

Gestational Diabetes and Risk for Childhood Obesity: Mini Review

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It is estimated that 10% of women will develop gestational diabetes during their pregnancies [1]. Gestational diabetes mellitus (GDM) is diagnosed for the first time during pregnancy and usually remits after delivery. However, 10-40% of women with GDM will develop type 2 diabetes mellitus (T2DM) within 10 years after the delivery and 70% of women with previous GDM will develop T2DM within 20 years [2]. T2DM is one of the most common yet serious chronic diseases, causing 5.1 million deaths worldwide. GDM may be responsible for up to 30% of cases of type 2 diabetes [3]. As women with previous GDM are at high risk for developing T2DM, interventions such as lifestyle modification [4-7] and use of pharmacological agent have been developed and tested [8,9] and demonstrate promising potential in T2DM prevention. However, little is known on the impact of intrauterine exposure to GDM, such as increased risk for childhood obesity and glucose metabolism alternation. Thus, the aim of this mini review is to discuss current state of science on the obesity risk of offspring of mothers with GDM.

It has been documented that exposure to diabetes in utero increases risk for obesity in children. Early research in Pima Indian Study provides initial evidence on the association between maternal GDM and childhood obesity risk [10]. In a multiethnic study of children, exposure to GDM was associated with 1.3 kg/m² higher BMI, 4.2 cm larger waist circumference, 3.6 cm² more visceral adipose tissue, and 34.7 cm² more sub-cutaneous adipose tissue in 6- to 13-year-old multiethnic youth from Colorado [11]. Evidence in the positive relationship between exposure to GDM and obesity risk among children is also found in other studies [12-14]. However, other studies have also suggested that GDM may not be an independent risk for obesity in children. In a longitudinal cohort study of risk factor for T2DM and metabolic syndrome among children, results indicated that childhood obesity and the combination of large gestational age (LGA) status and GDM were associated with insulin resistance in children at the age of 11. The odds of developing insulin resistance were 10 times for children who were LGA with a mother of GDM and 4 times for obese children [10]. The possible mechanism for increased risk among these children is proposed by Freinkel in 1980 called fuel-mediated teratogenesis (fetal over nutrition) [15]. This mechanism speaks to the temporal relationships between exposure to a metabolic insult and consequences of the exposure. Early Pima Indian Study provides initial inside to this theory with later studies demonstrates similar relationship in other ethnic groups. However, inconsistent evidence on the degree of association between GDM and childhood obesity was found in the literature. A systematic review on 12 studies examining the association between GDM and childhood found that crude odds ratios for the relationship between GDM and childhood overweight or obesity ranged from 0.7 to 6.3 with 8 studies finding no statistical significant [16]. In addition, few studies have adjusted confounders such as pre-pregnancy obesity and pregnancy weight [16]. Future research needs to adjust potential confounding factors.

T2DM has become the most common type of DM in school children and adolescents [17]. The emerging epidemic of T2DM in children is coupled with the increased prevalence of childhood obesity in the last two decades. Obesity in childhood is associated with many

adverse health consequences including T2DM, arterial hypertension, hyperlipidemia, and psychosocial problems [18-21]. There is increasing evidence that the risk of childhood obesity is influenced by prenatal and infant environmental exposures, particularly nutrition [22]. Because children who are exposed to in utero hyperglycemic may be at higher risk for obesity and metabolic syndrome, appropriate intervention targets for this high risk group are needed.

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