Blood Acid-Balance Balance During Pregnancy

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ABSTRACT

Relevance and objectives: to study and analyze the indicators of the acid - base state of the blood in the second and third trimesters of pregnancy, which proceeds without complications. A study of arterial and venous blood was carried out in 80 patients with uncomplicated pregnancy and 32 non-pregnant women to determine the parameters of the acid-base balance of blood on a gas analyzer. It was found that in the blood of women with a physiological course of pregnancy there is an accumulation of acidic metabolic products, a decrease in alkaline blood reserves - carbonate and protein buffers. The most significant fluctuations in the indicators of the acid-base state of the blood were observed in the third trimester of pregnancy. But all the observed changes were compensated due to the absence of a shift in blood pH.

Keywords:	pregnancy, acid-base composition of blood, laboratory diagnostics of blood.

Introduction. The stability of the acid-base balance of the internal environment is the most important condition for the life of the human body. Maintaining the acid-base state is of particular importance during pregnancy, when the processes of anabolism increase significantly and energy metabolism increases, for which more oxygen is needed for the oxidation of substrates and the elimination of H+ and e- [1, 2]. By examining the indicators of the acid-base balance of the blood, one can follow the nature of the metabolic processes in the mother and fetus. Changes in the acid-base state during pregnancy are an adaptive response of the mother, aimed at creating optimal conditions for placental gas exchange [3].

According to various authors, during a normal pregnancy in the blood of women, there is a moderately pronounced metabolic acidosis and respiratory (respiratory) alkalosis, which develops as a result of the stimulating effect of progesterone on the respiratory center [4, 5].

The aim of the study was to study the state of the acid-base balance of the blood in the second and third trimesters of pregnancy, which proceeds without complications.

Materials and research methods: 80 pregnant women with uncomplicated gestation and 32 women outside of pregnancy, who are patients of the Ferghana Regional Perinatal Center , were examined . The main group consisted of pregnant women, who were divided into two subgroups: Subgroup I included 35 patients in the second trimester; II subgroup - 45 pregnant women in the third trimester of gestation . The comparison group included 32 non-pregnant patients.

When analyzing the anamnesis, it was revealed that the age of pregnant women was in the range from 18 to 38 years and averaged 24.3 ± 1.3 years. In the comparison group, the average age of women was 24.9 ± 1.7 years, in the I main subgroup - 23.7 ± 1.7 years, in the II main subgroup - 25.5 ± 1.5 years.

The duration of pregnancy varied: in the I main subgroup - from 14 to 26 weeks, on

average 19.5 ± 3.2 weeks; in the II main subgroup - from 27 to 40 weeks, on average 34.1 ± 2.8 weeks. When considering the reproductive function in the I main subgroup, 28.4% (10) primigravidas and 39.6% (14) primiparas were identified , in II main subgroup - 32.7% (15) primigravida and 40.1% (18) primiparous.

The criterion for excluding patients from the main subgroups and the comparison group was the presence of a clinical manifestation of extragenital diseases.

Informed consent was obtained from all women for the use of survey data for scientific purposes, the study was approved by the Commission on Medical Ethics at the Fergana Regional Perinatal Center. All women underwent a comprehensive clinical and laboratory examination. Determination of the parameters of acid-base balance of arterial and venous blood was carried out on a gas analyzer LSB 5 manufactured by Kadocher (Denmark) according to the standard method. The material for the study was peripheral venous and arterial blood. To study the parameters of acid-base balance of arterial and venous blood the following indicators were distinguished: concentration of hydrogen ions (pH), blood base deficiency (BE), standard bicarbonate (SB), buffer base (BB), true bicarbonate (AB).

Statistical processing of the obtained results was carried out on a computer. The arithmetic mean value (M) and the error of the arithmetic mean value (w) were calculated. Groups were compared by parametric (Student's t-test) method. Differences between groups were considered statistically significant when the possibility of error was less than 5%.

Results and discussion

In table. 1 shows the indicators of acid-base balance of arterial and venous blood of patients in the second and third trimesters of a normal pregnancy in comparison with women outside of pregnancy. The pH values in the main subgroup I in arterial blood ranged from 7.35 to 7.44, reaching an average of 7.39 ± 0.01; in venous blood - from 7.26 to 7.37, on average - 7.31 ± 0.01. In the main subgroup II, the pH in the arterial blood was in the range of 7.36-7.43, on average - 7.39 ± 0.01; in venous blood -

7.26-7.35, on average - 7.30 ± 0.02. There were no significant differences in the pH value of arterial and venous blood in I and II main subgroups in relation to the comparison group. When analyzing the values of deficiency of arterial blood bases, it was found that the amount of underoxidized metabolic products was less than -3.91 meq / l of blood (BE values for non-pregnant women ranged from -3.91 to +3.91) in 22 out of 35 (64%) pregnant women I of the main subgroup, while in the II main subgroup the number of such patients increased to 82% (8 out of 45 women). Base deficit values less than -3.91 ... mEq /l of blood (the lower limit of BE values for non-pregnant women) can be interpreted as developing metabolic acidosis. At the same time, there is a shift in the lower limits of the BE values in the I main subgroup to -6.16 meq / l of blood, in the II main subgroup to -10.39 meq / l of blood. Statistically significant differences in base deficit values in arterial blood between the main subgroups I and II were revealed (p < 0.001).

From the data presented in table. 1, it can be understood that in the venous blood in the main subgroups I and II there is a significantly greater accumulation of underoxidized metabolic products. The average value of BE in venous blood in the main subgroup I was -4.32 ± 0.27 meq /l of blood with fluctuations from -1.59 to -7.04 meq /l of blood; in the II main subgroup: -5.81 ± 0.52 meq /l of blood, the fluctuation of the studied indicator was from -0.18 to -11.44 meq /l of blood. Statistical differences in venous blood VE values between the main subgroups I and II were found (p < 0.001).

When considering the indicators of alkaline reserves of arterial blood in the main subgroup I, it was revealed that out of 35 women studied, in 22 pregnant women (64%), the value of EV was less than 43.36 meq / l of blood (the lower limit of values for non-pregnant women), in 20 patients (56%) the value of 8B was less than 21.28 meq / l of plasma (the lower limit of values for non-pregnant women), in eight women (24%) - the value of AV was less than 18.37 meq / l of

plasma (the lower limit of values for non-pregnant women).

Table 1

Observation Group	Vessel	Indicators of acid-base balance in the blood				
		pH	BE	SB	BB	AB
Comparison group	Artery	7.39	0.00	23.23	48.08	21.8
	Vein	7.31	3.38	20.64	48.57	19.8
1st group	Artery	7.39	3.46	20.21	46.07	18.16
	Vein	7.31	4.32	20.41	47.34	19.22
2nd group	Artery	7.39	5.2	20.07	40.86	18.66
	Vein	7.30	5.81	18.54	41.49	18.36

A more significant decrease in blood buffers was observed in the II main subgroup. EV values less than 43.36 meq /l of blood were observed already in 89%, the value of SB less than 21.28 meq /l of plasma was detected in 67%, and the AV value below 18.37 meq /l of plasma was observed in 49% of pregnant women. Differences in the distributions of BB values in arterial blood between I and 11 major subgroups are statistically significant (p < 0.001 and p < 0.01).

Analysis of indicators of alkaline reserves of venous blood in the I main subgroup showed a decrease in the quantitative content of blood buffers in relation to the comparison group. In 19 patients (53%), the value of VV was less than 44.32 meq /l of blood (the lower limit of values for non-pregnant women), in

In 12 pregnant women (33%), the value of 8B was less than 18.47 meq / l of plasma (the lower limit of values for non-pregnant women), in 11 (32%) - the value of AV was below 17.32 meq / l of plasma (the lower limit of values for non-pregnant women) . In the second main subgroup, a further decrease in buffers in the venous blood of pregnant women was observed. The value of VV less than 44.32 meq /l of blood was detected in 79%, the values of SB below 18.47 meq /l of plasma were observed in 59%, and in 54% of women there was a decrease in the value of AV below 17.32 meq /l of plasma. Differences in the distributions of BB , 8B, AB values in venous blood between I and II main subgroups were statistically significant (p < 0.001, p < 0.001, p < 0.05).

Conclusions. Analysis of the data obtained showed that in the second and third trimesters of uncomplicated pregnancy, changes occur in the state of the acid-base balance of the blood. An increase in under-oxidized metabolic products in the blood of the studied pregnant women was revealed, the most significant changes related to the third trimester of gestation . In all pregnant women, base deficit (BE) values were expressed as a negative value, which may indicate an excessive accumulation of acidic metabolic products in comparison with non-pregnant patients. The state of indicators of the acid-base balance of the blood towards acidosis during pregnancy is influenced by a slight decrease in the alkaline reserves of the blood. With an increase in the gestation period , an increase in the degree of metabolic acidosis and a decrease in alkaline blood reserves of carbonate and protein buffers were observed. No shift in pH towards acidic or alkaline reaction was observed in any pregnant woman. This suggests that the compensation mechanisms in patients with uncomplicated pregnancies in the second and third trimesters are sufficient to prevent a shift in active blood response despite changes in metabolism.

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