THE COURSE OF PREGNANCY, LABOR, POSTPARTUM, AND EARLY NEONATAL PERIODS IN THE PRESENCE OF SIGNS OF PRETERM BIRTH

Jamoliddin T. Mamasaidov - D.M.Sc., associate professor
Maftuna T. Muydinova - independent researcher
Fergana Medical Institute of Public Health (Fergana, Uzbekistan)
muydinovaamaftuna@gmail.com

Abstract. *This study investigates the signs and risk factors of preterm birth during pregnancy, labor, postpartum, and early neonatal periods. Clinical, demographic, and instrumental data, including Doppler assessment of uterine arteries, were analyzed. The findings demonstrate that the systolic-diastolic ratio and pulsatility index are significant predictors of preterm birth. Additionally, factors such as threatened miscarriage, preeclampsia, polyhydramnios, and infectious-inflammatory processes significantly increase the risk. The results are important for improving prediction and prevention strategies of preterm birth.*

Keywords: *preterm birth, pregnancy, Doppler, uterine artery, preeclampsia, pulsatility index, miscarriage risk, neonatal period*

Relevance of the problem.

Studying risk factors affecting the course of pregnancy and improving the quality and scope of screening examinations aimed at preventing various complications, as well as enhancing the effectiveness of implemented and planned measures, remains one of the pressing issues for healthcare authorities. Therefore, in state programs and reports of practicing physicians, the digitalization of data and statistics related to maternal and child health indicators contributes to achieving more accurate and reliable outcomes. In this regard, the scope of scientific research conducted in this field and the obtained results play a significant role in improving the qualifications of practicing physicians, as well as in preventing preterm birth and obstetric complications and enhancing the quality of medical care provided.

Materials and methods.

At the first follow-up visit, a detailed questionnaire was conducted to collect demographic, clinical, and medical data. Analysis of exchange cards and birth histories made it possible to describe the specific features of pregnancy progression. Doppler examination of the uterine arteries (UA) was performed. Wave characteristics were assessed based on qualitative analysis of the pulsatility index (PI) and systolic/diastolic (S/D) ratio. Measurements of the uterine arteries were carried out at the time of hospital admission.

Results.

Moderate preeclampsia was observed in 13.7% of the studied pregnant women. Doppler examination of the uterine arteries was performed at the point of intersection with the external iliac artery. Wave characteristics were evaluated based on qualitative analysis of the pulsatility index (PI), S/D ratio, and the presence of a diastolic notch. Measurements of the uterine arteries were performed at hospital admission.

The maternal body mass index (BMI) was compared across all groups and averaged 22.4±0.42 kg/m², showing no statistically significant differences in relation to preterm birth (p=0.246).

The proportion of primiparous women was higher in the group of preterm births at 28.0–34.0 weeks, accounting for 56.35%. The frequency of previous preterm births in the medical history was also higher in this group, reaching 50%.

During Doppler examination of the uterine arteries, the following indicators were analyzed: systolic/diastolic ratio (S/D) and pulsatility index (PI). The S/D ratio was interpreted as an indicator of peripheral vascular resistance. In normal pregnancy, this ratio remains stable at 1.08–1.09.

Values of the S/D ratio above 1.8 were considered abnormal and associated with pregnancy complications, potentially leading to preterm birth. A statistically significant correlation was found between the S/D ratio and the risk of preterm birth ($p<0.05$). Thus, this ratio may serve as an important predictor of spontaneous preterm birth at this stage of pregnancy.

Resistance to blood flow in the uteroplacental circulation is transmitted to the uterine arteries and can be quantitatively assessed using the pulsatility index (PI) or resistance index (RI).

We analyzed PI values across three Doppler examinations at different gestational ages, followed by statistical analysis. At the first visit (18.0–22.6 weeks of gestation), PI values above the 95th percentile were observed in 6.89% of preterm birth cases and in 0.86% of term deliveries (Table 1).

During our study, the presence of a diastolic notch was assessed using Doppler ultrasound. The diastolic notch, also referred to as a dicrotic notch, represents a characteristic pattern of the blood flow velocity waveform detected during Doppler assessment of the uterine arteries in pregnancy. It is manifested by a sharp decrease in blood flow velocity at the beginning of diastole, which may indicate impaired uteroplacental circulation. Doppler ultrasonography was used in our study to evaluate the velocity and characteristics of blood flow in vessels, including the uterine arteries, during pregnancy.

Table 1.

Analysis of Doppler parameters between groups

Indicator	S/D ratio	RI	PI
Mean (M)	2.715377	0.759906	0.619387
SD	0.757851	0.08914	0.069125
Median	2.725	0.76	0.66
Mode	2.74	0.76	0.51
Kurtosis	-1.13284	6.287056	-1.07684
Max	3.95	0.9	0.7
Min	1.35	0.36	0.51
n	212	212	212
Mean	2.72	0.76	0.66
Average	2.7	0.75	0.61
N	212	212	212
SD	0.75	0.08	0.06
t-value	0.001831	0.008585	0.057234
α	0.05	0.05	0.05
d.f	211	211	211
t-critical	1.971271	1.971271	1.971271
p-value	3.156294	2.652991	1.911979

In the study, diastolic notches were identified in cases of preterm birth: 12 in the left uterine artery and 12 in the right, of which 4 were bilateral. We analyzed several abnormal Doppler waveform changes, including persistence of a protodiastolic notch (unilateral or bilateral) after 28 weeks of gestation, S/D ratio >3 after 30 weeks, or increased pulsatility index (PI >95th percentile).

The test results for predicting preterm birth at 28.0–33.6 weeks of gestation showed a sensitivity of 92%, specificity of 26%, positive predictive value of 13%, and negative predictive value of 95%.

The low positive predictive value indicates that only 11–13% of women with abnormal uterine artery Doppler findings experienced preterm birth.

The high negative predictive value (90–97%) suggests that in women with normal uterine artery Doppler results, the probability of term delivery is significantly higher than that of preterm birth.

Based on the obtained data, it was concluded that Doppler examination of the uterine arteries in the second and third trimesters is necessary for predicting both preterm and spontaneous preterm birth; however, its accuracy may be limited. The pulsatility index of the uterine arteries can be used independently in the third trimester or in combination with other clinical and paraclinical indicators in the second and third trimesters.

One of the inclusion criteria for the study was the spontaneous onset of labor, while exclusion criteria included women who delivered by cesarean section. Therefore, all participants in the study had vaginal deliveries.

Episiotomy was performed more frequently in women of the main group; however, no statistically significant differences were found compared to women who had term deliveries.

Accordingly, a comparative analysis of the specific features of pregnancy progression in women of the study groups was carried out (Figure 1).

A high frequency of threatened miscarriage was observed among women in the main group during the first and second trimesters: 78.3% (166 cases, $p>0.001$) and 74.1% (157 cases, $p>0.001$), respectively.

The calculation of relative risks demonstrated that the presence of threatened miscarriage during pregnancy increases the likelihood of early preterm birth by 3.13 times (RR 4.69; 95% CI 2.1–10.4) and the likelihood of preterm birth by 2 times (sensitivity 97%, specificity 35.2%).

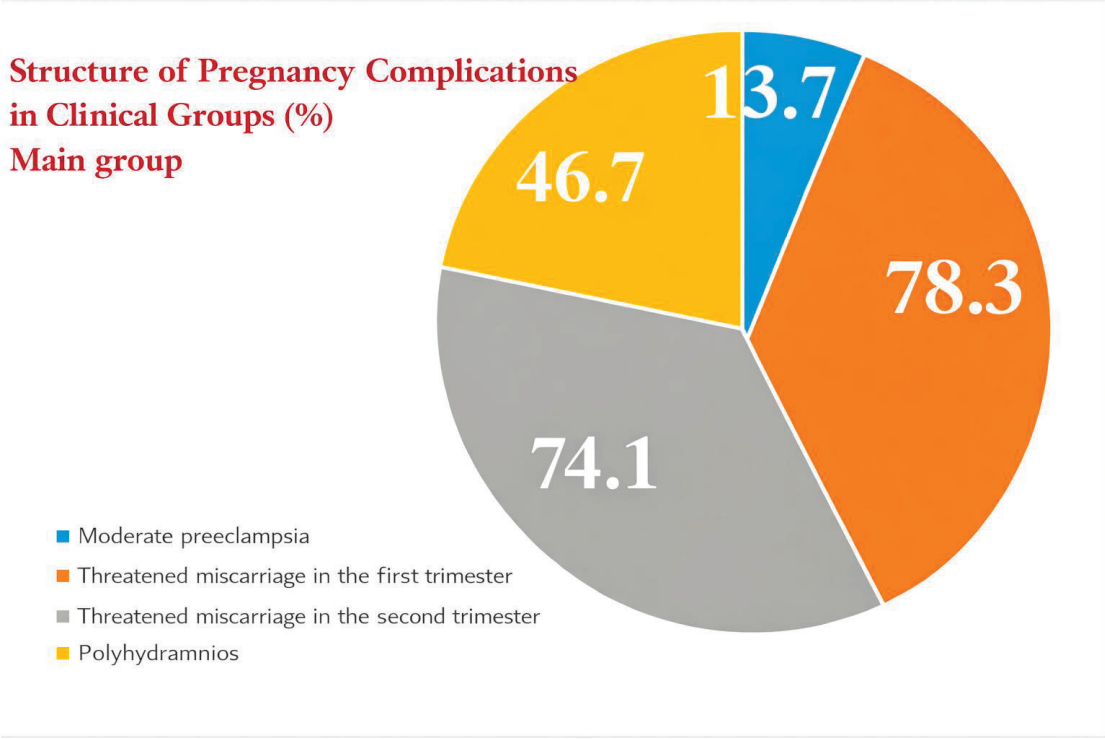


Figure 1. Comparative analysis of the specific features of pregnancy progression in women

Note: *$p>0.001$ – statistical significance according to Pearson's chi-square test compared with the control group data.*

A higher frequency of moderate preeclampsia was observed in women of the main group – 13.6% (29 cases), while it was not observed in the control group; the absolute risk in the main group was 0.137.

Polyhydramnios diagnosed by ultrasound was recorded in 46.7% (99 cases) of women in the main group. This corresponds to an odds ratio (OR) for preterm birth risk of 12.2 (95% CI 2.8–52.8).

Analysis of complications occurring during labor showed that premature rupture of membranes was statistically significant, with a frequency of 60.8% (129 cases, risk factor 0.7) in the main group and 23.3% (7 cases, risk factor 0.3) in the control group, which is 37.5% higher (95% CI 0.95–5.55) (Table 3.9).

A prolonged anhydrous period exceeding 12 hours was observed in 63 women in the main group; however, no statistically significant differences were found between the groups (p=0.061).

Histological analysis revealed inflammatory changes in the placenta in 31.1% (66 cases) of the main group (p<0.001).

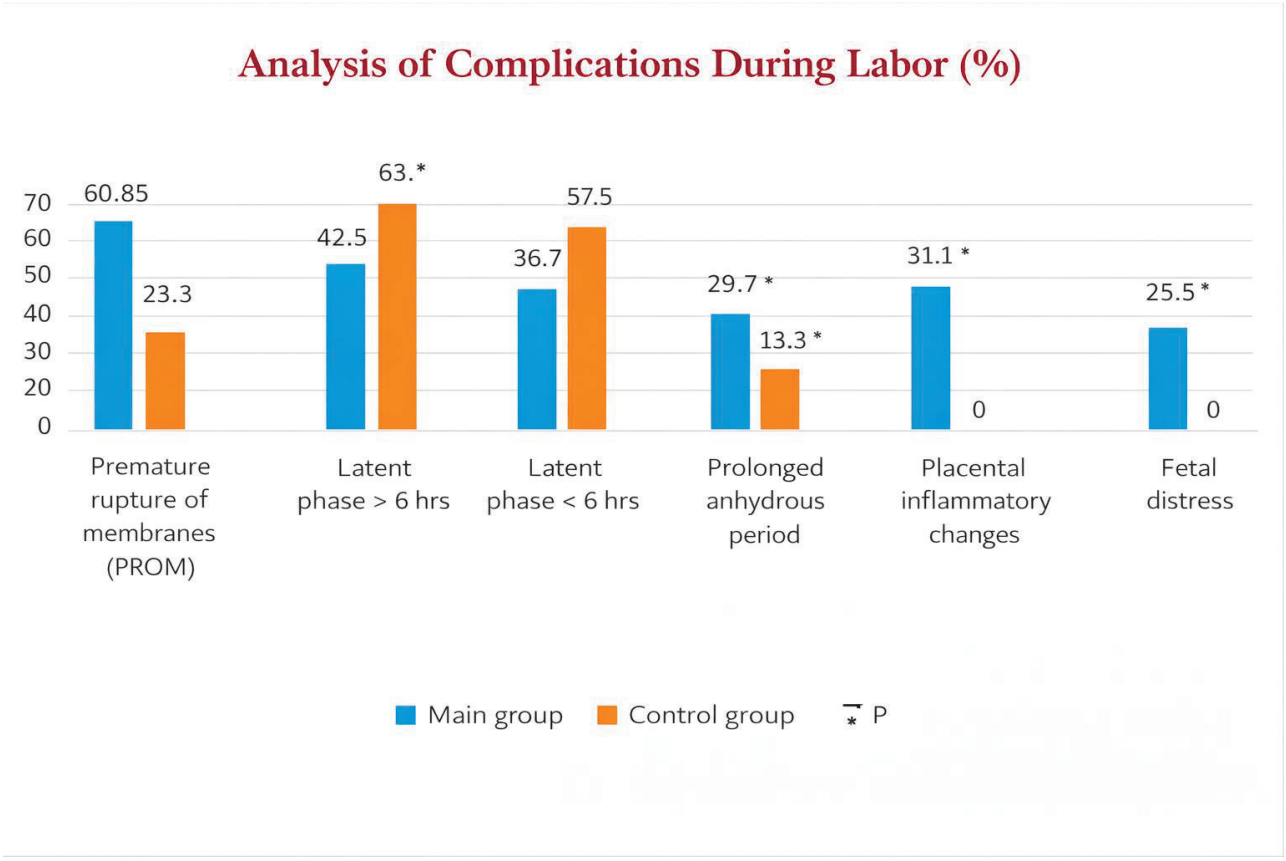


Figure 2. Analysis of complications during labor (%)

The results of the relative risk analysis for women in both groups are presented in Table 3.10.

Complications in the third stage of labor were more frequently observed in the main group. Manual examination of the uterine cavity walls and removal of retained placental tissue due to placental defects were performed in 57 (26.9%) women in the main group and in 3 (10%) women in the control group.

The volume of blood loss did not differ significantly between the groups: 201±88 ml in the main group and 187±28.2 ml in the control group. No cases of pathological blood loss or postpartum hemorrhage were recorded in either group.

Acute fetal distress as a complication of labor was observed in 54 cases and was statistically significant (p<0.001). Table. Relative Risk Analysis of Labor Complications

Table 2.

Results of relative risk analysis of labor complications

Indicator	Value
Absolute risk in the main group (EER)	0.608
Absolute risk in the control group (CER)	0.233
Relative risk (RR)	2.608
Standard error of RR (S)	0.335
95% CI (lower limit)	1.351
95% CI (upper limit)	5.033
Relative risk reduction (RRR)	1.608
Risk difference (RD)	0.375
Number needed to treat (NNT)	2.666
Sensitivity (Se)	0.949
Specificity (Sp)	0.217

The rate of cervical dilation during labor varied depending on parity: in primiparous women it was 1–1.5 cm per hour, while in multiparous women it did not exceed 2 cm per hour. No significant differences in cervical dilation rates were found between the clinical groups. Cervical dystocia was not observed in any of the clinical groups.

Assessment of neonatal condition

The gestational age of newborns is an important factor in predicting their further development. It is well known that morbidity rates are significantly higher in preterm infants compared to term infants, a fact confirmed by numerous studies.

Analysis of birth outcomes showed that in all newborns, physical development indicators (body weight) corresponded to gestational age (Table 3).

Table 3.

Analysis of anthropometric parameters of newborns in the study groups

Indicator	Main group	Control group	f	T	α
Length	43.88±0.28	43.77±0.62	240	1.972	0.05
Weight	2297.25±45.07	3091.57±48.74			

Analysis of the relationship between birth weight and gestational age showed that in the main group, 5.66% (12) of newborns had very low birth weight, and 24.5% (52) had low birth weight.

Extremely low birth weight (500–1000 g) was recorded in 3.77% (8) of newborns (p<0.001), which was associated with intrauterine growth restriction during pregnancy.

Additionally, in this group, 66.07% of newborns (p<0.001) had a birth weight above 2000 g (Figure 3).

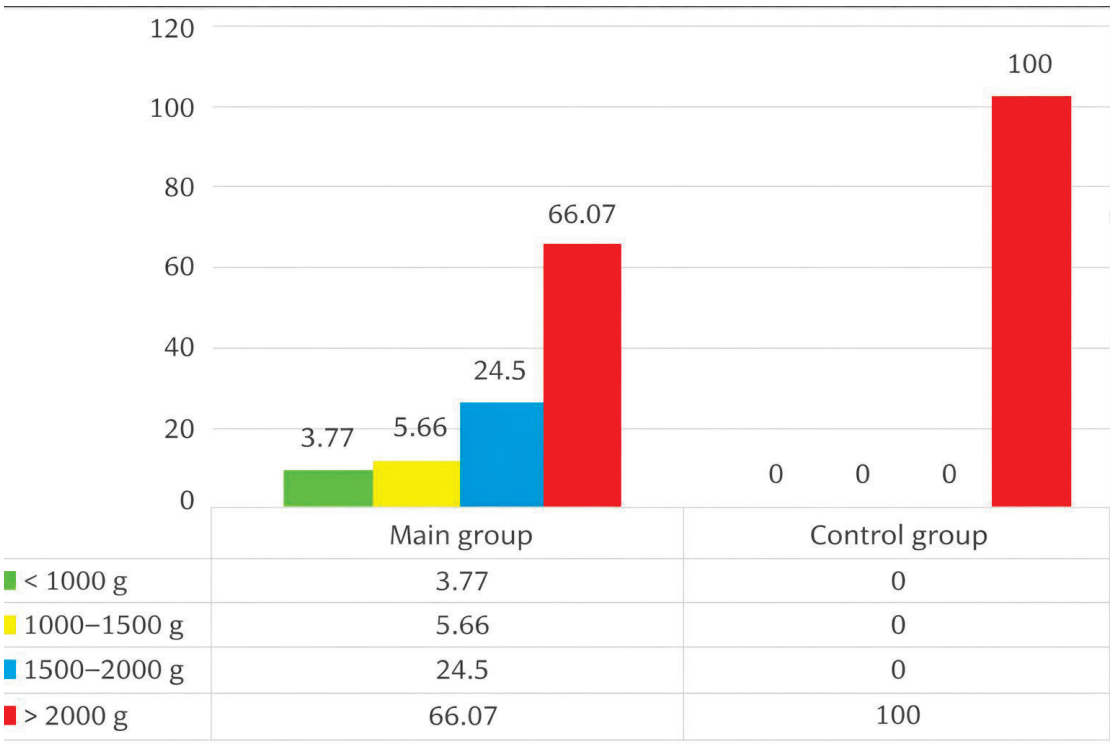


Figure 3. Analysis of newborn birth weight

Most newborns in the control group were assessed at 8–10 points on the Apgar scale, whereas in the main group this показатель ranged from 5–7 points (Table 4).

Table 4.

Assessment of newborn condition according to the Apgar scale (M±m)

Indicator	1 minute	5 minutes	α
Main group	6.89±0.06	7.85±0.07	0.05
Control group	7.13±0.09	7.97±0.13	0.05

A comparative analysis of the postnatal condition of newborns showed that infants born to women in the main group had more severe health conditions compared to those in the control group.

However, 157 newborns in the main group were discharged home in satisfactory condition, while 55 were transferred to the neonatal pathology department. Importantly, all newborns transferred to this department were later discharged in satisfactory condition.

Conclusion

Thus, based on the analysis of the course of pregnancy, labor, postpartum, and early neonatal periods, the following conclusions were drawn:

Among women in the main group, a higher frequency of advanced reproductive age, inflammatory processes, extragenital pathology, and increased risk of miscarriage was identified. These factors showed statistically significant differences and formed a high-risk group among pregnant women in the main group.

In preterm births, complications such as premature rupture of membranes, prolonged anhydrous period, shortened latent phase (<6 hours), and fetal distress ($p<0.0001$) were observed with significantly higher frequency.

In cases of premature rupture of membranes, a statistically significant increase in inflammatory changes in the placenta was observed ($p<0.0001$).

REFERENCES

1. Ahmedova, N. M., & Sattaraliyeva, H. B. (2021). Features of reproductive health in adolescent girls. *Re-health Journal*, 2(10), 33–35.

2. Asrankulova, D. B., & Sattaraliyeva, H. B. (2024). The effect of pharmacotherapy on hormonal and biochemical status in patients with polycystic ovary syndrome. *Journal of Humanities and Natural Sciences*, 11(2), 67–70.

3. Baev, O. R., & Dolgushina, V. F. (2016). Infectious-inflammatory processes in the genesis of preterm birth. *Russian Bulletin of Obstetrician-Gynecologist*, 16(4), 7–14.

4. Baranov, V. S., & Ginter, E. K. (2018). Genetic factors of preterm birth: current perspectives. *Medical Genetics*, 17(5), 20–31.

5. Bastek, J. A., Gomez, L. M., & Elovitz, M. A. (2011). The role of inflammation in the genesis of preterm birth. *BJOG*, 118(2), 133–140.

6. Borovkova, E. I., & Tarasova, N. V. (2019). Immunological aspects of preterm birth. *Journal of Obstetrics and Women's Diseases*, 68(3), 41–50.

7. Buyanova, S. N., & Kuznetsova, I. V. (2014). Stress-associated disorders of pregnancy and preterm birth. *Obstetrics and Gynecology*, 10, 18–25.

8. Chen, J., et al. (2020). Genetic determinants of gestational duration and preterm birth. *PLOS Medicine*, 17(9), 1–15.

9. Cramer, S., & Amin, S. B. (2015). Biomarkers in preterm labor prediction. *Seminars in Perinatology*, 39(6), 468–476.

10. Dolgushina, V. F., & Baev, O. R. (2013). Pathogenesis of premature rupture of membranes. *Obstetrics and Gynecology*, 7, 16–23.

11. Glukhovets, B. I., & Medvedev, M. V. (2015). Morphofunctional characteristics of the placenta in threatened preterm birth. *Archive of Pathology*, 77(3), 21–28.

12. Garmash, E. Yu., & Sidorova, I. S. (2020). The role of cytokines in the pathogenesis of preterm birth. *Obstetrics, Gynecology and Reproduction*, 14(1), 34–42.

13. Guseva, E. V., & Revazova, Yu. A. (2018). Neuroendocrine mechanisms of preterm birth. *Russian Journal of Gynecology, Obstetrics and Perinatology*, 18(5), 12–19.

14. Ivashova, O. N., Lebedeva, O. P., et al. (2014). Antimicrobial peptides in the pathogenesis of infectious complications in obstetrics and gynecology. *Journal of Obstetrics and Women's Diseases*, XIII(5), 73–81.

15. Kan, N. M., & Tyutyunnik, V. L. (2015). Immune regulation of pregnancy and its disorders in preterm birth. *Russian Immunological Journal*, 9(4), 340–348.

16. Knyazeva, T. A., & Babicheva, N. V. (2021). Biochemical markers of preterm birth. *Russian Bulletin of Obstetrician-Gynecologist*, 21(6), 47–54.

17. Kulakov, V. I., & Serov, V. N. (2013). *Obstetrics: National guideline*. Moscow: GEOTAR-Media.

18. Lebedev, V. A., & Melkonyan, M. K. (2018). Fetoplacental insufficiency and the risk of preterm birth. *Obstetrics and Gynecology*, 9, 37–45.

19. Lebedev, N. A., & Sarkisov, D. S. (2019). The role of cortisol and CRH in the pathogenesis of preterm birth. *Journal of Obstetrics and Women's Diseases*, 68(5), 12–20.

20. Makarov, O. V., & Savelyeva, G. M. (2015). *Infectious complications of pregnancy and preterm birth*. Moscow: GEOTAR-Media.

21. Medvedev, M. V., & Glukhovets, B. I. (2016). Placental vascular disorders in preterm birth. *Archive of Pathology*, 78(3), 17–25.

22. Novikova, S. V., & Ovsyannikova, T. V. (2020). Progesterone and cerclage in the prevention of preterm birth. *Obstetrics and Gynecology*, 12, 23–29.

23. Ovsyannikova, T. V., & Rudakova, I. G. (2018). Immune mechanisms of chorioamnionitis and preterm birth. *Russian Immunological Journal*, 12(2), 158–165.

24. Savelyeva, G. M., & Sukhikh, G. T. (2016). *Guide to perinatology*. Moscow: GEOTAR-Media.

25. Serov, V. N., & Tumanova, U. N. (2017). Placental pathology in preterm birth: clinical and morphological analysis. *Obstetrics and Gynecology*, 3, 5–11.

26. Vikhlyaeva, E. M. (2007). *Preterm birth: modern concept of pathogenesis*. Moscow: Medicine.

27. Viryasova, A., Delnova, M. A., & Ruzin, M. P. (2018). Pregnancy and HIV infection: outcomes for mother and fetus, 62–63.

28. Zhukova, N. O., & Solovyova, E. V. (2016). Vaginal microbiocenosis and the risk of preterm birth. *Gynecology*, 18(2), 33–39.

29. Zabolotskikh, I. B., & Petrova, N. S. (2017). Features of respiratory disorders in preterm newborns. *Neonatology*, 5(2), 14–21.