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Analysis of Obstetric Risk Factors in the Progression of Cerebral Palsy According to Data from Maternity Clinics in Almaty

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ABSTRACT

The problem of cerebral palsy worries all doctors in the world. The frequency of cerebral palsy is increasing every year. This is associated with improved resuscitation services and the treatment of such children. Today it is proved that it is impossible to single out one reason for the development of cerebral palsy, as the main one. A complex of factors leads to the development of periventricular leukomalacia, which leads to the flapping of cerebral palsy. Ante and intrapartum risk factors for developing cerebral palsy were studied on the basis of the analysis of the questionnaires of 150 parents of children with cerebral palsy (main group) and 150 parents of healthy children. The questionnaire contained 220 questions to study the social and medical factors, of which 77 questions were about obstetric risk factors for developing cerebral palsy. It was found that boys significantly more often develop cerebral palsy than girls (56.7 ± 4.0%), mothers of children with cerebral palsy have a low health index (thrombocytopenia (41.3 ± 4.0%), chronic arterial hypertension (37,3 ± 3.9%), hemorrhagic vasculitis, diabetes mellitus, thyroid disease, cardiac arrhythmias, myocardial dystrophy, myocarditis, APS syndrome all being 33.3 ± 3.8%. In 86 ± 2.8% of cases the first pregnancy of mothers of children with cerebral palsy was interrupted in one way or another. 70.6 ± 3.7% of pregnancies of mothers in the main group were complicated by signs of threatening abortion, which in 52.1% resulted in preterm delivery. Preterm delivery was more common in women with hypertensive complications of pregnancy. It was found that in the presence of acute infectious diseases of the respiratory tract in the first trimester of pregnancy, the frequency of birth of children with cerebral palsy increased significantly (33.3 ± 3.8%), and 45.3 ± 4.1% in the 2nd trimester, and 18 ± 3.1% of women suffered from sexually transmitted infections. In 6 ± 1.9% of cases of preterm delivery, children with extremely low birth weight were born, in 35.4% delivery occurred before 34 weeks, of which only 14% received diabetes prevention dexamethasone, leading to the need for long-term respiratory support for these newborns. 75.3% of children were born in a state of severe asphyxia, which also affected the state of the brain. In 3.3%, rapid and prolonged labor was observed, which led to the birth of 2% of children with birth trauma and 14% with trauma to the cervical spine. In 26% of cases, operative delivery was performed by cesarean section. Thus, with timely control of factors, the combination of which can lead to the development of cerebral palsy, timely prevention, diagnosis and rehabilitation of this disease is possible.

Introduction

Cerebral palsy (CP) is a group of stable disorders of motor development and maintenance of postures leading to motor defects caused by non-progressive damage and / or abnormalities of the developing brain in the fetus or newborn child [1]. According to the population studies from around the world cerebral palsy cases range from 1.5 to more than 4 per 1000 live births or children of a certain age range. The overall prevalence of the birth of children with cerebral palsy is approximately 2 per 1000 live births [2-4]. In Kazakhstan, cerebral palsy holds the leading position in the structure of childhood disability (from 30% to 70%). According to statistics, more than 44 thousand disabled children are registered, of which over 10 thousand children are diagnosed with cerebral palsy. Data on the frequency of cerebral palsy fluctuate widely with an average of 2.0-5.9 per 1000 births and is largely determined by the level of development of society [5].

Discussions about the root cause of cerebral palsy do not stop until now. Obstetricians from all over the world have repeatedly experienced significant pressure due to the fact that great importance in the progression of cerebral palsy was attached to the complicated course of childbirth and birth trauma, which led to an increase in lawsuits and a massive outflow of doctors. However, at the moment it has been proven that there are many reasons for the development of cerebral palsy, and it is almost impossible to single out one of them as the main one. All these causes lead to brain damage - periventricular leukomalacia and all scientists agree that cerebral palsy develops in association with it [6]. The main goal in the treatment of cerebral palsy is its timely diagnosis, prevention and early rehabilitation. Our study is devoted to the study of obstetric risk factors in the progression of cerebral palsy in a megacity based on the example of Almaty (Kazakhstan) with a population of over 1.5 million people.

Objective

Is to establish the role of the pathology of pregnancy and childbirth in the development of cerebral palsy.

Materials and Research Methods

In order to study the peculiarities of the course of pregnancy and childbirth in mothers of children with cerebral palsy, we carried out retrospective analysis of the features of the ante, intra and postnatal period of 150 patients with cerebral palsy (main group) and 150 healthy children (control group). A medical card consisting of several blocks of questions was filled out for each patient, with 220 general questions (age, nationality, place of work, etc.), obstetric part (77 questions) with ante and intranatal risk factors; neonatal and pediatric questions as well. For comparison, a similar survey was conducted among healthy children and their parents.

Statistical Analyses

Statistical processing of the results was carried out using MS Excel 2016, MS Access (for data entry) and SPSS 20 versions; a DBMS based on MS Access was used for data entry. The program has a convenient interface and allows you to protect the entered data from operator errors. Logical errors are detected when checking the quality of input forms. The data entered into the database are processed using modern methods of variation statistics. Primary statistical data processing was carried out to determine the frequency (in percent) of the occurrence of suspected cerebral palsy risk factors in general in the group under study, in the context of clinical diagnosis, in subgroups on the basis of fetus maturity and in terms of the development of cerebral palsy. Statistical processing showed average relative values (in percentage) with their standard error, which in turn makes it possible to judge by Student's t-test. It is known that the use of the sampling set and Student's t-test allows us to conclude that the differences between the mean values are significant. At the same time Student's test refers to parametric criteria and parametric criteria, as a rule, are more powerful than non-parametric. Differences between the compared average values were considered significant when the error probability is equal to or less than 0.05 ($p < 0.05$). The control group was selected by random sampling in the maternity clinics of the city.

The Results of the Study

In our study there were statistically more boys in the main group compared to girls (56.7 ± 4.0% versus 40.7 ± 4.0%, $p = 0.01$). All mothers of children with cerebral palsy were in active reproductive age, in contrast to the control group, where the number of women over 35 years old was 66.6 ± 3.9% versus 14 ± 2.8, $p = 0.001$. According to our research mothers of children with cerebral palsy got sick more often than mothers of healthy children. So, thrombocytopenia (41.3 ± 4.0%), chronic arterial hypertension (37.3 ± 3.9%), hemorrhagic vasculitis, diabetes mellitus, thyroid pathology, cardiac rhythm disturbance, myocardiodystrophy, myocarditis, APS-syndrome (33.3 ± 3.8%) and heart defects (4 ± 1.6%) were found only in the main group. Women from the control group did not suffer from such diseases. Thus, patients from the main group had a low health index which correspondingly affected the complicated course of pregnancy. Mothers of children suffering from cerebral palsy had a statistically significant history of the first early abortion (86 ± 2.8% vs. 48.7 ± 4.1%, $p = 0.001$). However, mothers of healthy children are proved to interrupt pregnancy more often. So, 4 ± 1.6% of women only in the main group had three or more abortions in past medical history against 46 ± 4.1% of the mothers in the control group, $p = 0.001$. Mothers of sick children in the past medical history were statistically more likely to have a dead fetus (40.6 ± 4.0%, $p = 0.001$) or preterm delivery (33.3 ± 3.8%, $p = 0.001$). Despite the fact that more than half of the women

(66.7%) had one or another type of infertility in the main group, the methods of assisted reproductive technologies were not used, infertility was cured by conservative means. The combination of complicated obstetric history and a large number of extragenital diseases led to a burdened course of pregnancy. Pregnancy in women of the main group was statistically significantly more often complicated by the threat of abortion (70.6 ± 3.7% vs. 2.7 ± 1.3%, p = 0.001).

Despite the clinical picture of threatened abortion and / or retrochorial hematoma, preserving therapy (progestins) were taken by 8 ± 2.2% of pregnant women only. The lack of adequate therapy led to preterm delivery. In 1/3 of the women of the main group, pregnancy was complicated by arterial hypertension caused by pregnancy (33.3 ± 3.8%, p = 0.001), and in 44.7% by preeclampsia (p = 0.001). A significant number of hypertensive complications of pregnancy may be associated with both extragenital diseases and the lack of prophylaxis; no woman took folic acid in the first trimester of pregnancy, and only 3.3 ± 1.5% of pregnant women in the main group received calcium supplements in the first trimester. The pathology of the membranes (multi- or low-water) prevailed 3.2 times in the main group (10.7 ± 2.5% versus 3.3 ± 1.5%, p = 0.01).

The infectious factor has played its role in our study. Up to 12 weeks of gestation, i.e., during the aniage of main organs and systems 1/3 of patients in the main group had ARVI or ARD (33.3 ± 3.8%, p = 0.001), and 45.3% suffered from these diseases in the second trimester (45.3 ± 4.1% versus 0.7 ± 0.7%, p = 0.001). The exacerbation of chronic diseases, such as chronic pyelonephritis and tonsillitis complicated the course of pregnancy, but the difference was statistically significant only with exacerbation of chronic tonsillitis (4 ± 1.6%, p = 0.01). Carriage of genital infections (TORCH) was found in the main group almost 4 times more often than in the control group (10.7 ± 2.5% vs. 2.7 ± 1.3%, p = 0.01).

And sexually transmitted infections during pregnancy in the main group were almost 14 times higher than in the main group (18 ± 3.1% versus 1.3 ± 0.9%, p = 0.001). Complicated course of pregnancy in patients of the main group worsened by complicated childbirth. 52.1% of mothers with children suffering from cerebral palsy had preterm delivery whereas this number in the control group is 6.7% (p = 0.001) only. In 35.4% of cases (control group 0%), preterm delivery occurred up to 34 weeks in patients of the main group, but only 14% of patients received prophylaxis of RDS with dexamethasone. A significant role in addition to prematurity belongs to body weight at birth. Thus, children with extremely low body weight from 500 to 999 grams requiring prolonged nursing and respiratory support, with an immaturity of all organs and systems in the main group were 3 times more than in the control group (6 ± 1.9% vs. 2 ± 1.1%), as well as with very low body mass from 1000 to 1499 grams almost 3 times more (6 ± 1.9% against 2.1 ± 1.2%). Estimation of children on the Apgar scale, which reflects the state of the child at birth and the effectiveness of the resuscitation was also statistically different from healthy children. Thus, in the first minute of life 5.3% of children in the main group received 0 against 0 children in the control group (p = 0.01) and 1 point was received by 75.3% of children in the main group (p = 0.001). 74.7% of children in the main group (p = 0.001) received a score of 1 point during the first 5 minutes of life, whereas in the control group there were no children born in a state of severe asphyxia. In 3.3% of cases in the main group the protracted labor was observed for more than 18 hours, which led to the worsening of infection and possible injury. Also, in 3.3% of cases rapid delivery was observed in less than 4 hours, which is extremely traumatic for both the mother and the fetus. In the main group, 2% of children with birth trauma and 14% (p = 0.001) with a cervical spine injury were noted, whereas there were no similar diagnoses in the control group. In the main group, prenatal rupture of membranes of 45.3% was significantly more frequent against 0 (p = 0.001).

In 6.7% (control group 0%) of cases there was induction of labor with amniotomy and the same number of cases of labor induction with oxytocin (p = 0.001). As a consequence of hypertensive complications of pregnancy and those who did not receive appropriate prophylaxis, 7.3% (control group 0%, p =0.001) of patients were diagnosed with premature detachment of a normally located placenta, which worsened the fetal condition and 26% (control 4.7%, p = 0.001) delivery was performed by cesarean section. The placenta is the main organ of communication between the mother and the child in the antenatal period and its histological study provides answers to many questions. All pregnancy complications, both infectious and hypertensive, affect the state of the placenta. In 3.3% (control 0%, p = 0.05) cases the inflammatory changes in the placenta were detected and decompensated and subcompensated placental insufficiency in 14.6% of cases, whereas in the control group only 0.7% of the compensated form of placental insufficiency was detected (p = 0.001).

Conclusion

Thus, cerebral palsy as a disease does not have a major or leading risk factor for its development. But a combination of several, rather frequent factors leads to disastrous results. The combination of preterm delivery with hypertensive complications of pregnancy, aggravated obstetric and extragenital history, intrauterine infection, all together leads to periventricular leukomalacia of the fetus and newborn brain, the development and aggravation of which after birth leads to the manifestation of cerebral palsy. And, perhaps, more thorough pregravid preparation, improvement of preventive measures, strict control over their health and careful attitude to pregnancy will lead to a decrease in cerebral palsy as a disabling disease. Allocation of risk factors is of great importance in the early rehabilitation of children with a high risk of developing cerebral palsy, as well as promptly initiated prevention and rehabilitation will undoubtedly level out the symptoms of the disease and ensure quick adaptation in the society.

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