UDC: 618.3-06/616.16+618.39-079.7

DYNAMICS OF CHANGES IN IMPORTANT BIOCHEMICAL PARAMETERS IN PREECLAMPSIA

Sharipova Shakhnoza Ulugbekovna[1], Tuksanova Dilbar Ismatovna[2]

[1] Doctoral student, Department of Obstetrics and Gynecology in Family Medicine, Bukhara State Medical Institute, Bukhara, Uzbekistan

[2] Doctor of Medical Sciences (DSc), Professor, Department of Obstetrics and Gynecology in Family Medicine, Bukhara State Medical Institute, Bukhara, Uzbekistan

Abstract. *Preeclampsia may be accompanied by metabolic and inflammatory changes resulting from systemic endothelial dysfunction and impaired microcirculation. This study investigated the dynamics of changes in important biochemical parameters, including lactate dehydrogenase (LDH), C-reactive protein (CRP), and urea, in women with preeclampsia. The results demonstrated that pathological changes in these parameters increased with the severity of preeclampsia. The identified changes reflect tissue hypoxia, systemic inflammatory response, and alterations in renal function and may be of significant importance for assessing and predicting the clinical course of preeclampsia.*

Relevance. *Preeclampsia is a serious pregnancy complication associated with multisystem pathological processes that pose significant risks to both the mother and fetus [1,3]. LDH is an indirect marker of tissue hypoxia and cellular injury, CRP is an important marker of systemic inflammation, while urea is a clinically relevant indicator of renal function. Assessment of their dynamic changes may help evaluate the progression of pathological processes in preeclampsia, determine disease severity, and predict potential complications at an early stage [2,4].*

Keywords: *preeclampsia, lactate dehydrogenase, LDH, C-reactive protein, CRP, urea, renal function.*

Materials and Methods. Based on the aims and objectives of the study, pregnant women were divided into three groups. Group 1 consisted of 30 women with physiological pregnancies. The main group included 72 patients, of whom 32 women (Group 2) were diagnosed at an early gestational stage based on angiogenic markers and fetoplacental blood flow parameters and subsequently received comprehensive preventive and therapeutic interventions. Group 3 included 40 patients who did not undergo early gestational screening or appropriate preventive and therapeutic interventions.

Study Results. At the next stage of the study, the main biochemical parameters in the blood of pregnant women were assessed, including C-reactive protein (CRP), lactate dehydrogenase (LDH), urea, and creatinine. The results demonstrated significant changes in these parameters in women with preeclampsia compared with those observed in women with physiological pregnancies. C-reactive protein levels may also change to some extent during physiological pregnancy; however, its elevation in preeclampsia may reflect an intensified systemic inflammatory response and endothelial dysfunction. Increased CRP levels may be associated with impaired endothelial function and the systemic inflammatory processes characteristic of preeclampsia. An increase in LDH levels may indicate enhanced tissue hypoxia and cellular injury, whereas changes in urea and creatinine levels may reflect impaired renal function. Comprehensive assessment of these biochemical parameters may therefore provide additional diagnostic value in determining the severity of preeclampsia and predicting its clinical course.

In the control group, the level of C-reactive protein (CRP) changed within the physiological reference range depending on the trimester of pregnancy. In the first trimester, its level increased from 2.8±0.4 mg/L to 6.3±0.9 mg/L, representing a 2.25-fold increase. In Group 2, where comprehensive diagnostic and therapeutic measures were initiated at an early stage, the inflammatory activity was higher than in the control group. Its level increased from 8.6±1.2 mg/L in the first trimester to 15.8±2.1 mg/L in the third trimester, corresponding to a 1.83-fold increase. In the group in which diagnostic and therapeutic measures were not

initiated at an early stage, a marked increase in this parameter was observed, indicating a more pronounced systemic inflammatory process. In this group, the CRP level was already 10.2±1.5 mg/L in the first trimester and reached 32.9±3.8 mg/L by the third trimester, representing a 3.22-fold increase and indicating progression of the disease ($p>0.05$). Such elevated levels may also indicate an increased risk of complications.

The next parameter assessed was lactate dehydrogenase (LDH), which is considered an important marker for monitoring the condition of women with preeclampsia over time. This marker reflects tissue damage, particularly hepatic injury, cytolysis, and hypoxic damage in vital organs. In preeclampsia, generalized endothelial dysfunction leads to impaired microcirculation and vasospasm, resulting in tissue ischemia and, ultimately, disruption of cell membranes with the release of intracellular enzymes into the bloodstream. An increase in LDH levels may reflect the degree of endothelial injury, tissue hypoxia, severity of microangiopathy, hemolysis, and multiorgan dysfunction. Markedly elevated LDH levels may indicate progression of preeclampsia to HELLP syndrome. The results obtained in the study groups demonstrated that the highest LDH values throughout all trimesters were observed in Group 3, indicating a greater severity of endothelial dysfunction in these patients. For example, in the first trimester, the LDH level in Group 3 was 1.7 times higher than that in the control group during the same period, reaching 118.5±10.6 U/L. In the second trimester, it was 2.22 times higher, reaching 236.1±18.3 U/L, while in the third trimester it was 2.88 times higher, reaching 423.5±34 U/L ($p>0.01$). These findings indicate that an LDH level exceeding 400 U/L may reflect tissue hypoxia and the onset of hemolysis in the maternal organism.

Another important parameter used in the assessment of preeclampsia is the blood urea level. The kidneys are considered one of the main target organs affected in preeclampsia. Endothelial injury and reduced glomerular filtration associated with this condition may lead to an increase in blood urea levels. Progressive elevation of urea indicates a decline in renal filtration and impaired nitrogen metabolism. Therefore, this prognostic marker is important for assessing

disease progression. It should be noted that the reference range for blood urea during pregnancy is 2.5–6.5 mmol/L. Reference values were observed only in the control group, whereas in the two main groups, urea levels were several times higher than the normal range depending on the severity of preeclampsia. Similar to the other parameters described above, the highest mean urea level among all groups was observed in Group 3. For example, in Group 3, the urea level in the first trimester was 4.1 mmol/L, which was 0.7 mmol/L, or 1.2 times, higher than the corresponding value in the control group. In the second trimester, the level reached 5.8 mmol/L, which was 2.7 mmol/L, or 1.9 times, higher than in the control group. By the third trimester, the mean urea level reached 7.1 mmol/L, exceeding the control group value by 4.2 mmol/L, or 2.4 times. These findings suggest that patients in Group 3 experienced more pronounced changes in renal function compared with the other groups, which may increase the likelihood of complications.

Conclusion

Under physiological conditions, blood urea levels tend to decrease slightly toward the later trimesters of pregnancy. In contrast, preeclampsia is characterized by an opposite trend, with a several-fold increase in urea levels due to the additional renal burden associated with pregnancy and endothelial dysfunction. These findings confirm the importance of monitoring urea levels in assessing renal involvement and the progression of preeclampsia.

References

1. Rolnik D.L., Wright D., Poon L.C. et al. Aspirin versus placebo in pregnancies at high risk for preterm preeclampsia // New England Journal of Medicine. – 2017. – Vol. 377, №7. – P. 613–622.

2. Papageorghiou A.T., Yu C.K.H., Erasmus I.E. et al. Assessment of risk for the development of pre-eclampsia by maternal characteristics and uterine artery Doppler // BJOG: An International Journal of Obstetrics & Gynaecology. – 2005. – Vol. 112, №6. – P. 703–709.

3. Espinoza J., Romero R., Nien J.K. et al. Identification of patients at risk for early onset and/or severe preeclampsia with the use of uterine artery Doppler velocimetry and maternal characteristics // American Journal of Obstetrics and Gynecology. – 2007. – Vol. 196, №4. – P. 326.e1–326.e13.

4. Scazzocchio E., Figueras F. Contemporary prediction of preeclampsia // Current Opinion in Obstetrics and Gynecology. – 2011. – Vol. 23, №2. – P. 65–71.