

# Gestational diabetes and hypertension - outcome of newborns

*Diabetul și hipertensiunea arterială gestațională - impactul asupra nou-născuților*

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## Abstract

**Objectives.** Gestational diabetes is a frequent complication in recent years associated with excessive weight or obesity. On the other hand, gestational hypertension is an independent entity in pregnancy or possible associated with gestational diabetes and obesity. **Implication.** Few cases of gestational diabetes associate hypertension or fetal distress. **Material and methods.** In the cases born in "Alfred Rusescu" Institute for Mother and Child Care/Polizu, Neonatology Clinic, Bucharest, in 2015, mothers who developed gestational diabetes have experienced other complications (stained amniotic fluid, thrombophilia, arterial hypertension, cholestasis). In one case, preexisting hypertension pregnancy was associated with gestational diabetes, resulting a term neonate, large for gestational age, extracted by caesarean in cranial presentation. **Results.** Gestational diabetes influenced fetal antropometric indicators and not hypertension. **Conclusions.** The association of gestational diabetes, maternal obesity and hypertension in pregnancy requires further investigation, fetal monitoring and perinatal team for an uncomplicated adaptation of the newborn to life outside the womb. **Originality value.** Maternal pregnancy hypertension affects fetal nutrition and the result is intrauterine growth restriction, iatrogenic prematurity and fetal distress. Gestational diabetes with hypertension has an influence on antropometric indicators, giving birth to infants with higher weight for gestational age. **Keywords:** gestational hypertension, gestational diabetes, intrauterine growth restriction, large for gestational age

## Rezumat

**Obiectiv.** Diabetul gestațional este o complicație frecventă în ultimii ani, asociată cu greutate excesivă sau obezitate. Pe de altă parte, hipertensiunea gestațională este o entitate independentă în timpul sarcinii sau posibil asociată cu diabetul gestațional și obezitatea. **Impact.** Câteva cazuri de diabet zaharat gestațional asociază hipertensiune de sarcină sau suferință fetală. **Material și metodă.** În cazurile de copii născuți în Institutul pentru Sănătatea Mamei și Copilului „Alessandrescu-Rusescu”/Polizu, Clinica de Neonatologie, București, în 2015, mamele care au dezvoltat diabet gestațional au avut și alte complicații (lichid amniotic meconial, trombofilie, hipertensiune arterială, coleastăz). Într-un caz de hipertensiune preexistentă sarcinii a fost asociat diabet gestațional, având ca rezultat un nou-născut la termen, mare pentru vârsta gestațională, extras prin operație cezariană din prezență craniană. **Rezultate.** Diabetul gestațional a influențat indicatorii antropometrici fetalii, și nu hipertensiunea. **Concluzii.** Asocierea diabetului gestațional, obezitatea maternă și hipertensiunea arterială în timpul sarcinii necesită investigații suplimentare, monitorizare fetală și echipă perinatală pentru o adaptare necomplicată a nou-născutului la viața extrauterină. **Originalitate.** Hipertensiunea de sarcină afectează nutriția fetală, iar rezultatul este restricția de creștere intrauterină, prematuritate și suferință fetală. Diabetul gestațional cu hipertensiune are o influență asupra indicatorilor antropometrici care dau naștere la copii cu greutate mai mare pentru vârsta gestațională. **Cuvinte-cheie:** hipertensiune gestațională, diabet gestațional, restricție de creștere intrauterină, greutate mare pentru vârsta gestațională

## Introduction

It is well known that, during its clinical course, diabetes mellitus may be accompanied by several other morbid conditions and may be labeled as “co-morbidities”. However, a clear delimitation between these two categories is not always possible; for some entities we do not have decisive arguments to include them in one or another category<sup>(1)</sup>.

Co-morbidities that are worth being commented regarding their genetic background are the following: obesity, dyslipidemia, arterial hypertension and metabolic syndrome<sup>(1)</sup>.

Most women who have gestational diabetes deliver healthy babies. However, gestational diabetes that's not carefully managed can lead to uncontrolled blood sugar levels and cause problems for mother and newborn, including an increased likelihood of needing a C-section to deliver. It is more likely to develop once again gestational diabetes during a future pregnancy and to develop type 2 diabetes in time. Out of those women with a history of gestational diabetes who reach their ideal body weight after delivery, fewer than 1 in 4 eventually develops type 2 diabetes<sup>(2)</sup>.

### Diabetes mellitus and obesity

Recent studies have demonstrated that the repartition of adipose tissue has a major influence on the risk of obesity-related conditions development. The abdominal storage of the adipose tissue (with its two components: visceral and subcutaneous), known as central obesity, is correlated with a higher risk for cardiovascular diseases, arterial hypertension and metabolic disorders, insulin resistance and endothelial dysfunction<sup>(1)</sup>.

The relationship between type 2 diabetes and obesity is complex and it is still not entirely understood how closely these diseases influence each other. Several studies have reported that only a subset of patients have both these diseases<sup>(1)</sup>, and type 2 diabetes is not associated with all forms of obesity<sup>(1)</sup>. Insulin resistance and B-cell dysfunction are considered the critical mechanisms through which obesity may lead to diabetes<sup>(1)</sup>. But, obesity has a genetic predisposition and some specific genes linked to obesity may have effects on insulin levels and susceptibility to type 2 diabetes<sup>(1)</sup>.

It was studied the incidence of gestational diabetes mellitus (GDM) in relation to phenotypic characteristics and gestational weight gain (GWG) among women at high risk for GDM<sup>(3)</sup>. There was no interaction between GWG and GDM outcome and no significant difference in the prevalence of diabetes-associated antibodies. GWG and the presence of diabetes-associated antibodies were not associated with GDM occurrence among these high-risk women. Despite a healthier metabolic profile at baseline, the non-obese women with previous gestational diabetes mellitus display a markedly higher cumulative incidence of gestational diabetes mellitus<sup>(3)</sup>.

The discovery of genes (also known as quantitative trait loci - QTLs) contributing to blood pressure control is considered an important tool in elucidating the pathogenic mechanisms that lay behind essential hypertension<sup>(1)</sup>.

### Diabetes mellitus and blood pressure

A genome-wide scan (GWS) for the discovery of BP genes can be described as a search for QTLs across the entire



Figure 1. Large for gestational age clinical aspect

genome using anonymous, highly polymorphic (and thus genetically informative) microsatellite (MS) markers in large cohorts of families with hypertension traits. As a result, more than 100 hypertension gene variants (QTLs) were described, with at least one hypertension QTL on each chromosome<sup>(1)</sup>.

It can be expected that in the following years, due to the quick advances in genotyping technology and computing methods, better designed and enlarged GWA scans will provide novel, unbiased information about the heritable basis of hypertension at a level of detail that has not been possible previously<sup>(1)</sup>.

Gestational diabetes and pregnancy-induced hypertension are common, and their relation is not well understood<sup>(4)</sup>.

Hypertensive disorders of pregnancy complicate 5-10% of all pregnancies and can result in a variety of maternal and fetal complications, including seizures, stroke, hepatic failure, renal failure, intrauterine growth retardation, fetal distress, premature delivery, and death<sup>(4)</sup>.

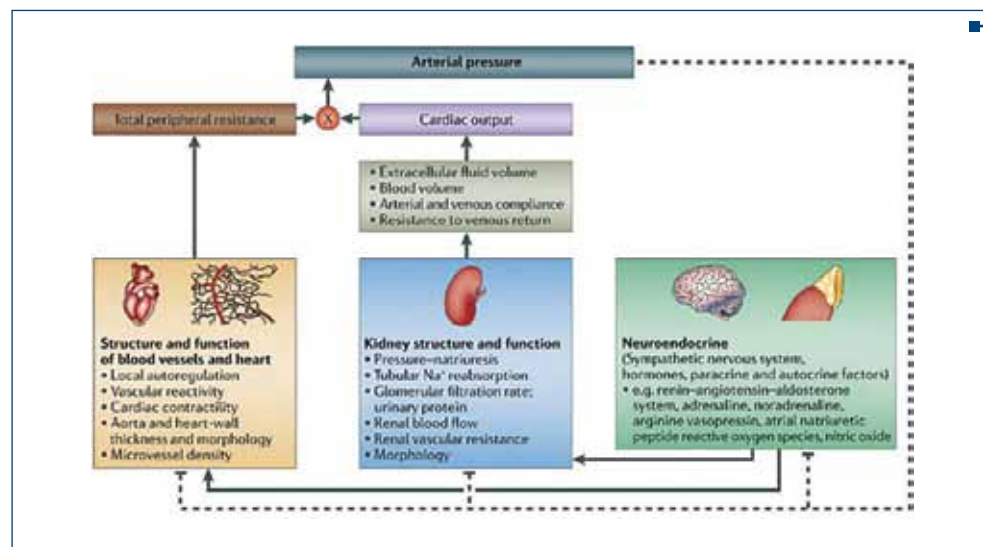


Figure 2. Allen W. Cowley Jr., *Nature Reviews Genetics* 7, 829-840 (November 2006), doi:10.1038/nrg1967



Figure 3. Large for gestational age features



Figure 4. Birth injury (facial ecchymosis)

Like pregnancy-induced hypertension, gestational diabetes mellitus is also relatively common and affects 3-5% of pregnancies, resulting in a variety of complications that primarily affect the fetus, including macrosomia, stillbirth, jaundice, and respiratory distress syndrome<sup>(4)</sup>.

In this large, population-based study, we found a significantly increased risk of gestational hypertension, mild pre-eclampsia, and severe preeclampsia among women with gestational diabetes. The risk for pregnancy-induced hypertension associated with gestational diabetes varied among different maternal ethnicity groups and also by degree of prenatal care<sup>(4)</sup>.

There is little direct clinical evidence on the reverse issue, but data are presented to suggest that pregnancy-induced hypertension may only predispose to gestational diabetes when its etiology is gestational hypertension and not preeclampsia<sup>(5)</sup>.

Preeclampsia and gestational diabetes also affected the newborns. Women with preeclampsia were more likely to give birth to underweight babies and deliver prematurely. Women with gestational diabetes were more likely to deliver overweight babies<sup>(6)</sup>.

### Experimental

The study from Polizu Maternity analyzed pregnant women with gestational diabetes and their newborns. One case was of type 1 diabetes mellitus.

Newborns of women with gestational diabetes type 2 were macrosoms, developing early neonatal pathology, metabolic (hypoglycaemia and/or hypocalcemia), plastic lesions (fetal borderline position determined by fetal-uterus disproportion), and injuries induced by the act of birth due to neonatal antropometric measurements located on the 90<sup>th</sup> percentile for gestational age and over.

There were minor injuries type facial bruising, *caput succedaneum*, cephalhematoma, despite the fact that over 80% of fetuses were extracted by caesarean section.

Please note that the indication for caesarean section was in 60% of cases the scar in the uterus, and the newborns were large for gestational age, that could induce maternal and fetal/neonatal morbidity during labor.

It was not registered changes in blood pressure, heart rate or another cardio-circulatory pathology in these newborns.

In type 1 diabetes, cardiac structural modification was registered by patent ductus arteriosus.

### Results

Gestational diabetes influenced fetal antropometric indicators and hypoglycemia as metabolic disorder and not hypertension.

### Discussion

Maternal pregnancy hypertension affects fetal nutrition and the result is intrauterine growth restriction, iatrogenic prematurity and fetal distress. Gestational diabetes with hypertension has an influence on antropometric indicators, giving birth to infants with higher weight for gestational age.

### Conclusions

The association of gestational diabetes, maternal obesity and hypertension in pregnancy requires further investigation, fetal monitoring and perinatal team for an uncomplicated adaptation of the newborn to life outside the womb. ■

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