PREGNANCY-A METABOLIC CHALLENGE

Oana BODEAN[1]
Simona VLADAREANU[2]
Elvira BRATILA[3]
Monica CIRSTOIU[4]

ABSTRACT*:*
PREGNANCY INVOLVES METABOLIC CHANGES WHICH OCCUR IN ORDER TO SUSTAIN A PROPER GROWTH AND DEVELOPMENT OF THE FETUS. A SERIES OF PREEXISTING OR COINCIDENT METABOLIC ALTERATIONS PREDISPOSE TO FURTHER COMPLICATIONS DURING THIS PARTICULAR STAGE IN A WOMAN`S LIFE. OBESITY AND METABOLIC SYNDROME PREDISPOSE TO CARDIOVASCULAR DISEASE, GESTATIONAL DIABETES, IMPAIRED RENAL FUNCTION AND OTHER EVENTS THAT LEAD TO SEVERE OUTCOMES SUCH AS PREECLAMPSIA. IN THIS ARTICLE WE DISCUSS A FEW METABOLIC ASPECTS INVOLVED IN THE PATHOPHYSIOLOGY OF PREECLAMPSIA, ACCORDING TO OUR EXPERIENCE AT THE BUCHAREST EMERGENCY UNIVERSITY HOSPITAL.

KEYWORDS: PREECLAMPSIA, METABOLISM, HYPERTENSION

INTRODUCTION

An increasing number of pregnancies develop complications related to different metabolic changes. Obesity, gestational diabetes[5, 6], pregnancy-induced hypertension, blood clot disorders are such complications transforming a physiological pregnancy into a high risk condition.

High blood pressure during pregnancy is quite frequent among women who have certain risk factors to develop such disease. The most dangerous form of hypertension during pregnancy is called preeclampsia and is defined as the onset of blood pressure values higher than 140/90mmHg, edema and proteinuria (>0.3g/24h) after 20 weeks of gestation[7-10].

Women who are overweight or obese (Body Mass Index>30) have an increased risk of developing preeclampsia which can evolve into its severe form, that of eclampsia, causing eclamptic seizures, even death of both mother and foetus.

[1] PHD, Department of Obstetrics and Gynecology, Bucharest Emergency University Hospital, oanamb8@gmail.com
[2] Department of Neonatology, "ELIAS" Emergency University Hospital Bucharest, "Carol Davila" University of Medicine and Pharmacy
[3] Department of Obstetrics and Gynecology, "St. Pantelimon" Hospital Bucharest
[4] Department of Obstetrics and Gynecology, Emergency University Hospital Bucharest, "Carol Davila" University of Medicine and Pharmacy

The metabolic changes taking place during pregnancy are complex. The pregnancy itself can be considered a metabolic stress test[11, 12].

In this article we discuss a few metabolic aspects involved in the pathophysiology of preeclampsia, according to our experience at the Bucharest Emergency University Hospital.

MATERIALS AND METHODS

The study included 406 singleton pregnancies admitted in the Bucharest Emergency University Hospital between January 2012 and December 2013 and diagnosed with pregnancy-induced hypertension during the current gestation. Data was collected from patients` files and analyzed by the Department of Statistics. Patients with known preexisting hypertension prior to pregnancy were excluded.

RESULTS AND DISCUSSIONS

From a total number of 3665 pregnancies registered during one year in our hospital, a number of 406 were diagnosed with different types of pregnancy-induced hypertension.

A total of 111 cases developed preeclampsia during their pregnancy. These patients also associated a series of conditions, as illustrated in Chart 1. Obesity was diagnosed in 45 pregnant patients. Gestational diabetes mellitus was found in 30 cases. Renal insufficiency complicated 10 cases. The rest of our patients had other or no relevant pathology. The weight of the newborns varied, from those with intrauterine growth restriction due to placental insufficiency to large for gestational age and macrosoms delivered by women with gestational diabetes mellitus.

Placental insufficiency was investigated by ultrasound, the patients showing impaired placental development (Figure 1), altered placental perfusion, abnormal placental vascularity, abnormal placental insertion (Figure 2), calcium deposits, and early placental maturation. The abnormal placentas were sent to the pathology department after delivery. Intraoperatory images of abnormal placentas are shown in Figure 3 and Figure 4.

Figure 1. Placental insufficiency. Circumvalate placenta with calcium deposits.

Figure 2. Low insertion of the placenta

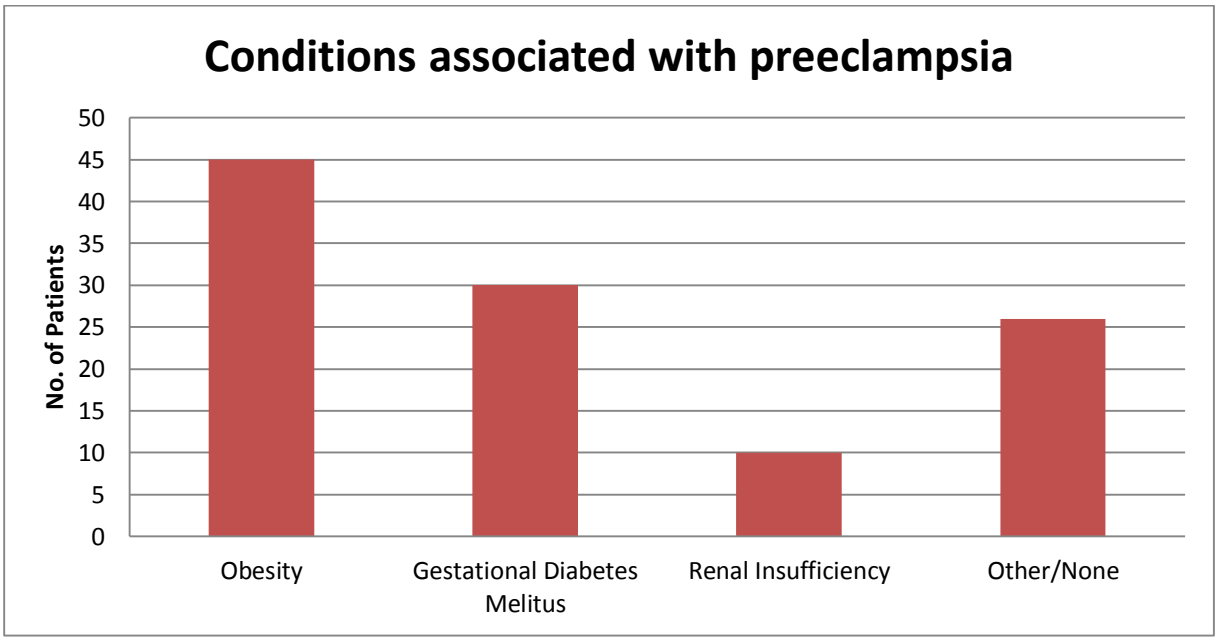

Chart 1 . Conditions associated with preeclampsia

The etiology of preeclampsia is still unclear, although there is much research being done in this field, from epidemiology studies to the newest metabolomics[1-4], trying to investigate the wide range of possible mechanisms involved.

A list of etiologic factors is presented in **Table 1**:

Etiologic factors of preeclampsia
1. Abnormal implantation of the placenta
2. Angiogenic factors
3. Immune factors and inflammation
4. Genetic factors
5. Endothelial and vascular disorders

Table 1. Etiologic factors of preeclampsia

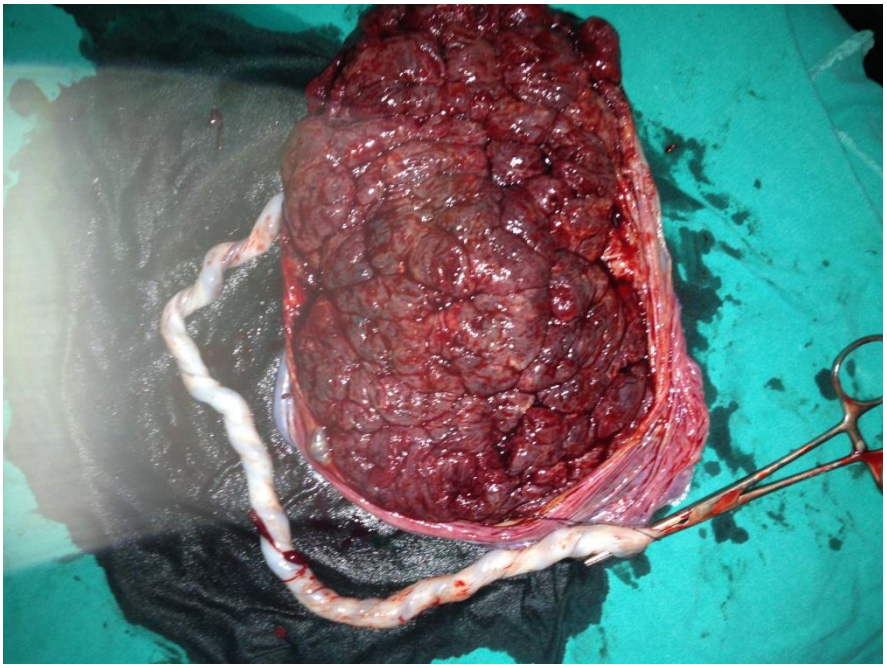

Figure 3. Abnormal placenta with calcium deposits

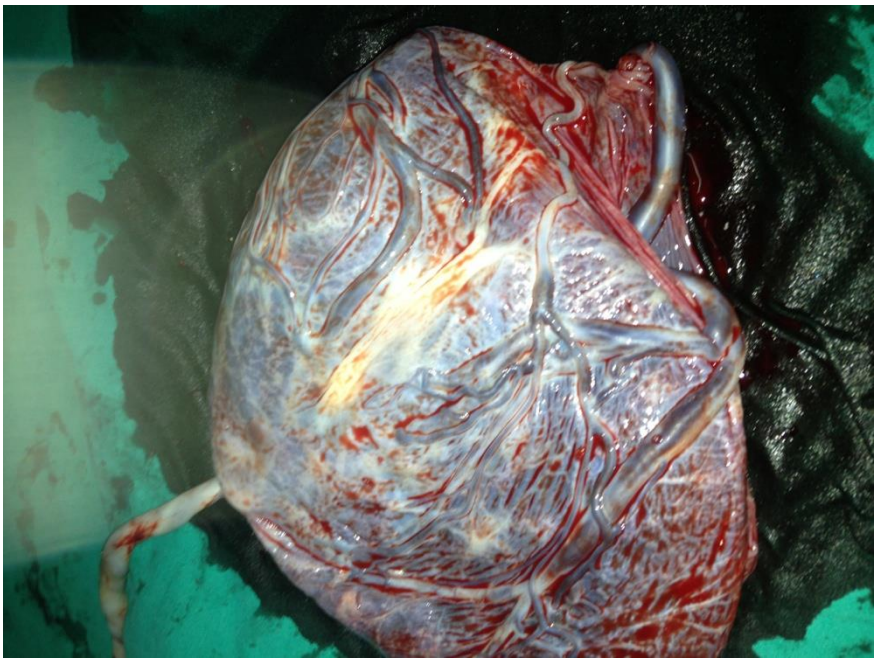

Figure 4. Abnormal placental vascularization

At a metabolic level, preeclampsia is characterized by increased insulin resistance, high levels of serum lipids, decreased filtration in the glomeruli, alteration of uric acid clearance and changes in the rennin-angiotensin-aldosterone system [13].

The same risk factors involved in the onset of preeclampsia are also involved in the occurrence of cardiovascular conditions. Recent studies state that women who develop metabolic syndrome during pregnancy have an increased risk of developing cardiovascular disease later in life [14, 15].

Metabolic syndrome is defined as a cluster of metabolic abnormalities that appear to directly promote the development of atherosclerotic cardiovascular disease and are characterized by chronic low-grade systemic inflammation. A faulty lifestyle, obesity and genetic predisposition also represent risk factors to developing metabolic syndrome in the general population, regardless of gender.[1,2]

Obese women are predisposed to have severe pregnancy outcomes. The American College of Obstetricians and Gynecologists sustain that the total weight gain during pregnancy for a woman with a normal pre-pregnancy BMI should be 11.5-16 kg. The adipose tissue acts like a real endocrine organ, producing hormones, cytokines and other substances which affect metabolism of both mother and fetus. Such cytokines (e.g. leptin, visfatin, resistin, vaspin) seem to correlate with different changes in the glucose metabolism of the mother and with fetal growth. Research in this field is new and quite promising.

CONCLUSIONS

Obesity, chronic hypertension, increased insulin resistance, impaired renal function, systemic inflammation involve metabolic changes common to both preeclampsia and cardiovascular disease.

Fetal growth and development are related to maternal metabolic changes and to maternal preexisting metabolic conditions, such as obesity, diabetes or chronic hypertension.

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