

## Analysis Of The Specificity Of Antenatal And Intrapartum Risk Factors In Newborns With Intrauterine Hypoxia

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### Abstract

The medical community is unswervingly joining forces to address issues of maternal and child health, acquiring against the background demographic problems of our time, political and social significance [1, 4, 19]. At the heart of many conditions that complicate the course pregnancy and childbirth, is universal for the fetus and newborn damaging factor - hypoxia, which disrupts the flow of basic volatile processes, triggering a complex of pathological endogenous reactions contributing to the development of multiple organ dysfunction [4, 5, 15].

**The purpose of the study.** Analysis of antenatal and intrapartum risk factors in mothers of infants born with intrauterine hypoxia based on the history of pregnancy and childbirth.

**Research material and methods.** The study was conducted on the basis of anamnesis of pregnancy and childbirth in mothers of 40 newborns who underwent intrauterine hypoxia and were born physiologically and surgically. The age, social status and bad habits of mothers were studied. Mothers of 10 healthy babies were selected for control.

**Results.** The data obtained show a higher concentration of negative factors in women whose children underwent hypoxia and were forced to be removed by CS, and also agree with modern ideas about the negative impact of the pathology of the reproductive sphere in the mother in the form of chronic inflammatory diseases, hormonal disorders, specific infections, previous medical abortions. that pose a threat to gestation and the formation of healthy offspring

**Keywords:** Newborn, Postnatal Dysadaptation, Intrauterine Hypoxia, Cesarean Section

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One of the recognized measures to reduce perinatal losses is delivery by caesarean section (CS) [8, 19]. In the last years, the proportion of children born by CS is steadily increasing, including due to repeated deliveries by CS, and in a number of perinatal centers reaches 40% - 50%, although according to the recommendation of WHO experts, the frequency of CS should not exceed 10-15%. It is known that

technical difficulties in during operative delivery can contribute to the development of newborn aspiration syndrome, birth trauma of the spinal cord, and also other pathology, especially when removed for emergency indications [2,3,6]. Impact on the fetus of anesthetic benefits, given to the mother, especially total anesthesia, can cause newborn cardiorespiratory depression not only in the first hours, but even during several days of life.

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**Results.** In order to identify risk factors that negatively affected the condition of newborns who underwent intrauterine hypoxia, an analysis of the antenatal and intrapartum periods was carried out according to the anamnestic data of pregnancy and childbirth of their mothers. The age of the women included in the study was, on average, comparable. The representation of the age category over 35 years old in the comparison groups was 23.7% and 21% ( $p > 0.05$ ) and had only a tendency to a higher frequency than in the control group (15.7%), which is a reflection of the current trend of reproductive behavior of women. The analysis of social factors showed in the comparison groups a higher and comparable frequency of secondary vocational education (61% and 56.2%,  $p > 0.05$ ) in the comparison groups, which probably explains the lack of awareness of the studied women in the field of antenatal prophylaxis of intrauterine fetal hypoxia and can be considered a risk factor for the development of postnatal dysadaptation ( $F = 5.63$ ,  $p = 0.011$ ). Among women whose children underwent intrauterine hypoxia, a high frequency of smoking was shown, which significantly distinguished them from women in the control group ( $p = 0.0001$  and  $p = 0.0001$ ). The highest frequency of tobacco smoking was noted in group I (56.8% versus 43.8%,  $\chi^2 = 7.26$ ,  $p = 0.007$ ), especially among women delivered by cesarean section at 35-37 weeks (91.4% versus 65%, 20.83,  $p = 0.0002$ ). The significance of the revealed negative factor in the development of dysadaptation of a newborn child was determined ( $F = 9.14$ ,  $p = 0.002$ ). In our sample, half of the women who gave birth to children with intrauterine hypoxia lived in rural areas (49.5% and 51.9%,  $p > 0.05$ ), which is explained by the status of the republican perinatal center, on the basis of which the study was carried out. All women whose children underwent intrauterine hypoxia show a complicated obstetric and gynecological history. In the comparison groups, more than half of the women had repeated pregnancies (54.4% and 59.4%,  $p > 0.05$ ), but the frequency of 3 or more pregnancies was higher in women of group I (20% versus 12.4%,  $\chi^2 = 4.57$ ,  $p = 0.033$ ), especially those who gave birth at 35-37 weeks (35.2% versus 20%,  $\chi^2 = 5.46$ ,  $p = 0.019$ ). Repeated births in the

comparison groups were registered in 44.2% and 40.5% ( $p > 0.05$ ), however, in group I, the frequency of 3 and subsequent births was significantly lower (2% versus 8.1%,  $\chi^2 = 9, 75, p = 0.002$ ) with significant differences in 2 subgroups ( $p = 0.0002$ ). In women delivered by CS, especially in premature pregnancy, a history of a tendency towards a higher frequency of abortions due to medical abortion (O04) (38.9% versus 34%,  $p > 0.05$ ), spontaneous abortion (O03) (20% versus 18.3%,  $p > 0.05$ ), early fetal death with a delay in the uterus (O02.1) (2.4% versus 0.6%,  $p > 0.05$ ). It was found that in the history of women in group I, repeated cesarean sections were more often recorded (O82.0) - 13.4% versus 2.1% ( $\chi^2 = 17.47, p = 0.0003$ ). A direct correlation was revealed between repeated CS operations in history and placental abnormalities (O43) in this pregnancy ( $r = 0.824, p = 0.002$ ). This factor was allocated to the risk group for the development of postnatal dysadaptation of newborns ( $F = 8.63, p = 0.008$ ). In the comparison groups in women delivered by abdominal route, a higher incidence of inflammatory diseases of the female pelvic organs (N73) was established - 33.4% versus 22.8% ( $\chi^2 = 6.30, p = 0.043$ ), especially among those delivered by CS with premature pregnancy with significant differences in 2 subgroups - 46% versus 25% ( $\chi^2 = 9.29, p = 0.010$ ). The significance of the identified risk factor in the formation of dysadaptation of newborns who underwent intrauterine hypoxia was determined -  $F = 11.97, p = 0.001$ . The data obtained show a higher concentration of negative factors in women whose children underwent hypoxia and were forced to be removed by CS, and also agree with modern ideas about the negative impact of the pathology of the reproductive sphere in the mother in the form of chronic inflammatory diseases, hormonal disorders, specific infections, previous medical abortions. that threaten the gestation and the formation of healthy offspring. The analysis of extragenital pathology in the study groups revealed a higher incidence rate in women, according to the severity of the condition of those delivered by CS - 1.74 nosologies were registered per woman versus 1.32 in the comparison group ( $\chi^2 = 23.05, p = 0.0002$ ) and 0.98 in the control group ( $\chi^2 = 39.00, p = 0.0001$ ). In women who delivered by CS, more often than in the comparison group, tubulointerstitial kidney diseases (N10-N13) were recorded - 40.3% versus 31.1% ( $\chi^2 = 3.93, p = 0.047$ ) with the highest frequency and reliable differences among mothers who gave birth to premature babies in 1 subgroups - 50% versus 23.3% ( $\chi^2 = 5.24, p = 0.022$ ) and in 2 subgroups - 48.4% versus 20% ( $\chi^2 = 10, 11, p = 0.001$ ). The significance of the pathology of the urinary system in women whose children underwent intrauterine hypoxia was established as a risk factor for the development of postnatal dysadaptation, especially in newborns extracted by CS -  $F = 13.32, p = 0.0002$ . The incidence of acute upper respiratory tract infection (J06.9) during pregnancy in women of group I was significantly higher than in the comparison group - 25.8% versus 13.5% ( $\chi^2 = 10.36, p = 0.001$ ), and also in the control group (10.5%,  $\chi^2 = 6.26, p = 0.012$ ), especially among women of group I with premature pregnancy in subgroup 1 - 42.8% versus 10% ( $\chi^2 = 9.14, p = 0.002$ ) and in the 2nd subgroup - 28.1% versus 11.2% ( $\chi^2 = 8.27, p = 0.004$ ). The revealed factor created the risk of postnatal dysadaptation in newborns who underwent intrauterine hypoxia, especially in those extracted by CS -  $F = 5.34, p = 0.012$ . It should be noted that in women who delivered by CS, visual pathology (myopia

(H52.1), retinal diseases (H35)) was significantly more often recorded in 16.8% versus 6.4% in the comparison group ( $\chi^2 = 10.94$ ,  $p = 0.0003$ ) and, despite the fact that this pathology does not affect the growth and development of the fetus, it forms indications for operative delivery, which itself is a factor of intrapartum risk. The mothers of the 1st group versus the comparison group were more likely to have diseases of the endocrine system and metabolic disorders. They were more often diagnosed with thyroid disease (E07) (11% versus 4.8%,  $\chi^2 = 5.45$ ,  $p = 0.019$ ), especially among women delivered at 32-34 weeks (16.6%). The significance of diseases of the thyroid gland of pregnant women and, consequently, of the altered hormonal background of mothers in the violation of the adaptive capabilities of newborns who underwent hypoxia and were extracted by caesarean section was determined -  $F = 8.57$ ,  $p = 0.004$ . The rest of the diseases in women of the comparison groups were revealed with a comparable frequency. It should be noted that women who delivered by CS were more often diagnosed with combined somatic pathology - 37.2% versus 25.4% in the comparison group ( $\chi^2 = 7.20$ ,  $p = 0.007$ ), which was one of the risk factors for the development of dysadaptation in newborns extracted by the abdominal route -  $F = 14.38$ ,  $p = 0.0001$ .

Our data indicate a higher incidence of morbidity in women whose children have undergone intrauterine hypoxia, especially among those delivered by CS. This is consistent with the literature data on the adverse effect of somatic pathology of mothers, especially combined, on the course of pregnancy, which poses a threat to the bearing and birth of a healthy child. A burdened obstetric-gynecological history and somatic ill-being contributed to the development of complicated pregnancy in women of the comparison groups, which significantly distinguished them from the control group ( $p < 0.05$ ) and, undoubtedly, negatively influenced the growth and development of the fetus. In the comparison groups, a high frequency of hypertensive disorders during pregnancy (O10-O16) was established, especially in women of group I - 54.1% versus 39.4% ( $\chi^2 = 9.74$ ,  $p = 0.001$ ) with the highest frequency among women giving birth by CS at 32 - 34 weeks (76.1%) and significant differences in subgroup 2 - 69.5% versus 45% ( $\chi^2 = 12.35$ ,  $p = 0.0004$ ). A high significance of hypertensive disorders was established as a risk factor for the development of postnatal dysadaptation in newborns who underwent intrauterine hypoxia -  $F = 15.84$ ,  $p = 0.0001$ .

Placental disorders (O43), which worsened the connection in the "mother-placenta-fetus" system, negatively influenced the growth and development of the fetus, reduced the adaptive capabilities of the newborn, were recorded with a high frequency in women in the comparison groups, especially among those delivered by CS - 53.7 % versus 30.2% in the comparison group ( $\chi^2 = 25.29$ ,  $p = 0.0002$ ), with the highest frequency and significant differences in the 2nd subgroup - 63.2% versus 28.7% ( $\chi^2 = 23, 48$ ,  $p = 0.0002$ ).

The significance of placental disorders as a high risk factor for the development of postnatal dysadaptation in newborns who underwent intrauterine hypoxia was established -  $F = 22.28$ ,  $p = 0.0001$ . Women who delivered by CS showed a tendency to more frequent development of anemia (D50) when

compared with women in group II (37.5% and 31.8%,  $p > 0.05$ ). Regardless of the method of delivery, more than a quarter of mothers whose children underwent hypoxia had a history of threatening abortion (O20.0), which significantly distinguished them from women in the control group ( $p = 0.0003$ ).

Based on the study of the anamnestic data of mothers whose children underwent intrauterine hypoxia, a large representation of negative factors, against which this pregnancy began and proceeded, was revealed in women delivered by CS, especially at 32-34 weeks. The combined nature of antenatal risk factors in the form of a complicated somatic and obstetric-gynecological status of mothers of this group formed an unfavorable background for bearing a healthy child and giving birth in a physiological way, which is consistent with literature data.

The high representation of negative factors during pregnancy in women of the comparison groups was the cause of pathological conditions in the intrapartum period. At the same time, the frequency and nature of the main complications of the period of labor, which contributed to the emergence of acute / progression of chronic hypoxic damage to the fetus, had significant differences in the groups with the prevalence of negative factors in women delivered by the abdominal route, especially in premature pregnancy. In women of group I, premature rupture of membranes (O42) was more often registered - 22.7% versus 12.9% ( $\chi^2 = 7.04$ ,  $p = 0.008$ ), with the highest frequency in those delivered by CS at 32-34 weeks (28, 5%) and significant differences in 2 subgroups (25.7% versus 13.7%,  $\chi^2 = 4.27$ ,  $p = 0.038$ ). At the same time, in group I, a tendency towards a higher frequency of onset of labor after a 24-hour anhydrous period (O42.1) was shown (11.4% versus 7%,  $p > 0.05$ ), especially in women delivered by CS at 32-34 weeks (23.8%,  $p > 0.05$ ) and fetal damage as a result of chorioamnionitis (P02.7) (4.8%,  $p > 0.05$ ), which correlated with the low social status of patients ( $r = -0.684$ ,  $p = 0.705$ ). The significance of premature rupture of the membranes was shown as a risk factor for the development of postnatal dysadaptation in newborns who underwent intrauterine hypoxia -  $F = 7.28$ ,  $p = 0.012$ .

The onset of labor in women who delivered by CS were more often associated with a violation of labor (weakness, discoordination of labor) (O62), in contrast to those who gave birth naturally (40% versus 3.2%,  $\chi^2 = 79.95$ ,  $p = 0.0001$ ) with the highest frequency in the 2nd (48.4%) and 3rd subgroups (41.7%), which was a risk factor for the development of postnatal dysadaptation in this group of newborns -  $F = 10.28$ ,  $p = 0.004$ . In group I, childbirth was more often complicated by incorrect presentation of the fetus, requiring the provision of medical care to the mother (O32.8) - 8.6% versus 3.7% of those who gave birth by natural means ( $\chi^2 = 4.21$ ,  $p = 0.040$ ) with the highest frequency in 2 subgroup (14.8% versus 5% of the comparison group with a similar gestational age,  $\chi^2 = 4.85$ ,  $p = 0.027$ ).

Preeclampsia (O14.1) (22.1%,  $p = 0.0003$ ) was a severe complication of the intrapartum period in women who delivered by CS compared with those who gave birth naturally (42, 9%), as well as premature placental abruption (O45) (5.1%,  $p = 0.0004$ ), which caused bleeding. The significance of the established risk factors in the development of postnatal dysadaptation of newborns extracted by CS was established -  $F = 24.15$ ,  $p = 0.0001$  and  $F = 15.37$ ,  $p = 0.0001$ , respectively.

The severity of the obstetric situation in women delivered by CS induced the development of fetal distress in more than 2/3 of cases (71.4%), which undoubtedly had a negative effect on the postnatal period in these children -  $F = 21.17$ ,  $p = 0.0001$ .

**Conclusion.** The prevailing high risk of perinatal losses and / or the impossibility of delivery through the vaginal birth canal formed indications for early termination of pregnancy in women of group I for early termination of pregnancy by delivery by CS. A comparative analysis of indications for delivery by CS was carried out, taking into account the urgency of fetal extraction at different periods of gestation. In our sample, the share of emergency CS was higher - 59.7% versus 40.3% of planned operative deliveries ( $\chi^2 = 21.63$ ,  $p = 0.0002$ ). Analysis of the main indications for delivery by CS showed that at full-term pregnancy, planned CS was predominantly used in conditions that had a lesser effect on the growth and development of the fetus, but made it impossible to end pregnancy through the vaginal birth canal as a result of the presence of a scar on the uterus due to repeated cesarean sections (O82.0) (64%,  $\chi^2 = 45.58$ ,  $p = 0.0001$ ), vision pathologies in women (myopia (H52.1), retinal diseases (H35)) (25.3%,  $\chi^2 = 12$ ,  $p = 0.0003$ ).

Other indications for elective delivery by CS were formed during premature pregnancy, which were associated with the severity of intrauterine fetal suffering, which created the need for premature termination of pregnancy in the interests of the fetus with placental disorders (O43) (90%,  $\chi^2 = 84.82$ ,  $p = 0, 0001$ ), insufficient fetal growth (O36.5) (64.3%,  $\chi^2 = 62.68$ ,  $p = 0.0001$ ), as well as in the interests of the mother and the fetus in severe preeclampsia (O14.1) (21.4% ,  $\chi^2 = 17.41$ ,  $p = 0.0003$ ) before the onset of labor.

A high, but comparable frequency of emergency abdominal delivery, regardless of gestational age, is indicated in cases of labor disorders (64.8% and 73.3%,  $p > 0.05$ ), as well as as a result of severe preeclampsia (35.1% and 22, 2%,  $p > 0.05$ ). At full-term terms of emergency delivery by CS with the onset of labor, obstetric situations associated with the large size of the fetus were reliably more often required, leading to a disproportion requiring the provision of medical care to the mother (O33.5) (31.1%,  $\chi^2 = 43.33$ ,  $p = 0.0001$ ), and in case of premature pregnancy - as a result of incorrect presentation of the fetus, requiring the provision of medical care to the mother (O32.8) (17.9%,  $\chi^2 = 4.93$ ,  $p = 0.026$ ).

Thus, the results obtained show that the complicated course of pregnancy, worsening the connection in the "mother-placenta-fetus" system, negatively affected the maturation of the fetus, contributing to the formation of intrauterine hypoxia, and the complicated course of the intrapartum period created additional conditions for the progression of hypoxia or the occurrence of fetal distress in childbirth. The maximum concentration of negative factors of the antenatal and intrapartum periods in women delivered by CS, disrupted the process of growth and development of the fetus already in the early stages of pregnancy, creating the prerequisites for miscarriage and threatening the death of a weakened

fetus at birth through the vaginal birth canal. Placental disorders ( $F = 22.28$ ,  $p = 0.0001$ ), hypertensive disorders ( $F = 15.84$ ,  $p = 0.0001$ ), combined somatic pathology ( $F = 14.38$ ,  $p = 0.0001$ ), pathology of the urinary system ( $F = 13.32$ ,  $p = 0.0001$ ), inflammatory diseases of the female pelvic organs ( $F = 11.97$ ,  $p = 0.001$ ), tobacco smoking ( $F = 9.14$ ,  $p = 0.002$ ), repeated CS operations ( $F = 8.63$ ,  $p = 0.008$ ), thyroid disease ( $F = 8.57$ ,  $p = 0.004$ ), acute upper respiratory tract infection ( $F = 5.34$ ,  $p = 0.012$ ). In the intrapartum period, significant factors were severe preeclampsia ( $F = 24.15$ ,  $p = 0.0001$ ), fetal distress ( $F = 21.17$ ,  $p = 0.0001$ ), premature placental abruption ( $F = 15.37$ ,  $p = 0.0001$ ), impaired labor ( $F = 10.28$ ,  $p = 0.004$ ), premature rupture of the membranes ( $F = 7.28$ ,  $p = 0.012$ ).

Taking into account the data obtained, it seemed important to us to conduct a comparative assessment of the postnatal adaptation of children of different gestational age who underwent intrauterine hypoxia, extracted both naturally and by means of CS, based on the results of studying metabolic processes, structural and functional characteristics of the leading regulatory systems of the body - cardiovascular and central nervous systems with the subsequent determination of the contribution of the identified risk factors of the antenatal and intrapartum periods to the development of cardiocerebral dysadaptation in these children in the neonatal period.

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