High Maternal Dietary Glycemic Index and Sugar Consumption and Their Association with Birth Defects and Pregnancy Complications

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Introduction

• Birth defects occur in 1 in every 33 babies in the United States, and 7.8 million babies worldwide (1).
• Having a child with a birth defect can be costly for the family not only in the money spent on medical bills, but also the emotional toll (2).
• In 2004, hospital costs for children with birth defects in the United States were $2.6 billion (3).
• There are many environmental and genetic factors that can lead to birth defects, including the mother’s nutritional habits before and during pregnancy (4).
• Increased sugar intake (including glucose, fructose, or sucrose), or high dietary glycemic index (DGI), by the mother could be a risk factor for the formation of birth defects.
• Neural tube defects (NTD’s) are a main outcome associated with a high DGI in the mothers (4).
• Over 300,000 babies worldwide are born with a NTD, which cause major problems with the brain and spine (5).
• Pregnancy complications, mainly preeclampsia, have also been linked to increased sugar consumption (6).

Methods

PubMed was the primary database used for this systematic review.

• The key terms used were “pregnant women” OR “pregnancy” AND “glycemic index” AND “congenital abnormalities”.
• A MeSH search using these key terms resulted in 10 articles, five of which were chosen (Figure 1).
• Cases were excluded if there were no human subjects or the mother had pre-gestational diabetes.
• There had to be mention of an exposure of high DGI or sugar intake (including glucose, fructose or sucrose), and the risk for birth defects or pregnancy complications for a study to be included in this review.
• The other articles in this study were obtained by looking at the references of the five that were originally chosen (Figure 1).

Results

Eight out of nine studies showed an increased risk for pregnancy complications and birth defects.

Birth Defects

The six case-control studies looked at birth defects, mainly neural tube defects (NTD’s), as the outcome for high DGI and/or sugar intake. Only one study did not find an increased risk (7).

• Of the five studies that found and increased risk for NTD’s:
  • three looked at DGI as the exposure (4,8,9)
  • one looked at sugar consumption (10)
  • one looked at both (11)
• The studies that looked at high DGI found an increased risk for NTD’s; one study also found that the risk for gastrointestinal and musculoskeletal defects increased (9).
• One case found that NTD mothers had a 45% higher consumption of sugar (primarily sucrose) than the control group mothers ($p < 0.05$) (10).

Complications

Three cohort studies looked at increased sugar intake as a risk factor for pregnancy complications (6, 12, 13).

• Two studies found preeclampsia to be an outcome associated with the risk factor (6, 12).
• One study found that an increased glucose concentration resulted in early birth by 1.8 days ($p < 0.05$) and 4.8 days ($p < 0.01$) (13).
• Mothers who consumed more natural sugars were at a lower risk for preeclampsia, but added sugars resulted in a higher risk ($p < 0.009$) (12).

Public Health Implications and Recommendations

• Mothers with a higher DGI and/or sugar intake are at an increased risk for pregnancy complications and having children with birth defects.
• Mothers should be conscious of dietary intakes before and during pregnancy in order to avoid birth defects and pregnancy complications.
• Further research should be done on the causes of preeclampsia, and a larger variation of study types should be performed on the entire topic discussed in this review.

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References