

CLINICAL RESEARCH

## Outcomes of Premature Birth in Women Having High Factors for Perinatal Risks

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### Abstract

Questions regarding the method of delivery in the case of preterm pregnancy have always been and will remain topical. Birth trauma continues to be one of the main causes of perinatal mortality among preterm infants, caused mainly by inadequate premature birth management. The choice of the optimal tactics of their management including an allowance for perinatal risk is a major factor in improving newborns health rate.

**Keywords:** premature birth; infection; cesarean section; perinatal risk factors.

### Introduction

Every year about 15 million babies are born prematurely, of whom more than 1 million die within the first year of their life, and among those that survive, unfortunately, many suffer with disabilities. Various influences during childbirth cause injurious effects in those children born prematurely [1,2]. Prematurity ranks first in the hierarchy of perinatal mortality: 60-70% of which include early neonatal mortality and 70-75% of which involve infant mortality, with up to 8-13 times more stillbirth during the time of preterm labor than at the time of childbirth [3,4].

Premature birth rate is about 12-13% in the USA and 9.5% in other developed countries; however, the rate of preterm birth has increased, mainly due to the rise in artificially conceived multiple pregnancies [5]. According to data by WHO and UNICEF, the mortality rate among children under five years declined from 12 million cases in 1990 to 7.6 million cases in 2010, constituting 5-12% of the population, and in the developed countries the figures tended to grow [5,6]. While prenatal therapy, corticosteroids, tocolytic and antibiotic therapy help to reduce the incidence of perinatal morbidity

and mortality, the incidence of premature birth continues to increase [7]. Questions regarding method of delivery to be employed under incomplete pregnancy becoming relevant and are hotly debated. Birth trauma is one of the main causes of perinatal mortality among the preterm infants, which is mainly due to the inadequate management of preterm labor.

In the Russian Federation clear recommendations and indices to perform cesarean section under incomplete pregnancy have not yet been developed. The National Guide to Obstetrics, published with the participation of the leading Russian specialists, recommends determining individually the indices for abdominal delivery under preterm labor [8]. However, there is no particular recommendation on how to take into account the degree of perinatal risk in selecting the best method of early delivery during premature birth.

**The objective** of this study was to evaluate the outcomes of premature birth in women with high perinatal risk, depending on the method of delivery.

### Material and Methods

A retrospective research was conducted using 126 premature birth stories at the time of gestation from 26 to 36 weeks on the clinical basis of CMH № 29 n.a. N.E. Bauman in Moscow and a maternity hospital in Mytishi.

Delivery histories were divided into three cohorts by gestation term: the 1<sup>st</sup> cohort: 26-28 weeks, the 2<sup>nd</sup> cohort:

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29-32 weeks, the 3<sup>rd</sup> cohort: 33 - 36 weeks. Each cohort was further divided into two groups – vaginal delivery and by Cesarean section.

1 <sup>st</sup> cohort		2 <sup>nd</sup> cohort		3 <sup>rd</sup> cohort	
Group 1 (vaginal delivery)	Group 2 (operative delivery)	Group 1 (vaginal delivery)	Group 2 (operative delivery)	Group 1 (vaginal delivery)	Group 2 (operative delivery)
18	15	23	24	26	20

Specification of the degree of perinatal risk was performed based on the scale developed by O.G. Frolova and E.I. Nikolaeva and modified by V. Radzinsky. Premature birth methods and their outcomes, as well as a histological evaluation of the placentae were assessed.

Results were statistically processed using the *software* package Statistica 8.0 for Windows. We used the Chi-square test to compare observed data. A value of  $P < 0.05$  was considered statistically significant.

## Results and Discussion

All births before 26 weeks terminated in stillbirth or early neonatal mortality, regardless of the methods of delivery employed. However, the proportion of women with high perinatal risk factors is insignificant for reliable analysis.

All the women had a high degree of perinatal risk prior to childbirth. In the third cohort medium and high degree of premature births were encountered, although a significant effect on birth outcomes provided intrapartum gain (in the

ratio of the total points of intrapartum risk factors to the total points of prenatal factors, expressed in %); however, there were not as many intrapartum factors as evident during urgent delivery, and their influence on the outcome of preterm birth is vital, even if there is only a small increase in their number. The most significant factors in the study cohort are presented in Table 1.

In the 1<sup>st</sup> cohort, birth ended most often vaginally. Factors of perinatal risk ranged from 25 to 34 points, and intrapartum gain was observed in 42%. In 60% of the cases, the delivery was conducted under peridural anesthesia (PDA); in 35% of the pregnant women, the process of uterine contractions proceeded without anesthesia, and in 5% pudendal anesthesia was used. On studying childbirth performed without EDA, it was observed that twice as many infants had IVH, the hypoxic-ischemic effect of CNS, and the worst adaptation period (Table 2). Prevention of respiratory distress syndrome (in the 1<sup>st</sup> and the 2<sup>nd</sup> cohorts) was performed with Diprosan in 20% of the patients and with dexamethasone in 80%.

The perinatal mortality rate was 7.22% (5- vaginally and 3- by cesarian section). None of the babies could latch on. Babies with 1000g and more birth weight had authentically good indices in the early neonatal period (and when subjected to CPAP earlier on, showed a positive trend in weight, lower mortality, but not morbidity) compared with those infants weighing less than 1000g, as the data are unreliable and there is high mortality in such cases.

Placenta weight was  $180 \pm 15$ g. Under histological examination, purulent chorioamnionitis, endarteritis and leukocytic thrombi in the blood vessels of the umbilical cord became perceptible significantly more often (52%), as well as

**Table 1.**

*Perinatal risk factors often found in the cohorts analyzed*

Variable	1 <sup>st</sup> cohort	2 <sup>nd</sup> cohort	3 <sup>rd</sup> cohort	P		
	%, 95% CI	%, 95% CI	%, 95% CI	1-2	1-3	2-3
Over the age of 30	98 (91.1÷100.0)	76 (64.5÷88.7)	88 (77.2÷96.7)	0.0120	0.1225	0.1962
Tobacco smoking	67 (50.6÷82.8)	67 (52.4÷79.5)	48 (33.4÷62.3)	0.9473	0.0964	0.0774
Early sexual activity	48 (31.4÷65.5)	41 (26.4÷54.5)	32 (19.1÷46.2)	0.4744	0.1541	0.4339
Inflammatory diseases of the pelvic organs	75 (61.1÷90.4)	67 (52.4÷79.5)	54 (40÷68.7)	0.3464	0.0515	0.2528
Therapeutic abortion (misbirth or induced miscarriage)	65 (47.2÷80)	74 (62÷86.9)	72 (58.7÷84.8)	0.2980	0.4451	0.7666
Premature birth in past history	15 (2.9÷27.4)	12 (3.2÷22.3)	7 (-0.6÷13.7)	0.7604	0.2099	0.3085
<b>Intranatally:</b>						
Virus infection	35 (20÷52.8)	25 (13.1÷38)	23 (11.6÷36.2)	0.2980	0.2296	0.8564
Aggravation of urogenital infections	36 (20÷52.8)	33 (20.5÷47.6)	14 (3.3÷22.8)	0.8303	0.0148	0.0172
Preeclampsia	65 (47.2÷80)	58 (43.3÷71.6)	62 (49.1÷77)	0.5780	0.9570	0.5814
Fetal growth retardation	18 (5÷31,3)	24 (11.3÷35.5)	22 (9.8÷33.7)	0.5740	0.6980	0.8477
Oligohydramnios	5 (-2.1÷14.2)	10 (1.8÷19.5)	7 (-0.6÷13.7)	0.4756	0.9338	0.4790
Polyhydramnios	8 (-0.7÷18.9)	6 (-0.6÷13.4)	5 (-1.5÷10.2)	0.6508	0.3932	0.6635
Acute fetal hypoxia	16 (2.9÷27.4)	20 (7.9÷30.4)	12 (3.3÷22.8)	0.6432	0.7895	0.4235
Prenatal outpouring waters	62 (43.9÷77.3)	54 (38.9÷67.5)	38 (23÷50.9)	0.5105	0.0378	0.1157
Chorioamnionitis	38 (22.7÷56.1)	29 (16.7÷42.9)	11 (1.9÷19.9)	0.3710	0.0029	0.0237

immaturity of the terminal villi (29%) and acute circulatory disturbance (9%). At the same time, antibiotic therapy was practiced among women with prenatal breaking of the waters. Three pregnant women and newborns (according to results of bacterial inoculation for flora of the cervix, ears and anus) had *E. coli*, which was not sensitive to any antibiotics.

**Table 2.**

**Health status of the preterm infants and resuscitations of the 1<sup>st</sup> cohort**

Variable	Group 1 %, 95% CI	Group 2 %, 95% CI	P
Severe asphyxia	22.9(0.2÷46)	22.0(-0.2÷40.2)	0.8431
Moderate asphyxia	45.3(19.1÷73.3)	27.1(4.3÷49)	0.2831
Mild asphyxia	31.8(5.7÷55.9)	50.9(28.1÷78.6)	0.2289
Small-for-date fetus	30.2(5.7÷55.9)	59.7(35.2÷84.8)	0.1219
Respiratory distress	94.8(77.8÷100)	94.0(80.7÷100)	0.9163
Asphyxia / hypoxia	100(84.3÷100)	100(100÷100)	1.000
Intrauterine infection	90.2(77.8÷106.8)	49.3(21.4÷71.9)	0.0099
Intraventricular hemorrhage	87.79(65÷100)	45.5(21.4÷71.9)	0.0366
Artificial lung ventilation	41.9(12÷64.9)	57.99(35.2÷84.8)	0.2556
CPAP	100(84.3÷100)	100(100÷100)	1.000

**Table 3.**

**Health status of the preterm infants and resuscitations of the 2<sup>nd</sup> cohort**

Variable	Group 1 %, 95% CI	Group 2 %, 95% CI	P
Severe asphyxia	15.2(1.9÷32.9)	10.1(-2.7÷19.4)	0.3559
Moderate asphyxia	54.8(36.3÷76.8)	35.4(18.1÷56.9)	0.1902
Mild asphyxia	29.9(11.6÷49.2)	45.5(25.9÷65.8)	0.2766
Small-for-date fetus	57.1(36.3÷76.8)	55.2(34.2÷74.1)	0.8717
Respiratory distress	90.5(79.8÷102.8)	92.6(80.6÷102.7)	0.9647
Asphyxia / hypoxia	100(87.1÷100)	77.4(62.9÷95.4)	0.0156
Intrauterine infection	87.2(73.2÷100.7)	28.5(11÷47.4)	0.0000
Intraventricular hemorrhage	78.1(61.4÷95.1)	28.2(11÷47.4)	0.0003
Artificial lung ventilation	37.4(19.2÷59.1)	42.2(21.9÷61.4)	0.8601
CPAP	100(87.1÷100)	100(88.3÷100)	1.000

In the 2<sup>nd</sup> cohort, the factors of perinatal risk ranged between 30 and 38 points, and intrapartum gain was observed in 34%. Cesarean section with removal of the infant in the fetal membranes significantly reduced the risk of fetal trauma even in the high perinatal risk group, although it was not guaranteed in contrast with vaginal delivery. A significant increase in neonatal morbidity and perinatal mortality was observed (Table 3). On comparing outcomes, it was authentically noted that after the surgical delivery the infants were ventilated up to 24h and then up to 6 days on CPAP. Whereas after vaginal delivery children were ventilated up to 120 hours, and were then subjected to CPAP. Severity of the infant's state was conditioned by the severe RDS, the hypoxic-ischemic effect of CNS in 100% of newborns.

Births were conducted without anesthesia in 30% of the cases, and under EDA in 60%. On examining the infants delivered without EDA, significantly IVH was observed more frequently, with the hypoxic-ischemic affect of CNS, and the worst adaptation period. During delivery, where the EDA was not applied, antispasmodic drugs were used. Prevention of RDS was done using dexamethasone, but in 10% prevention was not performed. Among these infants 15% of the infants with a body weight of more than 1,500.0g were found to latch on.

Placenta weight was 230±30 g. Under histological examination, purulent chorioamnionitis, endarteritis and leukocytic thrombi in the blood vessels of the umbilical cord became perceptible significantly more often (38%), as well as immaturity of the terminal villi (39%), acute circulatory disturbance (7%), and placental angiopathy (16%).

In the 3<sup>rd</sup> cohort, the factors of perinatal risk ranged from 32 to 46 points, and intrapartum gain was observed in 30%. Cesarean section in the 3<sup>rd</sup> cohort of perinatal morbidity under operative delivery was significantly lower compared with that due to the vaginal delivery, especially noted when extracting the infant in the fetal membranes. After surgical delivery, the infants were ventilated from 24h to 48hours – taking into account the indices based on the type of operative delivery that was performed, and in 45% intranatal gain was observed which probably affected the state of the newborns. They were then subjected to 1-2 days of CPAP, and 75% were discharged home; only 25% were transferred to the Pathology Department of Newborns. 87% of the infants were found to latch on.

Deliveries were conducted without anesthesia in 20% (among them 5% pudendal anesthesia was applied in the 2<sup>nd</sup> period), and in 80% under the EDA.

Placenta weight was 230±30 g. Under histological examination, purulent chorioamnionitis, endarteritis and leukocytic thrombi in the blood vessels of the umbilical cord became perceptible significantly more often (34%), as well as immaturity of the terminal villi (45%), acute circulatory disturbance (4%), placental angiopathy (10%), and placental hypotrophy (7%). Table 4 shows the health status of preterm infants of the 3<sup>rd</sup> cohort.

**Table 4.**

**Health status of the preterm infants and resuscitations of the 3<sup>rd</sup> cohort**

Variable	Group 1 %, 95% CI	Group 3 %, 95% CI	P
Severe asphyxia	10.3(-0.7÷23.8)	5.1(-3.5÷11.2)	0.4353
Moderate asphyxia	24.9(6.9÷39.3)	21.5(1.5÷29.3)	0.8020
Mild asphyxia	64.8(47.1÷83.7)	74.2(38.7÷76.7)	0.4823
Small-for-date fetus	37.4(19.8÷57.2)	15.8(-0.7÷23.8)	0.0798
Respiratory distress	64.3(47.1÷83.7)	20.6(1.5÷29.3)	0.0022
Asphyxia / hypoxia	97.2(88.8÷100)	35.7(9.9÷44)	<0.0001
Intrauterine infection	76.1(60.7÷93.1)	15.4(-0.7÷23.8)	<0.0001
Intraventricular hemorrhage	73.9(56÷90.1)	10.0(-2.6÷17.9)	<0.0001
Artificial lung ventilation	34.5(16.3÷52.9)	8.2(-2.6÷17.9)	0.0523
CPAP	92.1(82.1÷100)	64.7(30.8÷69.2)	0.0206

In all the groups, bacterial inoculation for flora from the canalis cervicis uteri was noted: 16% Staphylococcus epidermidis, 25% Enterococcus faecalis, 17% Esherichia coli, 14% Candida sp. 14%, and 28% b-hemolytic streptococcus, significantly determined under bacterial inoculation of the newborns.

## Conclusion

Perinatal morbidity in the case of abdominal delivery of women with high perinatal risks was authentically lower than under the vaginal birth of such women. Using a modified Table of perinatal morbidity prognostication enables an enhancement in the accuracy of determining the severity of perinatal risk, to select the suitable method of adequate anesthesia and optimal delivery procedures, thus improving the perinatal outcome.

## Competing interests

The authors declare that they have no competing interests.

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