Risks associated with obesity and hyperglycemia for the mother and the fetus.

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Hyperglycemia is a known factor for obesity. Maternal obesity is a known cause of complications of pregnancy, including diabetes, fetal macrosomia, and unplanned cesarean delivery.

Maternal glucose crosses the placenta by a facilitated transportation. Due to accelerated metabolism, glucose in fetal circulation remains lower than that of the maternal. In other words, passage of glucose is mainly one-way from the mother to the fetus; this mechanism has a principal effect on metabolism and growth of the fetus.

Placenta is capable of synthesizing insulin during the first trimester. After the 14th week, fetal pancreas starts producing insulin. Insulin is the main growth hormone of the fetus.

In three prospective studies, we reviewed the effects of maternal blood glucose on complications of pregnancy. Our goal was to evaluate the effects of maternal glucose on fetal growth and on complications of pregnancy.

First Study

Our first study was analysis of clinical findings in more than 8,000 diabetic pregnancies in year 2006 in the State of California, USA.

The relationship between maternal obesity and other maternal and fetal complications with the type of diabetes is shown in the table.

	T1-DM	T2-DM	GDM	IGT	
n(%)	175(2.1)	662(7.8)	7,425(87.3)	246(2.9)	p value
Obesity	29.3	72.7	44.4	38.1	<.001
Macrosomia	22.3	17.8	10.6	11.2	NS
IUFD/1,000 births	21	27	3	0	<.001
Unplanned cesarean	41.4	32.7	21.9	15.6	<.001
NICU admission	24.8	20.8	8.2	7.1	<.001
Composite risk	41.7	37	23.5	19.5	<.001

Multifactorial analysis disclosed the following:

Maternal and fetal complications by type of diabetes

1- Maternal BMI correlates with the rate of fetal macrosomia and cesarean delivery

2- Type of maternal diabetes correlates with

rate of fetal demise and neonatal admission to NICU.

3- There is no strong correlation between the use of insulin and pregnancy complications.

Discriminant Analysis Summary Statistics by Dependent Variable						
			Cases Correctly Classified			
Outcome	Wilks' Λ (factor)	Eigenvalue	Original Grouped	Cross-Validated Grouped	η2	Kappa
Unplanned Caesarean	(Obesity) .975*	.026	57.9%	57.4%	2.49%	.067*
Macrosomia	(Obesity) .985*	.015	56.3%	56.3%	1.4%	.077*
IUFD	(Diabetes Type) .985*	.015	90.0%	90.0%	1.5%	.043*
NICU admission	(Diabetes Type) .982*	.018	83.0%	83.0%	1.8%	.120*
* = P < .0001						

Second study

In two subsequent studies we evaluated the effect of maternal blood glucose on fetal overgrowth among 71 non-diabetic mothers.

Continuous glucose monitoring in the mother showed fetal overgrowth has direct correlation with frequency, magnitude, and length of hyperglycemic episodes in the mother.

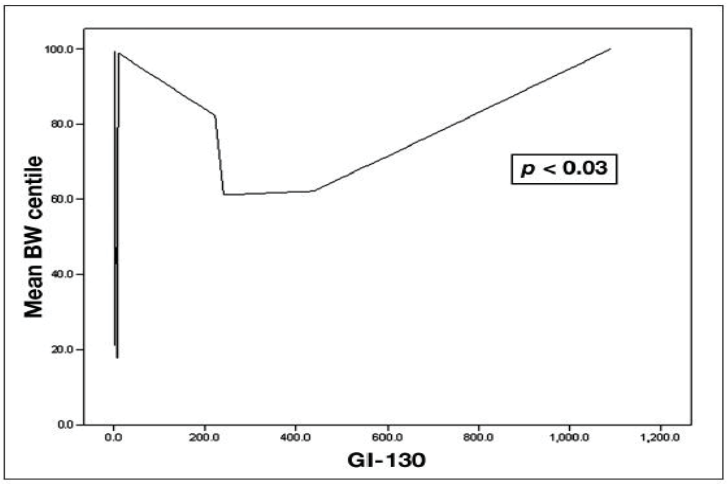

Figure 1. Correlation between glycemia index above 130 mg/dl and birth weight (BW) centile.