Examining the relationship between gestational diabetes mellitus and childhood obesity

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Abstract

Background Gestational diabetes mellitus (GDM) occurs during pregnancy, when a woman who was previously not diabetic experiences high blood glucose levels. The prevalence of GDM has increased dramatically since 1984 (Gathah et al., 2008). Studies have suggested a link between GDM and an increased risk in childhood obesity in the mothers’ offspring. The aim of this literature review was to determine if there was in fact a correlation between GDM and childhood obesity.

Methods Several studies from the body of literature were reviewed to assess the methods and evidence. Search words used included: gestational diabetes, GDM, childhood obesity, epidemiology, birth weight, and intrauterine exposure. The studies found were conducted in different regions around the globe but were primarily conducted in developed countries. Limits included the absence of studies not written in English, the absence of studies in developing countries, and the lack of attention towards women of different ethnic backgrounds. The University of Ottawa library was used to search across many databases at once; searches were not conducted across databases individually.

Results Fourteen studies were reviewed in total. Of these, 13 indicated a positive correlation, suggesting that GDM is associated with increased BMI and obesity in children. Only 1 study indicated minimal or no correlation, and this study suggests a potential causal relationship between gestational diabetes mellitus and childhood obesity.

Conclusion These results may pose a concern due to the multiple health risks associated with obesity, such as high blood pressure, type 2 diabetes and cardiovascular disease. Further research may be required to determine various areas of impact of childhood obesity beyond physiological, such as economical, psychological and on public health. Another area of potential future study could include more links to what causes GDM, as the literature reviewed seemed divided as to whether it was related to maternal BMI. Primary prevention measures should also be considered.

Introduction

It has long been debated that intrauterine exposure to GDM increases the risk of adverse outcomes on the mothers’ offspring. It is suggested that children of mothers with GDM are at a higher risk of being overweight or classified as obese throughout their childhood. Childhood obesity is a growing problem in many countries around the world and raises many health concerns. Developed countries are the most affected, including the United States, where childhood obesity has more than doubled in children and quadrupled in adolescents in the past 30 years (CDC, 2014). It is important to identify the underlying causes and potential methods available to reduce the high rates of obesity and address the adverse health effects and outcomes associated with obesity. Establishing a positive association between GDM and childhood obesity could be useful in the prevention of obesity. The primary research reviewed in this study by Gathah et al., with a prevalence of 1.9% in 1989 and 3.2% in 2003-2004 (2008). Studies have also shown that women who are overweight or obese compared to normal-weight women were at a higher risk of developing gestational diabetes (Shin et al., 2005). These studies then suggest that GDM may be part attributable to an increased BMI and obesity. The question remains whether or not children born from mothers with GDM are at a higher risk of developing childhood obesity when compared to children born from non-GDM mothers. This structured literature review attempts to answer this question by looking at several studies which attempt to establish a relationship between GDM and childhood obesity.

Research Question

Are children born from mothers with gestational diabetes mellitus (GDM) at a higher risk of developing childhood obesity than children born from non-GDM mothers?

Methods and Materials

Research method: Structured literature review

Keywords: gestational diabetes, GDM, childhood obesity, epidemiology, birth weight, intrauterine exposure

Databases: University of Ottawa Library, PubMed, Google Scholar

Studies included in this review: Quantitative as they collected data using anthropometric and biochemical measurements to quantify and measure obesity rates among children born from GDM mothers and non-GDM mothers. All of the studies were peer-reviewed which provides merit and validity to this body of literature. Study methods varied. Some were prospective cohort studies, where they selected a cohort of pregnant women from which they collected baseline information and then followed subjects and their offspring longitudinally. Other studies were retrospective cohort studies which selected children and then determined whether or not their mothers suffered from GDM during pregnancy. A case control approach was used in order to establish a relationship between GDM and childhood obesity.

Inclusion criteria: Studies using large sample sizes

Exclusion criteria: Case studies

Results

Of the 14 studies included in this literature review, 13 found a positive correlation between GDM and childhood obesity. The study that did not, Whitaker et al., found “no increased risk of childhood obesity of children with mild, treated GDM and found no association between the metabolic markers of GDM and childhood obesity” (1998). However, the methods used in this study involved looking at medical records and looking at height and weight measurements. There are valid threats to this methodological approach, as hospital records can be an inaccurate source of information due to misclassification, error, etc. This is especially relevant because the data used in this study was from 1985-86 where there might not have been any computerized data collection or data audits, leading to a higher chance of false information. The study stated that “there is no established BMI cut-point to define childhood obesity”, so this could result in a misclassification bias in that study for how obesity was classified, and led to the researchers not finding a correlation. Many of the studies used measures such BMI, hip/waist circumference, and skin folds as a means of determining obesity in either the mothers or the children or both. Some of the studies went more into depth and did blood tests, amniotic fluid, and blood composition tests. These anthropometric and biochemical measurements were deemed appropriate for the purpose of these studies. Regardless of method, all but one of the studies found for this literature review found a positive association of GDM prevalence with childhood obesity.

Discussion/Limitations

The results of this study have many implications toward population health. With gestational diabetes being relatively common, and obesity in adolescence and adulthood on the rise, it is important to try and tackle these factors however possible, to try to decrease the risk for as many people as possible. Potential biases in these findings include a misclassification bias on what BMI is considered obese. A few of the studies stated that there was no official number that determined an obese BMI, and each of these studies gave their own parameters. This could have been avoided by using a measurement other than BMI, or having a regulated BMI scale. Of the 14 studies used in this literature review, 13 of them found a positive correlation between mothers having gestational diabetes and their children being obese or at risk. The results seemed very consistent across the literature, and contrary evidence at this point would be surprising. For the future, it is recommended that future studies focus on the prevention of GDM, as well as alternative approaches to preventing childhood obesity because BMI is widely known as less of a reliable method of determining obesity and doesn’t take into consideration the fat, waist, or muscle ratio.

Some limitations for this literature review included the time allotted to conduct the search being short, and that there were a limited amount of time to structure the review and find articles. A more technical limitation is that terms not included in the search parameters (defined in methods) might have led to an exclusion of some studies. Another limitation similar to this was the exclusion of studies not written in English, as translation resources were not used to be used due to time constraints on this review. The results of this review may not be generalizable to developing countries, as studies containing data on GDM and childhood obesity in these areas could not be found. There is also a limitation in the generalizability of these results across different ethnic backgrounds, as many of the studies found used mainly white men and children in their sample.

Conclusions

Through our structured literature review we can conclude that there is in fact a positive association between gestational diabetes mellitus and childhood obesity. Evidence shows that children born from GDM mothers have an increased risk of developing childhood obesity compared to children born from non-GDM mothers. Since the evidence seems indubitable, and since researchers seem to have reached a consensus, further research should focus on potential intervention methods targeting primary prevention of GDM in pregnant women. Adverse health effects can be seen in both the women and GDM and their offspring, therefore emphasizing the importance of prevention. Investigating further into prevention and implementing guidelines would be a valuable investment into maternal and pediatric health.