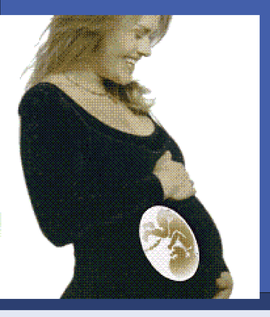
PP 48

The association between maternal glucose, lipid metabolism and fetal birth weight



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Introduction

The association between maternal hyperglycaemia and maternal obesity to the development of fetal macrosomia is well documented. The exact role of the lipid profile remains arguable.

Aim of the study

This study aimed to assess the association between the maternal lipid profile and the eventual fetal weight in relation to other maternal biochemical parameters.

Research Design and Methods

309 randomly selected mothers were invited to attend for an OGTT between 24 and 32 weeks of gestation. A fasting insulin, glucose and lipid profile was taken after an overnight fast of at least 8 hours, before being loaded with 75g of glucose.

Results

The results showed a positive interrelationship between all glycaemic parameters [fasting, first and second hour] to fasting insulin, and pre-pregnancy maternal BMI. Absolute HbA1c [Abs HbA1c] and HOMA-IR showed a statistically significant positive interrelationship with only the first hour and fasting respectively. Abs HbA1c and HOMA-IR further showed no correlation to the Area under glucose curve [Table 1]. Fasting insulin and Abs HbA1c further did not show any relationship to the eventual infant birth weight, though there was a positive interrelationship together with HOMA-IR with 3rd trimester BMI. The infant birth weight correlated very well to the maternal pre-pregnancy and 3rd trimester BMI [Table 2].

The lipid profile showed interrelationship to all other biological and glycaemic indices except Abs HbA1c. LDL correlated negatively with all the parameters tested; triglycerides correlated in a positive fashion [Table 1/3].

Conclusion

There appears to be a definite interrelationship between maternal body mass, lipid profile, and the glycaemic parameters to the eventual infant birth weight. Fasting insulin and Abs HbA1c however did not show any statistically significant relationship to the infant birth weight. AbsHbA1c showed a significant relationship only with 3rd trimester BMI and the 1 hour post-load glucose level. The HOMA-IR showed a relationship to all the parameters assessed except to the first and second hour glucose samples.

The fact that the LDL is showing an inverse relationship with fetal weight and with the pre-pregnancy BMI might be partly explained by the fact that overweight/obese women have lower LDL levels than their normal weight pregnant counter parts.

Out of the tests assessed for statistical significance to biochemical and clinical parameters the fasting insulin level seems to be the one that has been most promising. It role in clinical practice and implications for its introduction into routine clinical assessment should be the subject of further research.

Results

	FBG	1-hour	2-hour	Area under curve
Abs HbA1c	P=0.34 R = 0.29	P= < 0.002 * R = 0.23	P = 0.55 R = 0.16	P = 0.43755 R = 0.16
Fasting insulin	P= < 0.0001 * R = 0.17	P= < 0.0001 * R = 0.09	P= < 0.0008 * R = 0.08	P= < 0.0001 * R = 0.10
HOMA_IR	P= < 0.0001 * R = 0.15	P= 0.3 R = 0.14	P = 0.21 R = 0.13	P = 0.86186 R = 0.15
Pre-preg BMI	P= < 0.0001 * R = 0.17	P= < 0.0001 * R = 0.27	P= < 0.0001 * R = 0.23	P= < 0.0001 * R = 0.25
Infant birth weight	P= 0.00066 * R = 0.25	P= 0.00271* R = 0.25	P= 0.008 * R = 0.26	P= < 0.0001 * R = 0.26
LDL	P= < 0.0001 * R = - 0.16	P= < 0.0001 * R = - 0.02	P= < 0.0001 * R = - 0.01	P= < 0.0001 * R = - 0.02
Triglycerides	P= < 0.0001 * R = 0.19	P= < 0.0001 * R = 0.18	P= < 0.0001 * R = 0.19	P= < 0.0001 * R = 0.15

Table 1: OGTT correlations

	Pre-preg BMI	BMI at OGTT	Infant BW
F insulin	P= < 0.0001 * R = 0.3861	P= < 0.0001 * R = 0.397	P= 0.08 R = 0.1025
HOMA_IR	P= < 0.0001 * R = 0.288	P= < 0.0001 * R = 0.267	P= 0.0037 * R = -0.036
Abs Hba1c	P= 0.39 R = 0.149	P= 0.015 * R = 0.171	P= 0.087 R = 0.046
Infant BW	P= < 0.0001 * R = 0.038	P= < 0.0001 * R = 0.12	

Table 2: Correlations to maternal and infant biological characteristics

	Triglycerides	LDL
Pre-preg BMI	P= < 0.0001 * R = 0.10	P= < 0.0001 * R = - 0.18
Abs HbA1c	P = 0.22 R = -0.002	P = 0.07 R = - 0.16
Fasting insulin	P= < 0.0001 * R = 0.07	P= < 0.0001 * R = - 0.08
HOMA_IR	P= 0.01* R = 0.082	P= < 0.0001 * R = - 0.10
Infant birth weight	P= 0.02 * R = 0.11	P= < 0.0001 * R = - 0.03

Table 3: Lipid profile correlations