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3 knoll drive. London. N14 5LU United Kingdom

+44 7542 987055

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## The role of interleukin 10 in the development of preeclampsia: diagnosis and prognosis

Akhmedov F.K.

Bukhara State Medical Institute, Uzbekistan

**Abstract:** Hypertensive disorders during pregnancy are associated with high maternal and perinatal mortality, so it is very important for obstetricians to recognize severe cases with a poor prognosis in time. One of the pathogenesis of preeclampsia is an increase in the level of IL-10. In preeclampsia, in contrast to normal pregnancy, the cytokine profile changes - higher concentrations of IL-10 are noted. Although the final pathogenesis of this pathology remains to be elucidated, on the basis of this it will be possible to develop an adequate therapy algorithm to save the life of the mother and child.

**Keywords:** preeclampsia, interleukin, IL-10 pregnancy, immunology.

Approximately 10-15% of pregnant women worldwide still suffer from complications of hypertensive diseases, among which complications from preeclampsia occupy a special place [1,2,6].

Preeclampsia is a condition that occurs as a result of dysfunction of several systems of the body, which develops only in pregnant women; usually manifests with arterial hypertension and proteinuria; in rare cases, it occurs before the 20th week and has a negative effect on the course of pregnancy [3,12,14].

The National Committee analyzed 86 cases of maternal deaths between 2013 and 2015, and the results of the analysis showed that preeclampsia was one of the leading causes of maternal deaths. This was 22.8 percent of all maternal deaths within 3 years. Hypertensive cases take 4th place in the list of causes of maternal death in Russia, accounting for 15.7 percent [4,5,6].

Cytokines are signaling proteins that control biological processes during pregnancy, from implantation to birth. The first trimester is a vulnerable stage of pregnancy, because complications can be related to the improper development of placentation. In the first trimester, some evidence has shown that the concentration of IL-10 in women at risk of preeclampsia is much higher than in healthy pregnant women [7,11,13].

Interleukin-10 (IL-10), encoded on chromosome 1, is an anti-inflammatory cytokine that acts through a receptor complex composed of IL-10R1 and IL-10R2 [8,9]. The multifunctional cytokine is produced by macrophages, mast cells, Th2 cells and regulatory T cells (Treg) and can inhibit pro-inflammatory cytokines, including IFN- $\gamma$  [10,12]. IL-10 and TGF- $\beta$  by T cells (Treg) are released and their immunomodulatory properties control inflammation, which is important for successful pregnancy.

**The purpose of the study:** to study the role of interleukin-10 in the development of preeclampsia

### Materials and methods:

This research work was carried out in 2019-2022 at the Department of Obstetrics and Gynecology No. 2 of the Bukhara Medical Institute, the maternity

complex of the Zhondar District Medical Association and the Perinatal Center of the Bukhara Region.

Pregnant women at risk of PE were studied according to the level of risk in the I and II trimesters, when analyzed by trimesters, 100 (66.6%) pregnant women in the main group were women at risk of preeclampsia, of which 50 (33.3%) were in the I trimester. , 50 (33.3%) pregnant women in the II trimester and 50 (33.3%) pregnant women complicated by preeclampsia according to severity were studied.

In all cases, there is a risk of preeclampsia, and pregnant women complicated by preeclampsia developed PE against the background of various somatic and gynecological diseases.

The control group consisted of 50 women whose pregnancy was physiological.

The age of all the women under observation was around 19-42 years. Average age in group 1<sup>A</sup> is  $26.2 \pm 0.8$  (19-42) years;  $27.2 \pm 0.9$  (19-48) years in group 1<sup>B</sup>,  $28.8 \pm 0.8$  (42-19) in group 2, and  $25.7 \pm 0.7$  (20-37) in the control group .

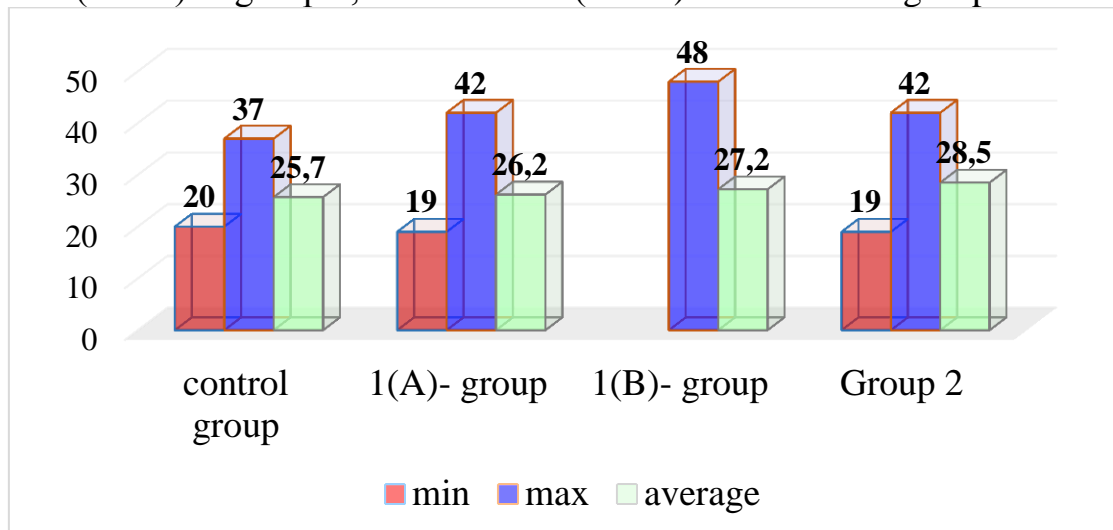


Figure 1. The average age of the examined women is young

In order to conduct a clinical-statistical analysis and during the examination of pregnant women in the main group, anamnesis data, somatic and gynecological diseases, the onset and nature of menstruation, sexual and reproductive functions were taken into account.

Immunological research method by the author, Ph.D., senior researcher Fayzyrakhmonova M.M. was carried out under the leadership of Examinations were carried out using the "Mindray MR-96A" immunoenzyme analyzer. IL10 and interleukins in the plasma of pregnant women involved in the study were examined. The data obtained during the investigation were statistically processed using Microsoft Office Excel-2016 software on a Pentium-IV personal computer using statistical processing functions.

## Results

The results obtained from our research showed that the concentration of interleukin-10 (IL-10) in the blood was  $14.42 \pm 0.54$  pg/ml in the first trimester and  $14.6 \pm 0.64$  pg/ml in the second trimester in pregnant women at risk of preeclampsia. did, no statistically significant changes were observed between the indicators of groups 1<sup>A</sup> and 1<sup>B</sup>. Among pregnant women complicated by preeclampsia, this



indicator is  $16.3 \pm 0.81$  pg/ml, and among pregnant women of the control group, this indicator is  $13.53 \pm 0.44$  pg/ml ( $P < 0.01$ ).

Compared to the indicators of groups 1<sup>A</sup> and 1<sup>B</sup> and the control group, the indicators of group 2 showed statistically significant changes.

Table 1

IL-10 cytokine levels in pregnant women with preeclampsia and risk of preeclampsia  
(n=200)

Indicators	Control group, n=50	Group 1 <sup>A</sup> , n=50	Group 1 <sup>B</sup> , n=50	Group 2, n=50
IL-10 pg/ml	13,53±0,44	14,42±0,54*	14,6±0,64*	16,3±0,81**^^
Max-min	15,02-12,56	20,25-2,6	23,8-4,2	32,2-10,4
Median	13,5	14,25	13,9	13,7
P-value	0,01	0,006	0,02	0,06

Note: \* - differences are significant compared to the data of the control group (\* -  $P < 0.05$ ), ^ - differences are significant compared to the data of group 1 (-  $P < 0.01$ )

If in pregnant women complicated by preeclampsia, IL-10, 1A and 1B were 13.3 and 14.7% ( $p < 0.05$ ), respectively, compared to pregnant women of the group, compared to the control group, these indicators were 20.7%, respectively ( $p < 0.001$ ) was equal.

In studies conducted by many investigators, pregnant women complicated by preeclampsia have been shown to have elevated levels of IL-10 in the placenta and peripheral blood, which may be a compensatory response to the excess of pro-inflammatory cytokines.

The presented data showed that there were no significant changes in the concentration of IL-10 in the blood of healthy pregnant women with a normal pregnancy, pregnant women at risk of preeclampsia.

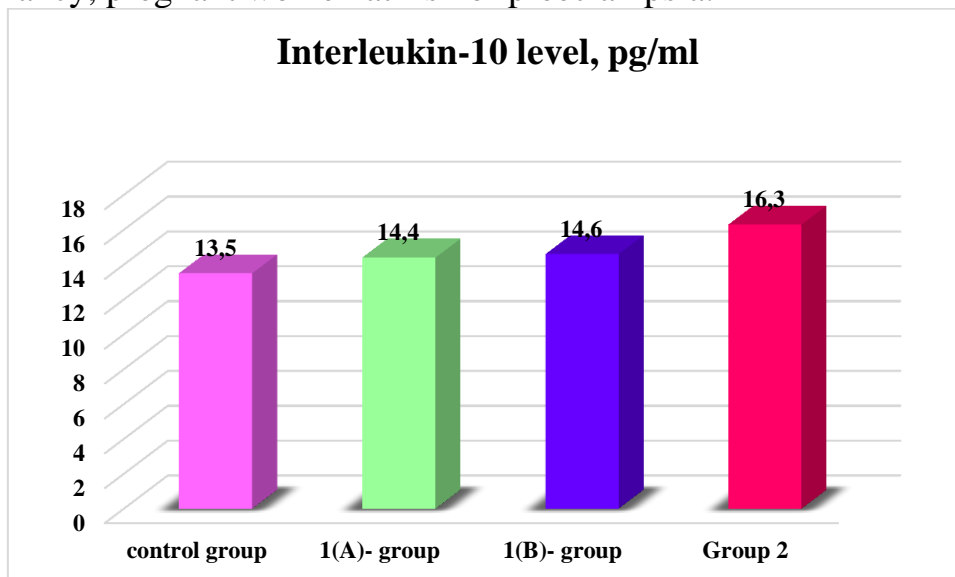


Figure 2. IL-10 concentrations in women with preeclampsia and risk of preeclampsia.

An important feature of this anti-inflammatory cytokine is its slight increase under the risk of developing preeclampsia (up to  $14.6 \pm 0.64$  pg/ml) and up to  $16.3 \pm$

0.81 pg/ml in pregnant women complicated by preeclampsia, that is, in conditions of advanced inflammatory process

Taking into account the above, it was shown that there is almost no difference in the concentration of IL-10 in the mother's serum between pregnant women at risk of preeclampsia and healthy pregnant women.

According to the literature, there is some evidence that IL-10 may be an early predictor of the onset of preeclampsia, but more studies are needed to confirm this evidence.

ROC analysis using ROC curves was performed to investigate the possibility of using interleukin-10 (IL-10) as a predictor of the development of preeclampsia.

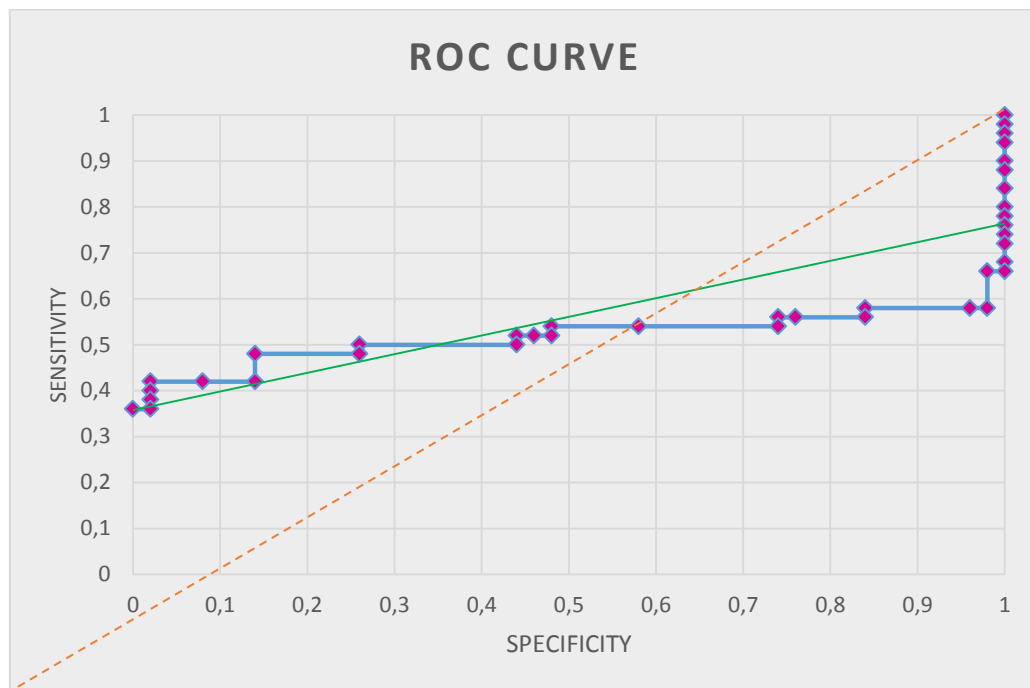


Figure 3. ROC curve for "Interleukin-10 (IL-10) pg/ml" in predicting severe preeclampsia

Figure 3 shows the ROC curve for the indicator "Interleukin-10 (IL-10) pg/ml". The area under the curve was  $1.03 \pm 0.100$  (95% IO (confidence interval) 0.360... 0.980),  $r=0.01$ , indicating the possibility of using IL-10 as a predictor of preeclampsia. In our study, IL-10 plasma level in women complicated by preeclampsia was 23.3 pg/ml (specificity 89.7%, sensitivity 76.4%, accuracy 80.5%).

Based on these, Munro S.K., et al. (2021) agree that interleukin-10 (IL-10) is not only a risk factor for preeclampsia but also a predictor of complicated pregnancy.

The results obtained from our research showed that the indicators recorded according to our results can be a predictor and indicator of the progression of PE and its severity.

Thus, concluding our studies in this chapter of the work, monitoring the indicators of pro-inflammatory and inflammatory cytokines in the mother, evaluating them, identifying possible complications of endothelial dysfunction and inflammatory system, monitoring the effectiveness of treatment without waiting for the exacerbation of clinical manifestations, timely treatment of preeclampsia once again we made sure that it allows to assess the level of severity.

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