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Adverse Health Outcomes in Women with Gestational Diabetes Mellitus

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ABSTRACT

Gestational diabetes mellitus (GDM) is a condition marked by glucose intolerance that occurs during pregnancy. Moderate to severe maternal hyperglycemia poses various diabetes related risks to both the mother and her unborn baby. GDM necessitates ongoing medical care and patient self-management, including physical activity and life style modifications to maintain healthy glucose levels and prevent acute complications, it is vital to provide appropriate care to reduce the short-term and long-term complications for mother and newborn. This review article explores the "adverse health outcomes associated with gestational diabetes, highlighting maternal and neonatal complications as well as the long-term health implications for both mothers and infants, women with GDM are at increased risk for excessive weight gain, pre-eclampsia, cardiovascular diseases later in life and cesarean section deliveries. Infants born to mothers with GDM face a higher risk of macrosomia, birth trauma, shoulder dystocia and some other conditions like hypoglycemia, hypocalcemia, hyperbilurubinemia, respiratory distress syndrome (RDS), polycythemia, subsequent obesity and type-II diabetes later in their life. In this article, we synthesize recent research findings to provide a comprehensive understanding of gestational diabetes mellitus adverse outcomes for both the mother and their infant.

Keywords: Gestational diabetes, Pregnant women, Insulin resistance, Obesity, Maternal and neonatal health, Adverse outcomes

INTRODUCTION

Gestational diabetes mellitus is a common medical complication (Practice Bulletin No.180, 2017), during pregnancy, moderate to severe maternal hyperglycemia or elevated blood glucose levels present multiple diabetes-related risks to both the mother and her unborn baby, gestational diabetes mellitus is in the form of glucose intolerance that emerges or is recognized first time during pregnancy (Kanguru *et al.*, 2014). GDM requires continuing medical care, along with ongoing patient self-management and support is essential for maintaining optimal blood glucose levels and preventing both the acute symptoms and long-term health complications, hyperglycemia typically results from beta cell dysfunction, influenced by hormones from the placenta and other obesity and pregnancy related factors that are not yet fully understood till now,all the occurring against a backdrop of chronic insulin resistance during pregnancy, altered carbohydrate metabolism can contribute to atherosclerosis and impair glomerular filtration, leading to negative impacts on both the maternal women and her infant (Kampmann *et al.,* 2015). According to the International Diabetes Federation (IDF) gestational diabetes affects approximately 14% of pregnancies worldwide, which represents approximately 20 million births annually (Wang *et al.,* 2022). The rising problem of overweight and obesity worldwide significantly contributes to the occurrence of diabetes during pregnancy, leading to an increase in gestational diabetes rates, this situation creates significant economical burden and requires an increased attention and awareness (Misra and Das, 2017), for the women who diagnosed as diabetic during the first trimester of pregnancy pre-existing

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diabetes should be strongly suspected (American Diabetes Association, 2014).

Some of the risk factors linked with gestational diabetes mellitus (GDM) includes being overweight, obesity, advanced maternal age and having family history of diabetes (Berkowitz *et al.,*1992; Berkowitz *et al.,*1992). GDM was once viewed as a significant public health concern, primarily in especially in developed countries, but it is increasingly becoming an issue in developing countries as well. But if left untreated, GDM possess risks to both the mother and her infant leading to severe short-term and long-term health complications, by these complications maternal women and her neonate can affect obstetric outcomes during pregnancy and at delivery, including the neonatal complications like macrosomia, birth injuries and the likelihood of cesarean section deliveries (Langer *et al.*, 2005; Yang *et al.*, 2022), moreover, genetic predisposition is one of the reasons to obesity and diabetes mellitus to the baby later in their life (Vohr *et al.*, 2008; Silverman *et al.*, 1995).

In addition, to an increased risk of being diagnosed with Type-II diabetes after delivery, GDM (gestational diabetes mellitus) is closely related to various adverse pregnancy outcomes for both the fetus and the pregnant women. These include an increased chances of cesarean sections, pre-eclampsia, large for gestational age (LGA) and intrauterine growth retardation [IUGR] (Dalfra *et al.*, 2012; Silverman *et al.*, 2017), this condition is also associated with delayed brain maturity in newborns and neuro behavioural changes, including relatively low intelligence when compared with the normal infants as well as language impairments, poor attention and impulsivity (Perna *et al.*,, 2014). Therefore, it is more important that GDM is managed properly to avoid multiple health risks to the children later in their life.

Pre-existing Diabetes and Gestational Diabetes:

During pregnancy, diabetes mellitus can be classified as either as pre-existing diabetes Type-I or Type-II or gestational diabetes mellitus. For pre-existing diabetes risk factors such as genetic predisposition, family history of type-I or type-II diabetes and autoimmune disorders may play a crucial role in the development of type-II diabetes mellitus (Majeed *et al.*, 2011; IDF, 2013a). Factors that significantly contributes to both the type-II and gestational diabetes including obesity, poor diet, physically being inactive, maternal age and ethnicity (Alberti *et al.*, 2007), some other life style changes like drinking alcohol and smoking have been also showing impact on the pregnant womens health (Alberti *et al.*, 2007). Women with diabetes during pregnancy and her newborn facing a heightened risk of various health complications such as obstructed labour, high blood pressure during delivery, preterm labor, postpartum hemorrhage, stillbirths, macrosomia, miscarriage, birth injuries, congenital abnormalities, intrauterine growth restriction (IUGR) and in some severe cases maternal or neonatal death (WHO, 2009; Modder and Fitzsimons, 2010). Women with diabetes facing more risks of long-term complications including retinopathy, neuropathy and nephropathy. Even after the 42-day postpartum period some women may experience lasting effects of diabetes mellitus during pregnancy, it is estimated that about 30-40% of women with a history of gestational diabetes will experience it again in the subsequent pregnancies and within 5-10 years 50% of those women will develops Type-II diabetes (Dain, 2011; IDF, 2009; IDF, 2013b).

Furthermore, infants born to women with diabetes having an increased risk of developing obesity in childhood, metabolic disorders in adolescence and type-II diabetes in adulthood, all these were linked to the metabolic imbalances encountered in the womb (IDF, 2013b). The pre-pregnancy and postpartum periods are more vital for reducing the risk of complications long-term effects and severe outcomes for both the mother and her infant (Hod, 2005).

Effects ofHyperglycemia during Pregnancy:

Hyperglycemia during pregnancy can results in both short-term and long-term complications for the mother and her infant, in pregnant women hyperglycemia is closely related to their glycemic levels and even mild instances can have considerable impact to the infant (Dudley, 2007; Crowther *et al.,* 2005). Infants born to women with gestational diabetes are at an increased risk of delivery complications like cesarean section deliveries, shoulder dystocia, birth trauma, macrosomia, being large for gestational age is frequently caused by fetal hyperinsulinemia which may also affect insulin production, moreover, these infants are the most susceptible to respiratory distress syndrome (RDS) (Metzger *et al.*, 2010), hyperglycemia during pregnancy can result from pre-existing diabetes or gestational diabetes mellitus (GDM) (McIntyre *et al.*, 2019). The risk of malformations further increases when the elevated maternal blood glucose levels and a abnormal body mass

index (BMI) are combined with pre-existing diabetes mellitus (Garcia-Patterson *et al.*, 2004) and earlier gestational diabetes age at diagnosis. The most frequent malformations are found in the cardiac and central nervous systems such as transposition of the arteries, congenital heart formations and neural tube defects which are all strongly linked with diabetes during pregnancy (Owens *et al.*, 2016). While maternal hyperglycemia in the second and third trimesters is generally linked to excessive fetal growth due to the maternal macrovascular disease, this condition may disrupt placental development and affect subsequent fetal growth through mechanisms that are still not fully understood (Mitanchez *et al.*, 2015; Gutaj *et al.*, 2016). These outcomes typically affect women who experience hyperglycemia during pregnancy.

Obesity in Pregnancy Fetal Long-Term Effects:

Maternal obesity is a significant risk factor for neonates born to obese mothers, the prevalence of obesity has been rising globally, especially in developed countries. In recent years obesity has emerged as a major public health concern alongside issues such as diabetes and hypertention (Arroyo-Johnson *et al.*, 2016; Bluher, 2019). Obese women during the pregnancy experience both short-term and long-term effects associated with their condition making them more vulnerable to gestational diabetes mellitus, pregnancy-induced hypertension and high blood pressure during delivery. Additionally, they face a higher risk of preterm labor and venous thromboembolism (VTE) a condition characterized as blood clot forming in veins, as a result these factors may require instrumental assistance in delivery, more often than for non-obese women (Mandal *et al.*, 2011; Burstein *et al.*, 2008). Infants born to obese mothers may be delivered at a pre-gestational age or pre-term, which can result in respiratory issues such as respiratory distress syndrome (RDS) and may necessitate admission to the neonatal intensive care unit (NICU) (Lindberger, 2020), sometimes neonates may be at the risk of hypoglycemia due to gestational diabetes mellitus in obese mother (Mortier *et al.*, 2017), in certain situations, the intrauterine growth environment of the obese women can delay the fetal lung maturation. If overweight or obesity is not managed properly it poses future risks to both the mother and her newborn baby (Turner *et al.*, 2019). If overweight or obesity is not managed properly it poses future risks to both the mother and her newborn baby, potentially leading to severe morbidities and even neonatal mortality in some cases.

Weight Gain during Pregnancy and Fetal Outcomes:

During pregnancy, maintaining an adequate weight and BMI is crucial, as excessive body weight can negatively affects the baby's health, women can gain a limited amount of weight during pregnancy, in recent years the Institute of Medicine (IOM) in the USA has recommended specific weight gains; 11 to 16 kg for women with normal weight, 7 to 11 kg for those who are overweight and 5 to 9 kg for women who are with obesity. The IOM suggests these guidelines to promote normal weight gain and to ensure women with good health during pregnancy (IOM, 2019), if a women's weight is either too high or low it can negatively impact later on, gaining the weight above the IOM (Institute of Medicine) recommendations is associated with complications such as gestational hypertension, metabolic disorders, gestational diabetes mellitus, cesarean section delivery, postpartum weight gain or retention, childhood obesity and other metabolic discomforts (Ren *et al.*, 2018; Macdonals-Wallis *et al.*, 2013; Whitaker *et al.*, 2022). Gestational weight gain is associated with intrauterine growth retardation (IUGR), preterm labor, neonatal mortality and an increased likelihood of neonates being large for gestational age (Hasan *et al.*, 2019; Wang *et al.*, 2021), to mitigate these issues, it is more essential for pregnant women to maintain or achieve a healthy weight during pregnancy, engaging in regular physical activity can help to promote good health and proper weight management. Additionally, the factors like smoking, unhealthy eating habits like consuming fast foods and excessive spicy and oily foods, poor meal timings and lack of physical activity are major contributors to maternal and neonatal complications.

Conclusion:

Gestational diabetes mellitus (GDM) is characterized by the glucose intolerance that occurs during pregnancy affecting both maternal health and that of newborn. GDM requires continuous medical care and ongoing self-management from women. They need to adjust their physical activity and lifestyle modifications based on their glucose levels to maintain good health. It is crucial to keep blood glucose levels within a normal range and to maintain a healthy weight and BMI during pregnancy to prevent acute complications for both mother and baby. GDM is associated with various pregnancy risks,

including pre- eclampsia, excessive weight gain, cesarean section delivery and cardiovascular and kidney diseases, infants born to the mothers with gestational diabetes have a higher likelihood of experiencing hypoglycemia, large for gestational age (LGA), birth trauma, shoulder dystocia as well as conditions like hypocalcemia, hyperbilirubinemia and respiratory distress syndrome. Additionally they may be more prone to the obesity and type-II diabetes later in life and some other behavioral changes may observed in these children.

To promote the health of both the mothers and their newborns it is essential to adopt healthier habits, engage in regular physical activity and should follow proper meal timings, along with these consulting with an obstetrician or health care provider is important for effective management of diabetes.

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