, but if someone with GDM isn't taking care of themselves and is sick or taking steroids, it can lead to DKA. Many pregnant women are scared, anxious, and worried when they find out they have GDM. Worrying about hurting the fetus, keeping a strict diet, and testing blood sugar levels can all make mental health issues worse. Research shows that women who had GDM were more likely to be depressed

than women who did not have the illness. The mother's elevated blood sugar has a direct effect on how the fetus grows and develops. The placenta lets too much glucose through, which makes the baby generate insulin. Insulin is like a growth hormone, and it can make macrosomia happen (birth weight beyond 4 kg). Macrosomic newborns are more likely to suffer shoulder dystocia, problems at birth, and need to be born in an emergency. Poorly managed GDM with vascular problems may diminish placental perfusion, leading to growth limitation. After the baby is born, the mother's glucose supply quits, but the baby's insulin levels stay high. This lowers the level of sugar in the blood. Hyperinsulinemia causes a baby's lungs to mature more slowly than they should. The bilirubin levels in infants could be too high, the calcium levels could be too low, or the red blood cells could be too high. These issues highlight how crucial it is for pregnant women to keep their blood sugar levels constant.[8,18]

GDM Long-term Effects on Mother and Child

Women diagnosed with GDM exhibit a significantly heightened risk of developing type 2 diabetes within 5 to 10 years following childbirth. They are also more prone to have heart disease, metabolic syndrome, and problems getting pregnant later on. More youngsters are overweight today than earlier. Not being able to eat sweet stuff, type 2 diabetes that starts when you're young, more prone to get heart disease, cognitive and neurodevelopmental difficulties (demonstrated by numerous studies). This passing down from one generation to the next shows how important it is for both mother and kid to pay attention to avoid problems.[19]

Possible Strategies for Women with GDM During Pregnancy

The management of pre-existing diabetes or gestational diabetes mellitus (GDM) requires a very structured and multidisciplinary approaches to maintain blood glucose level. Lifestyle modification is the main target to maintaining maternal glucose level. The first target is to reducing excess body weight, and maintain diet plan. Early pregnancy screening, including fasting plasma glucose and HbA1c evaluation, is essential to detect undiagnosed type 2 diabetes and initiate timely interventions. Changes in daily life, plans for meals that are low in sugar, high in fibre, and have a decent mix of carbs.

If lifestyle changes don't keep blood sugar levels in the proper range, the mother must go to the medicinal therapy. Insulin is still the best treatment because it doesn't cross the placenta and is safe for pregnant women to use. Some doctors employ oral medications like metformin and glyburide, but they are careful about doing so because they are worried about how they can hurt the placenta and the child's health in the long run. People on pharmacologic regimens need to keep an eye on their fasting and postprandial glucose levels all the time. Continuous glucose monitoring (CGM) may ensure that therapy changes are as effective as possible.

Keeping an eye on things during pregnancy is a very important part of managing GDM. A few ultrasound tests can assist in finding the size of fetus, its growth, and the quantity of amniotic fluid. During the later stages of pregnancy, especially for women with poor glycemic control or other obstetric risk factors, it is recommended to use extra fetal monitoring methods including non-stress testing and biophysical profiles. Based on her glycemic status, the growth of the fetus, and other obstetric factors, each woman has a specific strategy for delivery. The goal is to avoid problems including macrosomia, shoulder dystocia, and stillbirth. Moms must give importance to eating well, breastfeeding, working out often, and keep observing their health throughout time. Studies show that breastfeeding speeds up the mother's glucose metabolism and lowers the chances of her kids being overweight.[20,21]

CONCLUSION

Gestational Diabetes Mellitus is a complex metabolic condition that adversely affects the health of both the mother and the foetus, resulting in enduring consequences. Genetics, hormones, and the way you live your life can all make the disease worse. GDM is very dangerous, but people can do a lot better if they catch it early, keep taking their insulin, and get tested on every so often. To lower the number of GDM cases that are on the rise, it is important to address risk factors that may be changed before and throughout pregnancy, ensure strong screening processes, and improve follow-up therapy after birth. A whole treatment plan that includes medical care, patient education, and psychological support can considerably enhance the health of both mothers and their children. This helps break the cycle of metabolic disease that occurs in families.

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