Abstract

Introduction:

The escalating epidemic of obesity and diabetes is a major public health problem leading to premature death from cardiovascular diseases. As evidenced by the studies of developmental origins of health and disease, intrauterine exposure to hyperglycaemia can affect future risk of obesity, diabetes and cardiovascular diseases in the offspring via fetal programming.

Objectives:

To determine the long term effects of intrauterine exposure to hyperglycaemia in pregnancy (HIP) on anthropometric and cardio metabolic parameters in the offspring at 10- 11years of age in Colombo district

Methods:

A retrospective cohort study was conducted in Colombo district involving 159 offspring of mothers who had HIP (exposed group) and 253 offspring of mothers who did not have HIP (non-exposed group). Participants were selected using a multi stage sampling technique. Exposure status was ascertained based on antenatal records. Outcome was ascertained by clinical measurements (height, weight, waist circumference, Triceps skinfold thickness (TSFT), blood pressure) using calibrated equipment and laboratory investigations (fasting blood sugar and lipid profile). Information on confounding variables were obtained using pretested questionnaires (questionnaire 2 and 3, physical activity questionnaire). Participants' dietary energy intake was assessed using a 24 hour dietary recall. Bivariate analysis followed by logistic regression determined the outcomes significantly associated with exposure to HIP with adjustments for confounders.

Results:

Mean age of participants in the exposed and non-exposed groups were 10.89 years and 10.82 years respectively. Forty two percent (n=67) of exposed and forty seven percent (n=118) of non-exposed children were males. The vast majority of participants were Sinhala, Buddhists. Mothers of exposed children were significantly older (31.9 years versus 27.8 years, $p < 0.001$) and had higher BMI at first trimester of index pregnancy compared to mothers of

non-exposed children. Approximately 50% (n=128) of non-exposed children were firstborns as compared to only one third (n=53) among the exposed children (p=0.002). Exposed children were significantly heavier at birth than non-exposed children (3.1kg versus 2.9kg, p< 0.001).

After adjusting for confounders, the following outcomes were significantly associated with intrauterine exposure to HIP: overweight (OR=2.85; 95% CI 1.49 – 5.41), abdominal obesity (OR=2.89; 95% CI 1.29 – 6.46), TSFT > 70th percentile (OR=2.0; 95% CI 1.10 – 3.77), Elevated LDL cholesterol (OR=2; 95% CI 1.1 – 3.4), elevated triglycerides (OR=2.6; 95% CI 1.3 – 5.2).

The following outcomes were significantly associated with exposure to HIP in the bivariate analysis, but the significance disappeared after adjustment. Impaired fasting glycaemia (crude OR=5.9; 95% CI 1.2-28.9), total cholesterol (crude OR=2.1; 95% CI 1.3-3.4).

There was no significant difference in the risk of having obesity, systolic hypertension and prehypertension, diastolic hypertension and prehypertension and low HDL cholesterol levels between exposed and non-exposed groups in the crude or adjusted analysis.

There was no significant association between exposure to HIP and metabolic syndrome (OR=3.3; 95% CI 0.8 –13.6).

Conclusions and recommendations:

Intrauterine exposure to HIP has long term effects on the offspring. These mother-child pairs need long term follow up and advice on lifestyle modifications to prevent or delay the onset of adverse anthropometric and cardiometabolic outcomes. Children exposed to HIP need long term monitoring of growth and cardiometabolic risk parameters to detect and manage the adverse outcomes early.

Keywords

hyperglycaemia in pregnancy and offspring, gestational diabetes, long term risk of intrauterine hyperglycaemia, offspring of diabetic mother, Sri Lanka