

Clinical and laboratory indicators in pregnant women with preeclampsia

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ABSTRACT

Objectives: The objective of this study is to compare clinical and laboratory indicators in pregnant women with preeclampsia (PE) compared with women with physiological pregnancy. **Materials and Methods:** The study group included 459 women: 209 women with physiological pregnancy and 250 pregnant women with PE. We studied coagulogram data, biochemical blood analysis, and the level of systolic and diastolic blood pressure before and during pregnancy. **Results:** It was established that pregnant women with PE have higher blood pressure indicators than women without PE. The content of fibrinogen in the blood and the rate of thrombin time in pregnant women with PE are higher, and the prothrombin ratio, partial thromboplastin time, and the total protein content in the blood are lower compared to women without PE ($P < 0.01$). **Conclusions:** Thus, as a result of this study, significant associations of blood pressure and hemostasis in pregnant women with PE were established, compared with women with physiological pregnancy.

KEY WORDS: Arterial hypertension, Blood pressure, Preeclampsia, Pregnancy

INTRODUCTION

Preeclampsia (PE) is a multisystem pathological condition that occurs in the second half of pregnancy (after the 20th week), characterized by arterial hypertension in combination with proteinuria (≥ 3 g/l in daily urine), often edema and manifestations of polyorganic/polysystemic dysfunction/deficiency.^[1]

According to the world literature and the World Health Organization, the incidence of PE is 2–8%.^[1,3] PE remains an important cause of maternal, perinatal, and neonatal morbidity and mortality.^[2,4]

Severe PE and eclampsia cause the risk of complications such as hemorrhages and cerebral edema, placental abruption, disseminated intravascular coagulation syndrome, massive obstetric hemorrhages, hemolysis, elevated liver enzyme levels, and low platelet count syndrome, hemorrhage and rupture of the liver capsule, pulmonary edema, adult respiratory distress syndrome, and acute renal and hepatic insufficiency.^[1,15] In the following years of life, chronic hypertension, coronary

heart disease, and stroke become more common to such women (Bilano VL *et al.*, 2014).^[6]

Children born after preeclamptic pregnancies have a low weight and an increased risk of developing stroke, coronary heart disease, and metabolic syndrome in adulthood (Bilano VL *et al.*, 2014).^[1,6]

In the etiopathogenesis of PE, an important role is played by vascular reactions, which are based on generalized vasospasm causing ischemic and hypoxic changes in tissues with impaired function, the development of endothelial dysfunction, and multiple organ failure.^[7,8]

MATERIALS AND METHODS

The study group included 459 women: 250 pregnant women with PE and 209 women with normal pregnancy (control group). The studied samples included individuals of Russian nationality who are natives of the Central Black Earth Region of Russia and have no relationship with each other. Clinical and laboratory examination of pregnant women was carried out on the basis of the Perinatal Center of the Belgorod Regional Clinical Hospital.

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All clinical studies were carried out based on the informed consent of the patients to the use of materials of therapeutic and diagnostic activities carried out during and after the period of hospitalization associated with PE for research purposes and were recorded according to the standards of the Ethics Committee of the Russian Federation.

PE was defined as the presence of hypertension, accompanied by proteinuria, as defined by a 24 h urine protein excretion more 300 mg.^[1] The following qualitative and quantitative pathogenetically significant signs for PE were studied: Assessment of weight gain in pregnant women, edema and protein in the urine, and body mass index was calculated, coagulogram (fibrinogen, prothrombin ratio [PR], and partial thromboplastin time [PTT]) was studied, and thrombin time [TT], blood chemistry (total protein, glucose, urea, creatinine, and bilirubin), systolic blood pressure (SBP), and diastolic blood pressure (DBP) levels before pregnancy and during pregnancy were measured.

During the study of the clinical and laboratory parameters of pregnant women, the nature of the distribution of these signs was assessed using the Shapiro–Wilk criterion.^[9] Further, statistical analysis of the considered signs was carried out taking into account the nature of their distribution.^[9]

It was found that the distribution of all the studied quantitative characters was not consistent with a normal distribution and, therefore, the median (Me) and interquartile range (Q25–Q75) were used to describe them, and Mann–Whitney test was used for comparative analysis.^[9] Statistical data processing was carried out using Statistica 6.0 software package.^[9]

RESULTS

The gestational age was 37–40 weeks. The average age of the main group was 27.11 ± 6.42 years (ranged from 18

to 44 years) and of the control group - 26.5 ± 6.36 years (ranged from 18 to 42 years) ($P > 0.05$).

It was found that the systolic, diastolic, pulse, and mean blood pressure (MAP) in women with and without PE both statistically significantly differ from each other before and at the end of pregnancy [Table 1] ($P < 0.01$): Blood pressure is higher in those with PE than in women without PE. Along with this, significant differences were found in the examined groups according to clinical and laboratory parameters: The content of fibrinogen in the blood and the TT indicator in pregnant women with PE are higher, and the PTT, PR, and total protein content in the blood are lower compared with women without PE ($P < 0.01$). The blood glucose level in the studied groups of pregnant women was not statistically different ($P = 0.06$).

DISCUSSION

The results of this study demonstrate the differences in clinical and laboratory parameters in pregnant women with PE compared with women with physiological pregnancy.

First, pregnant women with PE are characterized by high blood pressure. According to other studies, increased SBP, DBP, and MAP during the first trimester significantly increase the risk of PE compared with women with normal blood pressure during pregnancy.^[10,11] High blood pressure is also associated with shorter gestation and lower birth weights^[12,13] In addition, women with PE have significantly higher risk of development of cardiovascular diseases, including hypertension and stroke.^[14]

Second, the results of this study indicate a positive hemostatic potential in pregnant women with PE, which increases the risk of blood clots and is consistent with other literature data.^[5] In turn, hypercoagulation leads to a decrease in placental perfusion of blood

Table 1: The parameters of the distribution of clinical and clinical laboratory indicators in the study group of women

Parameters	Pregnant women without PE	Pregnant women with PE	P
SBP before pregnancy, mmHg	105.00 (100.00–110.00)	110.00 (110.00–120.00)	0.000000
DBP before pregnancy, mmHg	70.00 (60.00–70.00)	70.00 (70.00–80.00)	0.000001
PBP before pregnancy, mmHg	40.00 (30.00–40.00)	40.00 (40.00–40.00)	0.000000
MAP before pregnancy, mmHg	81.67 (75.00–83.33)	83.33 (83.33–90.00)	0.0001
SBP at the end of pregnancy, mmHg	110.00 (100.00–115.00)	140.00 (130.00–150.00)	0.000000
DBP at the end of pregnancy, mmHg	70.00 (70.00–80.00)	90.00 (80.00–95.00)	0.000000
PBP at the end of pregnancy, mmHg	40.00 (30.00–40.00)	50.00 (45.00–60.00)	0.000000
MAP at the end of pregnancy, mmHg	85.00 (83.33–90.00)	106.67 (100.00–113.33)	0.000000
Fibrinogen levels, g/l	3.30 (2.90–3.80)	4.65 (4.10–5.10)	0.000000
PR, %	100.00 (100.00–100.00)	100.00 (90.00–100.00)	0.002
PTT, s	38.00 (34.50–41.00)	33.00 (28.00–36.00)	0.000000
TT, s	15.00 (12.00–16.00)	15.00 (13.00–17.00)	0.01
Total protein, g/l	69.75 (67.00–72.00)	63.00 (60.00–67.60)	0.000000
Blood glucose level, mmol/l	4.20 (3.80–4.70)	4.20 (3.80–4.80)	0.06

Me; Q25–Q75, interquartile range – the 25th and 75th percentiles; W: Shapiro–Wilk criterion; P: Significance level; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; PBP: Pulse blood pressure; MAP: Mean arterial pressure; TT: Thrombin time, PTT: Partial thromboplastin time, PR: Prothrombin ratio; PE: Preeclampsia

caused by microthrombi in placental blood vessels, which ultimately leads to placental ischemia underlying PE.^[16]

Thus, as a result of this study, significant associations of blood pressure and hemostasis in pregnant women with PE were established, compared with women with physiological pregnancy.

The obtained results broaden the existing ideas about the role of maternal factors in the development of PE and make it possible to practice them in obstetrics.

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