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# **MULTIDISCIPLINARY ACADEMIC NOTES. SCIENCE RESEARCH AND PRACTICE**

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## **INDICATORS OF THE HEMOSTASIS SYSTEM DEPENDING ON THE GESTATIONAL AGE**

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A postterm pregnancy should be considered a pregnancy that lasts more than 42 full weeks (294 days or more) from the first day of the last normal menstrual period. The frequency of postterm pregnancy ranges from 4 to 14% [1]. Postterm pregnancy is one of the problems in obstetrics and is of great scientific and practical interest [2]. The problem of postterm pregnancy and delayed childbirth is due to the high percentage of complications during pregnancy, childbirth and the postpartum period [3]. Scientists in recent decades have been constantly expanding their understanding of the metabolic aspects of the pathogenesis of postterm pregnancy. It is established that herewith starts a whole cascade of biochemical, genetic, immunological processes, which, eventually, lead to the formation of this pathology [4].



Disturbances in the hemostasis system certainly play a role in the pathogenesis of complicated gestation, which has an impact on the growth of the percentage of thrombohemorrhagic and thromboembolic complications [5, 6, 7]. With increasing gestational age in healthy pregnant women, the hemostasis system changes in the direction of increasing blood clotting potential. In the third trimester of pregnancy, and especially before childbirth between the systems of blood coagulation and fibrinolysis, a state of unstable balance is formed. During childbirth, all the mechanisms that prevent bleeding and increase the oxygen capacity of the blood are mobilized: hematocrit increases, erythrocyte aggregation increases, coagulation potential of blood increases. Consequently, physiological hypercoagulation and blood stasis during pregnancy are ideal conditions for the development of thrombosis on the background of acquired or combined (acquired and genetic) thrombophilia [7].

Given that changes in the hemostasis system during pregnancy, childbirth and the postpartum period play an important role in the genesis of thrombohemorrhagic and thromboembolic complications, they should be taken into account in practical obstetrics.

**The purpose of the research:** to establish the features of changes in the hemostasis system depending on the gestational age.

#### **Examined group and research methods**

In order to study the peculiarities of changes in the hemostasis system, an examination of 137 pregnant women was conducted. Depending on the gestational age, patients were divided into 2 groups: 1 group was consisted of 41 patients with childbirth in the gestation period of 37-40 weeks, 2 group – 96 patients whose childbirth occurred in 41-42 weeks of pregnancy. All observations were performed on the basis of the maternity ward of the Zaporizhia «Regional Perinatal Center». The mean age of the examined patients was  $27,29 \pm 0,40$  years. In 2 group, the average age of women was 27,54 years, ranging from a minimum of 15 years to a maximum of 45 years, while in 1 group this indicator was 27,19 years, ranging from 15 to 45 years.

All women underwent an analysis of the hemostasis system. Both platelet and plasma hemostasis chains were examined. Blood sampling for the research was performed in the morning on an empty stomach between 7<sup>00</sup> and 9<sup>00</sup> from the cubital vein. Management and delivery of women in the research groups, initial assessment of the newborn, his early physiological adaptation and medical care was carried out in accordance with current orders of the Ministry of Health of Ukraine.

Variation and statistical processing of results was performed using licensed standard software packages of multidimensional statistical analysis «STATISTICA 13».

#### **Research results and their discussion**

Based on the data we received, in the system of hemostasis in the group of postterm pregnancy were revealed some deviations from normal blood clotting. The normal course of pregnancy is characterized by a certain activation of the coagulation system to further reduce blood loss in childbirth. Hematocrit and platelet count (platelet component of hemostasis) in both groups were within the normal range, but in the postterm pregnancy group the hematocrit was slightly lower, averaging 34,9% compared to the term pregnancy group, where the hematocrit was 38,0%. Platelet

counts did not differ significantly between groups of women.

As for I phase of blood coagulation – fibrin formation, the activated partial thromboplastin time in the second group was 32,22 seconds, which is within the norm for the third trimester of pregnancy (32–36 seconds). In the control group, APTT was slightly longer and amounted to 39,79 seconds. The recalcification time in the control group was also longer than in the postterm pregnancy group: 62,12 seconds in the first group and 58,85 seconds in the second group, that is recalcification occurs in a few seconds faster than the lower limit of the norm, indicating the development of a tendency to hypercoagulation. Plasma recalcification time is an indicator of the formation of a clot of fibrin protein and generally reflects the state of the blood coagulation process, the norm – 60-120 seconds. The detected changes in the first phase of blood coagulation hemostasis in the group of postterm pregnancy indicate a normal rate of fibrin formation in women and as a result – the risk of hypocoagulable bleeding in childbirth is minimal. In pregnant women, the placenta is the main source of inhibitors of tissue plasminogen activator, which inhibit the activity of fibrinolysis. It is possible that the development of placental insufficiency during postterm pregnancy and «aging» of the placenta leads to insufficient synthesis of inhibitors of tissue plasminogen activator and increased fibrinolysis, but in our case in the group of postterm pregnancy such changes were not observed, and indicators of the first phase of blood coagulation were within the norm in both groups of pregnant women.

In the II phase of blood coagulation – the phase of thrombin formation, we studied such an indicator as the prothrombin index, normally it is 100-112% in the third trimester of pregnancy. We found a slight decrease in PTI for women from the first group of pregnancy, where this indicator averaged 94%, for the group of postterm pregnancy no abnormalities were found and PTI was almost 102%. These data also indicate the absence of any disorders of thrombin formation in the group of postterm pregnancy and the risk of bleeding in childbirth. Meanwhile, these indicators differed significantly.

In the III phase of blood coagulation there is a formation of fibrin, the normative indicators of which are 3,7-6,2 g/l. For the first group was found slightly lower levels of fibrin ( $4,13 \pm 0,15$  g/l) with normal indicators of fibrin ( $4,77 \pm 0,14$  g/l) in the group of postterm pregnancy, indicating the absence of a deficiency of coagulation factors the day before childbirth in women with prolonged pregnancy and indirectly indicates the state of synthetic function of the placenta. As for fibrinogen B, which is normally absent, in the control group one plus was found in 4 women and two pluses in 5 women, three pluses were not found in any woman in the first group. At the same time, in the group of postterm pregnancy, one, two and three pluses of fibrinogen B were found in 16, 17 and 5 women, respectively. This physiological increase of fibrinogen concentration in late pregnancy is necessary to prevent significant blood loss during childbirth.

Analyzing the indicators of the anticoagulant blood system, we found a significant decrease in plasma tolerance to heparin in women of the first group –  $445,73 \pm 14,11$  seconds against  $573,64 \pm 25,38$  seconds in women of the second group. This indicates an absence of procoagulant reserves in the hemostatic system in case of activation of the anticoagulant blood system and the risk of hypocoagulation.

The autocoagulation test (according to B. Bercard et al., modified by L.Z. Barkagan) is somewhat similar to activated partial thromboplastin time (APTT) (according to Caen et al.). This is a standardized technique that indicates the dynamics of growth and then inactivation of thromboplastin-thrombin activity in the explored blood and indicates both the state of the procoagulant blood coagulation chain and the state of the fibrinolytic (plasmin) system. ACT was 103 seconds in the control group, 99,79 seconds in the postterm pregnancy group.

Plasma tolerance to heparin is normally 7-15 minutes (420-900 seconds) (according to Poler), in the first group of examined women this indicator was 445,73 seconds, and in the second - 573,64 seconds, which is within normal limits.

According to the hemostasiograms, a pregnant woman has several signs of pathological changes in different phases of the hemostasis system, which are manifested by decreased APTT, increased PTI, the presence of significantly more people with a positive fibrinogen B test, increased plasma tolerance to heparin and decreased ACT. These pathological factors may be pathophysiological predictors of thrombosis in the vessels of the placenta, disrupting its normal functioning and provoking the development of disorders in the system mother-placenta-fetus/hypertensive disorders that may affect on the fetal development. Therefore, examining the indicators of the hemostasis system, we can identify a risk group for the development of disorders in the system mother-placenta-fetus and hypertensive disorders in both women with preterm and late delivery, but during postterm pregnancy hemostasis changes will occur towards hypocoagulation and procoagulant insufficiency in the presence of activation of procoagulant factors.

It should be noted that women with existing complications of pregnancy have a tendency to activate intravascular coagulation, which was manifested in hypercoagulation in the plasma chain of hemostasis.

### **Conclusions**

Examining the indicators of the hemostasis system, we can identify a risk group for the development of disorders in the mother-placenta-fetus system and hypertensive disorders in women with preterm and delayed childbirth, but during postterm pregnancy hemostasis changes in the direction of hypercoagulation and anticoagulant deficiency in the presence of activation of procoagulant factors. These data require appropriate attention to hypocoagulable bleeding in childbirth and the early postpartum period or the risk of thrombosis, respectively, changes in management tactics of women, qualitative preventive and curative measures before and during childbirth.

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