

Article

Analysis of Risk Factors for Hypoxic Damages of Newborn's Central Nervous System

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Abstract: Currently, perinatal damage to the central nervous system of newborns occupies an important place in the structure of pathology of young children, which is associated with high prevalence, severity of clinical manifestations and the risk of disability formation. The purpose of our study was to determine the significance of risk factors for the development and to develop criteria for the severity of hypoxic-ischemic CNS damage in newborns. We examined 120 newborns with moderate to severe perinatal CNS damage. The examination consisted of the collection of maternal history, which included information on somatic and gynecological diseases, the course of this pregnancy, childbirth, general clinical examination methods, examination of a newborn with an assessment of somatic and neurological status. The results of the study showed that modifying risk factors for the development of moderate perinatal encephalopathy are the threat of miscarriage, toxicosis, the age of the mother over 35 years old, moderate anemia, acute upper respiratory tract infections, gynecological pathology, taking antifungal drugs, rapid and protracted childbirth, weak birth activity. We also found that the modifying risk factors for the development of severe perinatal encephalopathy are stillbirth, bad habits in the father, closely related marriage, obesity, chronic foci of infection, acute bacterial infectious diseases, urogenital infection, NSAIDs, rapid and protracted childbirth, chronic fetal hypoxia.

Keywords: perinatal damage of the central nervous system, newborns, risk factors, modifying risk factors, perinatal encephalopathy

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1. Introduction

Echocardiography is essential for evaluating patients who are undergoing simultaneous procedures of (CABG) The etiology, clinical features and methods of correction of perinatal lesions of the central nervous system are an object of research for neonatologists, pediatricians and specialists in perinatal medicine [1,2,8]. There is a large number of scientific studies on the health status and neuropsychiatric development of infants, as well as on the assessment of the influence of perinatal risk factors on the severity of CNS damage [3,4,9,10].

Regardless of the etiology of hypoxia, its pathological effect on the fetus develops according to the same scenario and is accompanied by varying degrees of impaired brain development and maturation, provoking the occurrence of hypoxic-ischemic encephalopathy in the postnatal period [5,6,7]. In this regard, the study of risk factors and features of perinatal lesions of the central nervous system in newborns is undoubtedly relevant.

Objective of this study is to establish the significance of risk factors for development and to develop criteria for the severity of hypoxic-ischemic CNS damage in newborns.

2. Materials and Methods

120 newborns with moderate and severe perinatal CNS lesions who were hospitalized in the Department of neonatal Pathology and neonatal intensive care unit of the Samarkand Regional Children's Multidisciplinary Medical Center of Samarkand in the period from 2019 to 2022 were examined. The criteria for excluding sick newborns were the presence of infectious-inflammatory and organic brain lesions.

The examination consisted of collecting the mother's medical history, which included information about somatic and gynaecological diseases, the course of this pregnancy, childbirth, general clinical research methods, examination of the newborn with an assessment of somatic and neurological status.

As necessary, the patients were examined by a neurologist and a neurosurgeon. According to the set goal and objectives, we conducted examinations of 120 sick children, who, according to the set goal and objectives of the research, were divided into II groups: Group I consisted of 40 newborns with perinatal central nervous system damage of hypoxic genesis of moderate severity. Group II included 40 newborns with severe perinatal CNS damage of hypoxic origin. The control group consisted of 30 healthy newborns.

3. Results and Discussion

Obstetric and gynecological anamnestic risk factors for women such as abortions (22.5% and 27.5%), threats of termination of pregnancy (37.5% and 50.0%; $p < 0.05$), severe toxicosis (27.5% and 35%), severe stress during pregnancy (50% and 75%), fetal hypoxia (45.0% and 87.5%) are more common in groups I and II than in the control group. The frequency of stillbirths (10.0 and 12.5%, respectively), miscarriages (7.5% in both groups), induced (10% and 17.5%, respectively) and multiple pregnancies (5% and 7.5%, respectively) also prevails in groups I and II than in the control group of examined newborns.

It should be noted that such a factor as "secondary education" was present, and "bad habits of a woman in labor" was absent in all women in labor. Higher education, as a social factor, was present in 46.7% of women in labor in the control group, which was more common than in groups I and II; whereas "mother's age is over 35 years old", "closely related marriage" (10% and 15%, 17.5% and 20%, respectively) occurred in I and II groups, and completely

There are more primiparous women in groups I and II (28 women - 70% and 32 women - 80%) than in the control group (13 women, 43.3%), while repeat births predominate in the control group (17 women - 56.7%) compared with groups I and II (12 women - 30% and 8 women - 20%, respectively).

Consequently, the frequency of hypoxic damage to the central nervous system of moderate to severe degree increases if the mother is primiparous, which should be taken into account when predicting the risks of this pathology in newborn children.

In the structure of biomedical factors during the period of childbearing in groups I and II, anemia of moderate severity (80.0% and 92.5%), the presence of foci of chronic infection (62.5% and 57.5%), acute upper respiratory tract infections (27.5% and 25%), obesity (15% and 20%), exacerbation of chronic diseases (30% and 25%, respectively) compared with similar indicators of the control group of women in labour. These indicators within

the main group between groups I and II differed little from each other. Signs such as hereditary diseases in the family, gynecological infection did not occur in the control group, and in the main groups they occurred in 7.5% and 10%, respectively.

Herpetic and cytomegalovirus infections in groups I and II were more common (in 32.5% and 25% of cases, in 17.5% and 22.5% of cases, respectively), which is more common than in the control group (13.3%). Toxoplasmosis and chlamydia infection were not detected in the control group, whereas in the main group their frequency was quite high – 30% and 32.5%, as well as 5.0% and 7.5% of cases, respectively.

The use of vitamins and iron preparations for preventive or curative purposes was registered in 83.3% of women in the control group, which is more than in representatives of the main group, in which the frequency of taking these drugs was 5%, as well as 20% and 17.5%, respectively. Antifungal drugs were taken by 37.5% and 40% of women in the main group, which is more than 10 times more often than in the control group (3.3%). Despite the fact that the use of nonsteroidal anti-inflammatory drugs and antibiotics was noted more often in the main group of women in labour, there were no differences with the control group of women in labour. It should also be noted that the use of anticonvulsants was not detected in any of the groups examined.

More often than in the control group, such complications of childbirth as weak labour (35% and 40%), chronic fetal hypoxia (60% and 52.5%) and rapid childbirth (17.5% and 22.5%) were noted. Prolonged labour (7.5% and 12.5%), prolonged anhydrous interval (20% and 15%), umbilical cord entanglement (35% and 27.5%), stimulated labour (37.5% and 30%), as well as caesarean section (50% and 62.5%), which were more common in I and II in the groups of women in labour, but had no significant difference compared to the indicators in the control group.

Consequently, 37 (92.5%) newborns of groups I and II had a burdened perinatal history, 35 newborns (87.5%) had several risk factors, it can be concluded that the unfavourable ante- and intranatal period has its negative impact on the health of newborn children. The analysis of the obtained data showed that in the occurrence and development of severe perinatal encephalopathy, there is a dependence on the presence and frequency of pathology of obstetric and gynecological history, the course of pregnancy and childbirth.

Thus, the study showed that the most significant risk factors for the development of perinatal encephalopathy are: abortions, the threat of termination of pregnancy, chronic adnexitis, and rapid childbirth. Of particular importance was the presence of severe anemia in pregnant women, which was a factor in chronic fetal hypoxia, and then influenced the development of a more severe course of perinatal encephalopathy of newborns.

During the study, we studied risk factors using the method of calculating relative risk with a 95% confidence interval and obtained the following results:

In the I group of examined children, such antenatal factors as the threat of termination of pregnancy 1,611 Iu (1,120; 2,317), severe toxicosis during pregnancy 1,633 Iu (1,178; 2,384) had a significant difference with similar indicators. In the control group of patients, they were the most significant risk factors for moderate perinatal encephalopathy.

In the II group of newborns, the most significant risk factor for severe perinatal encephalopathy was the stillbirth rate in the gynecological history of the mother of 1,524 Iu (1,000; 2,323). She posed the highest risk for the development of severe perinatal encephalopathy.

The analysis of socio-hygienic risk factors for perinatal encephalopathy of II severity in group I of patients showed that the age of the mother over 35 years of age 1,833 Iu (1,471; 2,285) was the most significant in the development of the disease.

Among the socio-hygienic risk factors for perinatal encephalopathy of the III degree of severity in the II group of patients, the most significant were closely related marriage 1,938 Iu (1,523; 2,466) and the factor of bad habits in the father 1,966 Iu (1,254; 3,084).

When assessing the relative risk of developing perinatal encephalopathy of moderate severity in group I of newborns by biomedical factors, the high significance of such factors

as anemia of moderate severity 2,364 Iu (1,292; 4,325), acute upper respiratory tract infections 1,663 Iu (1,178; 2,348) and gynecological infection 1,811 Iu (1,460; 2,247) was established.

When assessing the relative risk of severe perinatal encephalopathy in group II of newborns by biomedical factors, the high significance of such factors as obesity 1,500 Iu (1,016; 2,215), chronic foci of infection 1,517 Iu (1,001; 2,299), acute bacterial infections 1,500 Iu (1,016; 2,215), as well as urogenital infection was established 1,714 Iu (1,222; 2,404).

Taking vitamins and iron preparations prevented the development of perinatal encephalopathy in both groups of patients. The development of perinatal encephalopathy of moderate severity was most likely facilitated by the intake of antifungal drugs by the mother during pregnancy 2,025 Iu (1,479; 2,772). Severe perinatal encephalopathy developed when the mother took nonsteroidal anti-inflammatory drugs 1,611 Iu (1,120; 2,317) during pregnancy.

We established a high risk of developing perinatal encephalopathy of moderate severity if a woman's labor was rapid 1,694 Iu (1,215; 2,362) or prolonged 1,544 Iu (1,158; 2,335), weak labour activity was observed 1,679 Iu (1,181; 2,386).

There is a high probability of developing severe perinatal encephalopathy in the presence of intranatal complications such as rapid labour in a woman 1,788 Iu (1,308; 2,445), prolonged labour 1,588 Iu (1,087; 2,320), chronic fetal hypoxia 1,989 Iu (1,358; 2,916).

Table 1. Analysis of risk factors for perinatal encephalopathy according to the criteria of relative risk in group I

Indicator	I group (n=40)		Control group (n=30)		P	RR	DI min	DI max abs.
	abs.	%	abs.	%				
Threat of termination of pregnancy	15	37,5	4	13,3	<0,05	1,611	1,120	2,317
Severe toxicosis	11	27,5	2	6,7	<0,05	1,663	1,178	2,348
The age of the mother is over 35 years old	4	10	-	-	<0,05	1,833	1,471	2,285
Anemia (moderate form)	32	80,0	12	40	<0,05	2,364	1,292	4,325
Acute upper respiratory tract infections	11	27,5	1	3,3	<0,05	1,663	1,178	2,348
Gynecological infection	3	7,5	-	-	<0,05	1,811	1,460	2,247
Antifungal	15	37,5	1	3,3	<0,05	2,025	1,479	2,772
Rapid childbirth	8	20	1	3,3	<0,05	1,694	1,215	2,362
Prolonged labor	3	7,5	1	3,3	<0,05	1,544	1,158	2,335
Weak labor activity	14	35	3	10	<0,05	1,679	1,181	2,386

Table 2. Analysis of risk factors for perinatal encephalopathy according to the criteria of relative risk in group II

Indicator	I group (n=40)		Control group (n=30)		P	RR	DI min	DI max abs.
	abs.	%	abs.	%				
Stillbirth rate	5	12,5	1	3,3	>0,5	1,524	1,000	2,323
Father's bad habits	26	65,0	8	26,7	<0,05	1,966	1,254	3,084
Closely related marriage	8	20	-	-	<0,05	1,938	1,523	2,466
Obesity	8	20	2	6,7	<0,05	1,500	1,016	2,215
Chronic foci of infection	23	57,5	10	33,3	>0,5	1,517	1,001	2,299
Acute bacterial infectious diseases	8	20	2	6,7	<0,05	1,500	1,016	2,215
Urogenital infection	12	30	2	6,7	<0,05	1,714	1,222	2,404

NSAIDs	15	37,5	4	13,3	<0,05	1,611	1,120	2,317
Rapid childbirth	10	25	1	3,3	<0,05	1,788	1,308	2,445
Prolonged labor	6	15	1	3,3	<0,05	1,588	1,087	2,320
Chronic fetal hypoxia	21	52,5	4	13,3	<0,05	1,989	1,358	2,916

4. Conclusion

Our analysis of relative risk indicators (RR) in newborns of the main and control groups allows us to draw the following conclusions: modifying risk factors for the development of perinatal encephalopathy of moderate severity are the threat of miscarriage, toxemia, maternal age over 35 years, anemia of moderate severity, acute upper respiratory tract infections, gynecological pathology, taking antifungal drugs, rapid and protracted labor, weak labour activity.

We also found that the modifying risk factors for the development of severe perinatal encephalopathy are stillbirth, bad habits in the father, closely related marriage, obesity, chronic foci of infection, acute bacterial infectious diseases, urogenital infection, NSAID intake, rapid and prolonged childbirth, chronic fetal hypoxia.

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