Perinatal risk of premature birth: new obstetric opportunities

Nargiz Shavazi[1*], *Nilufar* Akhtamova, and *Nadejda* Katkova

[1]Samarkand state medical university, 18 Amir Temur ko'chasi, 140100 Samarkand, Uzbekistan

Abstract. Premature birth (PB) is a complex medical and social problem associated with solving problems to improve the quality of subsequent life of children born prematurely and associated material and economic costs. The severity of complications associated with prematurity is proportional to the gestational age of premature birth. Currently, obstetricians face two main tasks: detection of threatening premature birth in order to avoid improper interventions and preparation of the fetus for premature birth with the help of adequate and at the same time safe medications. Most maternal complications develop during pregnancy, and many of them can be prevented or cured. These guidelines describe the impact of premature birth on obstetric complications, diagnostic methods and types of correction of various disorders, as well as the results of the study.

1 Introduction

Premature birth is a public health problem with 15 million premature babies born every year worldwide. Preterm birth is the leading cause of neonatal death and the second most common cause of death in children under 5 years of age.[7].Premature cessation of macro- and micronutrients from the mother to the fetus is combined with the inability of the premature baby to produce the required amount of metabolically essential key nutrients, such as docosahexaenoic and arachidonic acids, causing developmental problems. Therefore, the growth dynamics of most premature babies differs from that of intrauterine fetal growth in the last trimester of pregnancy[9]. In addition, it was assumed that the postnatal growth of preterm infants corresponds to that of fetuses that continued to grow in utero until term and is graphically represented by a convex curve flattened at the right edge. Unlike the above, according to the results of the project (Preterm Postnatal Follow-up Study) . it has been determined that the postnatal growth of preterm infants can be plotted as an ascending curve (up to 42 weeks of gestation) (see animation on the next slide).

The PPFS used a descriptive approach, assessing healthy preterm infants who were well-nourished, free of negative environmental factors and socioeconomic constraints affecting growth. In addition, the study was conducted in 8 centers around the world. This approach assumes that the INTERGROWTH-21st growth standards are generalized regardless of ethnic or geographic differences in populations.

* Corresponding author: dr.nargizedu2020@gmail.com

The World Health Organization (WHO) defines preterm birth as babies born alive before 37 completed weeks of pregnancy. An estimated 14.84 million babies were born prematurely worldwide in 2014, and this number is increasing. The preterm birth rate is 10.6% worldwide, ranging from 8.7% to 13.4% of newborns in different regions. In addition, the rate of preterm birth varies considerably across countries, with an increasing trend in most industrialized countries.

Although more research is needed, current evidence (mostly from observational studies) suggests that accelerated growth of preterm infants to corrected term (adjusted age) is beneficial for neurodevelopment but is associated with a risk of metabolic disorders. in later life, given that "catch-up" growth mainly consists of an increase in body fat mass[11].The nutritional requirement of preterm infants is greater than that of healthy term infants, so they need additional medical care to ensure optimal growth while avoiding undernutrition and overnutrition, both early and later in life. Thus, the early postnatal growth of all newborns, including preterm infants, should be as healthy as possible for their optimal survival and long-term outcomes (Villar J 2015)[12].

Purpose of the study: to study perinatal risks in preterm birth and new obstetric opportunities.

2 Material and research methods

The work was performed in the Regional Perinatal Center of the city of Samarkand in the department of pathology of pregnant women. A total of 700 pregnant women were examined to assess risk factors for the development of PR. 350 birth histories for 2017-2019 were retrospectively analyzed. Prospectively analyzed the initial clinical characteristics, as well as the features of the course of pregnancy. Under our supervision were 350 pregnant women. Pregnant women were included in the study as they were referred. In accordance with the data obtained from the clinical and laboratory examination, the diagnosis made and the criteria for inclusion in the study developed.

Under our supervision were 350 pregnant women. The main group consisted of 250 pregnant women with a gestational age of 28-35 weeks of pregnancy, who were divided into 3 groups according to the history. The control group consisted of 100 pregnant women with a physiological course of pregnancy.

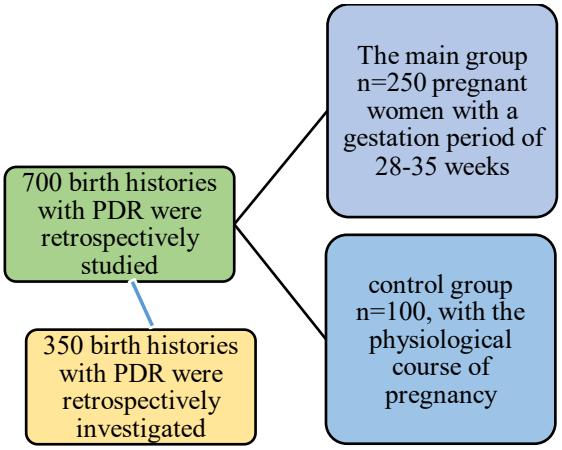

Fig. 1. Design of the formation of clinical groups

The criteria for identifying risk factors in preterm birth (PR) based on the materials of the birth histories were the outcomes of the birth of a retrospective group that was collected by us at the Perinatal Center in Samarkand for 2017-2019.

We studied 350 birth histories of pregnant women who had a preterm birth at 30-34 weeks gestation. When detecting PR, it was found that more often pregnant women complained of the following: frequent stress, bad habits, occupational hazards, age from 18 to 37, a history of a threatened miscarriage, a history of early gestosis, a history of preeclampsia, a history of eclampsia, oligohydramnios, polyhydramnios, PR in history in the short term, and extragenital diseases (EGD).

All pregnant women included in the study underwent a standard set of examinations. In the course of the work, general clinical and special research methods were used: laboratory, instrumental.

Research results

The age of women ranged from 18 to 34 years. More common were 20-24 years old 36.2%, as well as 25-29 years old 32.8%, and less common over 35 years old 4.2% and less than 19 years old 3.1%. According to the social status employees 29.4%, housewives 56.0%, students 14.5% prevailed.

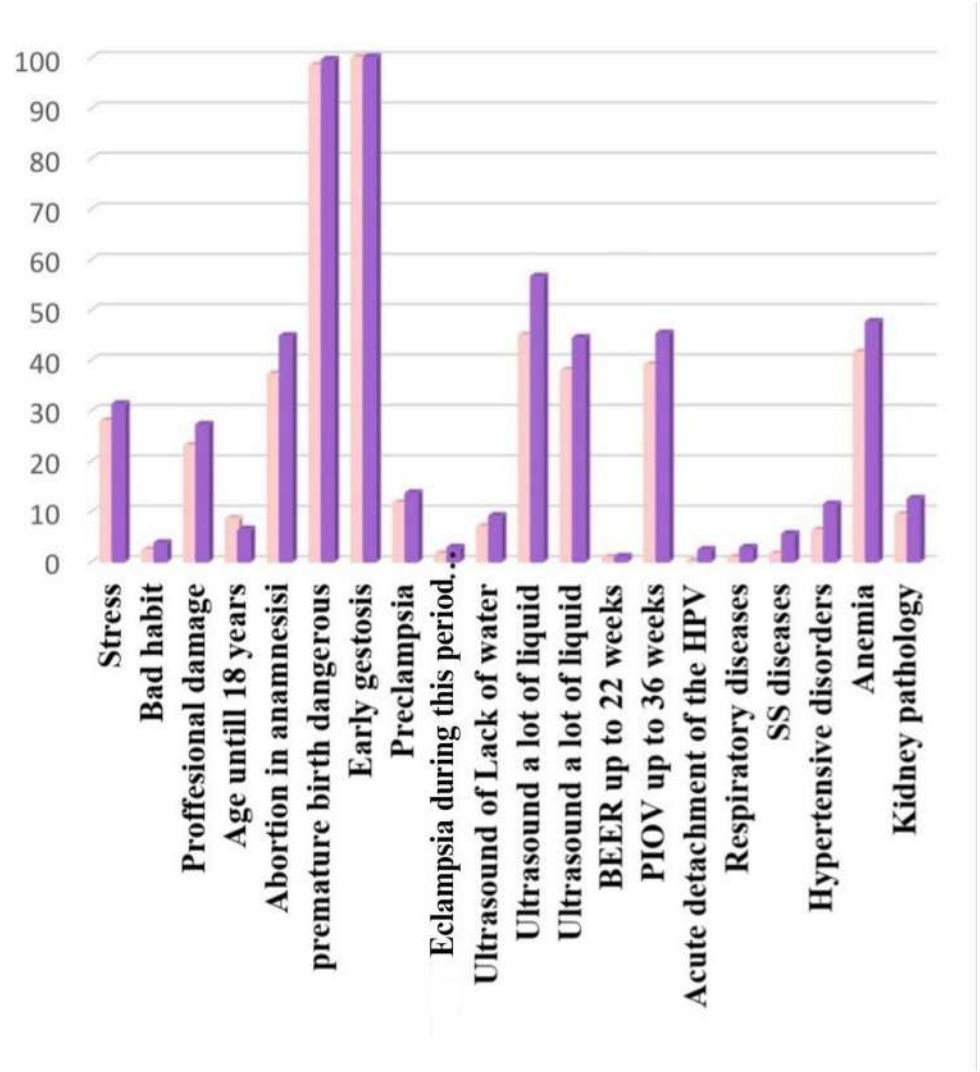

Fig. 2. Analysis of the anamnesis of the examined.

At the same time, in those examined with preterm birth, an increase in the frequency of risk factors was observed in comparison with women with a preserved pregnancy: stress (31.2%), bad habits (3.6%), age under 18 after 30 years (6.33%), history of abortions (44.7%), gynecological diseases (56.5%), threatened miscarriage (99.5%), early preeclampsia (100%), preeclampsia up to 22 weeks (0.90%), preeclampsia up to 36 weeks (45.2%), cardiovascular diseases (5.4%), hypertensive disorders (11.3%). When collecting an anamnesis, it was found that more often pregnant women complained of the following: frequent stress, bad habits, occupational hazards, age up to 18 after 30, a history of the threat of interruption, a history of toxicosis, a history of preeclampsia, a history of eclampsia, oligohydramnios, polyhydramnios, PR in the anamnesis in small terms, and extragenital pathology.

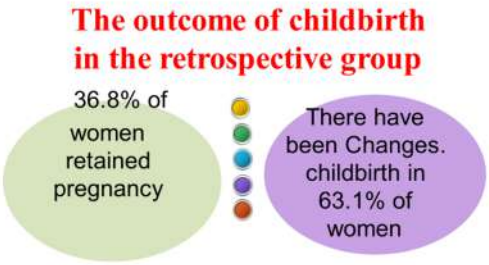

Fig. 3. Outcome of chilbirth

Approximately 55% of all prematurely born children are boys. It should be noted that boys have a disproportionately higher risk of death compared to girls born at the same gestational age.

More than 80% of preterm births occurred between the 32nd and 37th weeks of pregnancy. Most of the children born at this stage of pregnancy survived with the necessary care for the newborn.

A biochemical analysis of the mother's blood and amniotic fluid was also performed.

At the present stage, interest in the indicators of amniotic fluid, which is the immediate habitat of the fetus, has increased, a concept has been put forward about the dominant role of the microenvironment in the life support of the embryo [1,7,9]. The relationship of oligohydramnios with high rates of perinatal morbidity and mortality in the light of the perinatal focus of modern obstetrics determines the relevance of further research. At the same time, one of the insufficiently studied sections in perinatal obstetrics is the pathology of the amniotic fluid, in particular oligohydramnios, characterized by a decrease in the amount of amniotic fluid in the second half of pregnancy, less than 500 ml. Approximately 1/4 of women with oligohydramnios (21.6%) and polyhydramnios (23.9%) have no visible causes of their development.

Morphologically, the complex process of interaction between fetal and maternal tissues has not been studied enough, although it is no less interesting than the formation of uteroplacental relations. After the 16th week, as a result of partial fusion of the membranes, the volume of amniotic fluid (AF) increases rapidly: 16th week - 180 ml; 20th - 350 ml. 22nd-650 ml, 28th 950 ml. During this gestational period, the volume of amniotic fluid increases by an average of 44 ml every week. After the 28th week and until the end of pregnancy, their volume decreases: 30th week - 900 ml, 40th - 750 ml [2].

During the analysis, it was revealed that the amniotic fluid has a slightly alkaline or close to neutral reaction. It has been established that the pH of amniotic fluid during pregnancy up to 12 weeks is relatively high and amounts to 7.32 + 0.03. The amount of mineral substances in AF is 0.71%. They contain all the electrolytes available in the mother's body. Sodium provides the osmotic concentration of AF. In early pregnancy, the sodium level in the amniotic fluid is close to that in the mother's blood. In our study, 40% of women had sodium within normal limits at the start of pregnancy. The osmotic concentration of AF is created, in addition to electrolytes, by other components. These primarily include glucose and urea. The 2nd trimester of pregnancy accounts for the maximum rate of increase in the volume of AF and the most pronounced changes in its biochemical composition. At 15-25 weeks of gestation, there is a gradual decrease in the

pH of AF from 7.17 + 0.004 to 7.14 + 0.04. Simultaneously with an increase in the duration of pregnancy, the content of sodium and potassium in the AF decreases.

Table 1. The composition of amniotic fluid during pregnancy

The composition of amniotic fluid during pregnancy (according to Serov V.N.) N=350		
	II trimester of pregnancy	**III trimester of pregnancy**
Osmolality, mmol/kg	272±4.3	254 ± 16
Sodium, mmol/l	134±3.4	125±5.0
Chlorine, mmol/l	107 ± 1.6	104±3.7
Potassium, mmol/l	4.0±0.1	4.3±0.4
Magnesium, mmol/l	0.6 ± 0.07	0.55 ± 0.17
Calcium, mmol/l	1.9±0.21	1.9±0.34
Urea, mmol/l	4.0±0.8	6.3 ± 1.6
Creatinine, mmol/l	88 ± 12.0	192 ± 44.0
Lipids, mmol/l	121.6	138.2
Glucose, mmol/l	2.0±0.4	1.5±0.5
Total protein, g/l	8.0±4.0	3.0±1.0
Albumins, g/l	5.0±3.0	2.0±1.0
pO2, mm Hg Art.	48.2±0.5	43.0±1.2
HCO3, mmol/l	16.5±1.6	13.5±5.0

Based on multiple studies and the information content of the biochemical composition of blood and AF, we carried out a biochemical analysis of all indicators. Based on the obtained results, we would like to note that in the blood and in the AF, the changed parameters were similar. I noticed a change in urea, which was observed in 70% of women in the period of 28-35 weeks.

Table 2. The dependence of the state of the fetus on the composition of the anterior amniotic fluid in parturient women

The dependence of the state of the fetus on the composition of the anterior amniotic fluid in parturient women (according to E.V. Melnik and others)		
index	satisfactory condition of the fetus	fetal distress
Total protein, g/l	7.25 (3.90–11.65)	4.0* (1.80–8.30)
Glucose, mmol/l	0.5 (0.58–1.16)	0.3 (0.52–1.33)
Urea, mmol/l	5.51 (5.16–7.60)	5.48 (4.36–7.87)
Creatinine, μmol/l	166.80 (136.15–199.05)	182.80 (140.00–208.50)
Alanine aminotransferase, U/l	4.00 (1.95–6.60)	4.30 (1.10–4.30)
Aspartate aminotransferase, U/l	44.25 (25.45–113.35)	31.00 (14.10–60.00)
Alkaline phosphatase, U/l	303.85 (150.00–425.95)	492.20 (156.10–777.20)
Gamma-glutamyltransferase, U/l	60.05 (30.25–102.30)	31.0* (24.00–54.70)

Alpha-amylase, U/l	109.8 (148.65–297.25)	150.60* (77.90–181.90)
Uric acid, μmol/l	302.00 (293.50–448.50)	401.00 (280.00–410.00)
Cholesterol, mmol/l	0.33 (0.18–0.48)	0.10 (0.08–0.46)
Triglycerides, mmol/l	0.25 (0.08–0.42)	0.10* (0.01–0.15)
Low density lipoproteins, mmol/l	0.19 (0.07–0.26)	0.16 (0.06–0.26)
Pancreatic amylase, U/l	18.50 (7.40–18.10)	7.0 (6.00–11.60)
High density lipoproteins, mmol/l	0.05(0–0.01)	0.00 (–0.01–0.01)
Albumin 1, g/l	1.70 (0.60–2.90)	1.9 (0.40–2.10)
Antistreptolysin O, U/ml	23.00 (13.00-29.00)	13.0 (6.00-21.00)
Lactate dehydrogenase, U/l	1200.75 (559.0–2346.2)	896.20 (388.7–1512.3)
Iron (Fe), μmol/l	5.46 (2.97–9.29)	2.76* (2.07–4.48)
Magnesium (Mg), mmol/l	0.6 (0.60–0.78)	0.2 (0.58–0.88)
C-reactive protein, mg/l	4.40 (2.35–6.20)	4.85 (2.90–6.20)
Ultrasensitive C-reactive protein, mg/l	0.1 (0–0.40)	0.19 (0.10–0.20)
Immunoglobulin A (Ig A), g/l	0 (0.00–0.30)	0.00 (0.00–0.10)
Immunoglobulin G (Ig G), g/l	0.52 (0.29–1.55)	0.85 (0.29–3.34)

Thus, during the 2nd trimester of normal pregnancy, after the formation of the anlages of the main organs and systems of the embryo, their further growth, specialization of functions and the formation of interorgan connections take place. At the same time, fetal membranes are formed and the volume of AF rapidly increases around the fetus, that is, a paraplacental transport path is formed. In the placenta, the differentiation of stem and intermediate branches continues. In general, the amniotic structures provide morphological and functional capabilities for the rapid growth of the fetus, which at 16-17 weeks ahead of the weight of the placenta and in the future is no longer inferior to it "palm" [3,5].

At the end of pregnancy, the total area of the membranes is 1.64 + 0.22 sq.m; three parts are distinguished among them: the parietal part (extraplacental membrane, the actual fetal membranes); part of the membranes above the placenta, placental amnion; umbilical part, or umbilical cord epithelium [5,11].

In our study, the excretion of amniotic fluid acidosis was from 9.5 - 12.5 in the early stages and up to 12.8-15.2 at the 36th week of pregnancy

Clinical observations and data from experimental studies of the level of glycogen in the liver of the mother and fetus indicate a preferential transplacental transport of glucose. Along with this, it is impossible to exclude the use by the body of the fetus of its own sources of glucose formation. A high maternal-fetal glucose gradient in some observations is most likely associated with the use of endogenous glucose by the fetus as an energy product, and with a delay in its transport from the mother's body during labor [4,6].

Of interest is the assessment of the urea content in the mother-fetus system. In the mother's blood at the time of the birth of the child, the average urea content does not differ significantly from that in cord blood and varies within relatively small limits - from 6.39 to 3.0 mmol / l. The concentration of urea in the amniotic fluid (6.9±0.56 mmol/l) in all cases increases its level in the cord blood and in the mother's blood [8,12].

According to various authors, the amniotic fluid contains all fetal metabolites, but an excess of such metabolic products as urea, carbon dioxide, lactate, potassium, chlorides and

hydrogen ions are more actively excreted transamnially. This is facilitated by the lowest osmotic concentration of amniotic fluid compared to the blood of the mother and fetus and the low content of Na+. It has been established that amniotic fluid plays a certain role in supplying the fetus with oxygen, as evidenced by the high Po2 values of the amniotic fluid (Po2 value is 2 times higher than in cord blood, and 1.5 times higher than in the mother's capillary blood) [8,12].

All pregnant women who had an increase in uric acid were prescribed Canephron tablets 3 times a day for up to 2 months.

After the use of 1 month of this drug, a second analysis was carried out specifically for the content of uric acid. The result of the analysis was in favor of the pregnant woman; the decrease in the concentration of uric acid was placed from 70% to 40%.

The next task before us was the question of the method of delivery of a pregnant woman with preterm labor that had already begun, taking into account complications or the mother's consent to a caesarean section.When considering perinatal outcomes at 34-36 weeks of gestation, vaginal births were 1.3 times less likely to have hypoxia at birth, and the incidence of respiratory distress syndrome (RDS) was significantly lower (4.45% and 13.79%; $p < 0.01$; RR 3.9; 94% CI 1.420-8.823). However, in no case was there a need for mechanical ventilation - only auxiliary ventilation modes CPAP were used.

Also, there were no differences in the frequency of IVH, and it did not exceed 0.6%. The length of stay in the intensive care unit (ICU) did not differ.

Perinatal outcomes at 31–33 weeks of gestation SDR was 2.4 times more common in children born by caesarean section (56.2% vs. 28.5%; $p < 0.05$; RR 1.30; 96% CI 1.294 - 3.601

Also, none of the children required mechanical ventilation. The frequency of cerebral depression did not differ between the groups, and intraventricular hemorrhages were diagnosed 2 times more often in children born through the natural birth canal (4.41% and 2.08%; $p > 0.05$; RR 2.12; 95% CI 0.027-19.75), however, these differences were not statistically significant. The average length of stay of children in the intensive care unit and intensive care unit also did not differ and amounted to 7.6 and 8.2 days, respectively.

Perinatal outcomes at 28-30 weeks of gestation were of most interest given the immaturity. Almost 80% required mechanical ventilation. The frequency of cerebral depression did not differ between groups, and intraventricular hemorrhages were diagnosed 4 times more often in children born through the natural birth canal (5.41% and 5.08%; $p> 0.05$; RR 4.12; 95% CI 0.027-19.75), however, these differences were not statistically significant. The average length of stay of children in the intensive care unit and intensive care unit also did not differ and amounted to 20.6 and 22.2 days, respectively.

Thus, our study of perinatal outcomes of PR, depending on the tactics of delivery, showed that premature babies at 34-36 weeks 6 days have a very low incidence of IVH (0.58%) and it does not depend on the method of delivery. However, the frequency of SDR is significantly higher (3.7 times) in children born by caesarean section. Thus, we can say that the optimal method of delivery for premature babies at 34-36 weeks 6 days is vaginal delivery.

At 28-30 weeks, all newborns develop SDR and all children require respiratory support. We did not find a significant difference between the required ventilation parameters (IVL and CPAP) and the method of delivery. At the same time, the frequency of IVH was 2.5 times higher in children born through vaginal delivery (5.41% and 5.08%; $p> 0.05$; RR 4.12; 95% CI 0.027-19.75) When calculating the relative risk, it was found that in the case of vaginal delivery at 28-30 weeks, the risk of IVH is increased by 2.5 times than with a cesarean section, and the frequency of IVH reaches almost 15%.

3 Conclusions

Thus, the study of the amount of amniotic fluid and their physicochemical properties is of great importance in the formation of the biophysical profile of the fetus, the timely detection of metabolic disorders, as well as in the choice of tactics for managing pregnancy and childbirth and the prevention of perinatal pathology. Our study allowed us to conclude that the optimal method of delivery for premature newborns at terms of 28-30 weeks is delivery by caesarean section, which will reduce the frequency of intraventricular hemorrhages and lead to a decrease in perinatal and pediatric morbidity. After 31 weeks, vaginal delivery is the optimal method of delivery.

References

1. L. S. Abdullaeva, On the issue of prevention of obstetric bleeding in the syndrome of an overgrown uterus, Yangi uzbekistonda milliy tarakkiyot va innovasiyalar, 338-342 (2022)
2. R. Anderson, S. Daher, L. Regan, M. Al-Memar, T. Born, D. A. McIntyre, R. Rai, O. B. Christiansen, M. Sugiura-Ogasawara, J. Odendal, A. J. Devall, P. R. Bennett, S. Petru, A. Coomarasami, Issues of miscarriage: the epidemiological, physical, psychological, and economic costs of early pregnancy loss., Lancet. May 1, **397(10285)**, 1658-1667 (2021)
3. O. F. Akhtamova, Antiphospholipiid syndrome and a mistruction, Uzbek medical journal, 3(4) (2022)
4. S. A. Tilyavova, Modern approaches to the diagnostics and treatment of urinary disorders in premenopause women, Uzbek medical journal, **3(3)** (2022)
5. A. O. Fozilovna, Kh. D. Rakhimovna, Antiphospholipiid syndrome and the mission of pregnancy, umuminsoniy va milliy kadriyatlar: til, talim va madaniyat, **1**, 13-15 (2022)
6. D. R. Khudoyarova, Z. A. Shopulotova, Optimization of the management of pregnant women with chronic pyelonephritis, Uzbek medical journal, **3(3)** (2022)
7. N. N. Shavazi, P. B. Alimova, Modern aspects of obstetric bleeding (review of literature), Journal of reproductive health and damage-nephrological research, **3(2)** (2022)
8. B. H. Al Wattar, J. A. Tamblyn, W. Parry-Smith, et al., Management of obstetric postpartum haemorrhage: a national service assessment of current practice in the UK. Risk Manag Healthc Policy, 10, 1-6 (2017)
9. N. N. Shavazi, Z. B. Babamuradova, The ratio of pro- and antiangiogenic factors in the pathogenesis of preterm labor in pregnant women against the background of undifferentiated connective tissue dysplasia, European Research: innovation in science, education and technology, 93-96 (2020)
10. N. A. Akhtamova, N. N. Shavazi, Prediction of obsetric blood loss in women with preterm birth (literature review), Uzbek medical journal, **3(5)** (2022)
11. N. N. Shavazi, et al., Total gisterektomiyaning subtotal gisterektomiyadan ustunvorligini tahlillash, Journal of biomedicine and practice, **7(3)** (2022)
12. S. N. Nuraliyevna, J. M. Dilshodovna, Morphofunctional structure of the placenta in premature labor, Galaxy International Interdisciplinary Research Journal, **10(4)**, 381-384 (2022)