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Assessment of the main risk factors of development of children's cerebral palsy

Evaluación de los principales factores de riesgo de desarrollo de la parálisis cerebral infantil

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250

Abstract

The article discusses the main risk factors for the development of cerebral palsy. Several risk factors are causing the development of cerebral palsy in pre-, intra- and postnatal periods, in particular, gestational age, birth weight, general maternal health status, thrombophilia, and multiple pregnancies.

Keywords: cerebral palsy, risk factors, epidemiology.

ceptible to this injury. Delay in the motor developmental stages of the baby (controlling balance and limb positioning and walking ability) may be the first symptoms of the disease called Cerebral Palsy, or CP.

The most important symptoms of cerebral palsy are the motor disability in the child that lasts with him for life. Some children with cerebral palsy also have mental retardation. Although the brain injuries that are the main cause of the disease are not progressive, the patient's motor problems can progress. Therefore, these patients should be under the supervision of a physician until their physical development is complete.

The severity of cerebral palsy varies in different patients. In some, the condition is so severe that the baby dies shortly after birth and in others, it is so mild that they may need no action, but most patients are in the middle of this spectrum.

The treatment of the complication of cerebral palsy is divided into two parts, the treatment of the disease early in life and the other managing it during life. Early treatment is very important for children with cerebral palsy because the growing brain and body are more capable of changing. Children with cerebral palsy can improve their mobility by receiving traditional and alternative therapies or medication, surgery or other therapies.

As part of the strategic development programs for the health care of the Republic of Kazakhstan "Densaulyk" for 2016-2019, Message from the President of the Republic of Kazakhstan 2018 is one of the priorities of the state concept is treatment and prevention of the disabling syndrome, which places a significant socioeconomic burden on health care systems¹. Despite a large number of studies, the molecular etiology of cerebral palsy remains unknown. Several risk factors are causing the development

Resumen

El artículo discute los principales factores de riesgo para el desarrollo de la parálisis cerebral. Existen varios factores de riesgo que causan el desarrollo de parálisis cerebral en los períodos pre, intra y postnatal, en particular, la edad gestacional, el peso al nacer, el estado general de salud materna, la trombofilia y los embarazos múltiples.

Palabras clave: Parálisis cerebral, factores de riesgo, epidemiología.

Introduction

Cerebral palsy is not a disease but a group of diseases that are caused by brain damage. These injuries can be transmitted to the baby's brain at an embryonic time, before birth. It may occur during childbirth or even during the first year of life when the baby's brain is growing rapidly. Premature babies and those who lose weight at birth are more sus-

of cerebral palsy in pre-, intra- and post-natal periods, in particular, gestational age, birth weight, general maternal health status, thrombophilia, and multiple pregnancies. According to the literature, the prevalence of cerebral palsy in developed countries has remained stable over the past 15 years, while in Kazakhstan the prevalence of cerebral palsy is growing steadily.

Purpose of the Study: Assess the main risk factors for cerebral palsy depending on the form and severity of the incidence.

Materials and methods

For a retrospective, descriptive epidemiological study of children with cerebral palsy in Almaty, an analysis of the primary medical documentation of the participants and their mothers was conducted.

The main group consists of medical documents of 145 children suffering from cerebral palsy aged from 6 months to 17 years.

Statistical processing of the results was carried out using MS Excel 2016 programs, MS Access (for data entry) and SPSS 20, to eliminate errors in the formation of the database, double sequential input of information was used.

Primary statistical data processing was carried out with the determination of the frequency (in percent) of the occurrence of suspected cerebral palsy risk factors in the study group as a whole, in the context of clinical diagnoses, in subgroups based on full-term signs, and in terms of the development of cerebral palsy.

Results and Discussion

As a result of the study, statistically significant major risk factors for developing cerebral palsy in the prenatal, intranasal, postnatal periods of a child's life were identified depending on the form and severity of the disease based on the analysis of data of primary medical records and questioning the parents of children with cerebral palsy.

Children with cerebral palsy were born from women aged 18 to 30 years (60.7%), from re-pregnant (73.1%). The pregnancy of mothers was accompanied by anemia (60.7%), ARVI and ARD (42.1%), carriage of infections such as HSV, HCMV, toxoplasmosis, ureaplasmosis, and chlamydia (38.3%) and was complicated by the threat of

abortion (55.2%), severe pre-eclampsia (46.2%).

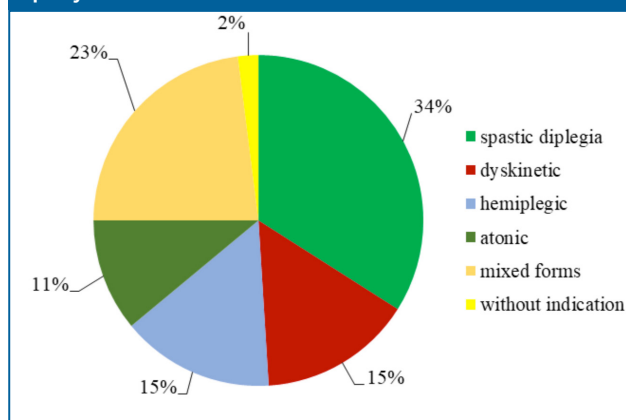
In our studies, preterm labor (51%) was complicated by asphyxiation of the newborn (35.2%) and in 57.2% of cases, newborns needed resuscitation. Operational labor (cesarean section) in our study was noted in 33.1% of cases.

When analyzing the age structure, it was established that children of primary and secondary school age (from 8 to 12 years old) made up 46.2%, pre-school age (from 3 to 7 years old) 33.1% of children, from 13 to 17 years old - 17.9% of children.

The diagnosis of cerebral palsy in 43.4% was established after the first year of life, in 32.4% in the second half of life, in 24.1% at the age of 6 months of life.

The structure of cerebral palsy was dominated by spastic diplegia, which was diagnosed in 33.8% of children. 23.4% had a mixed form of cerebral palsy. Hemiplegic (15.2%), dyskinetic (14.2%) and atonic (11%) forms of cerebral palsy were significantly less common (figure 1).

Figure 1. The structure of the clinical forms of cerebral palsy in children



Statistically significant risk factors for spastic diplegia were: untreated anemia ($p=0.028$), low birth weight ($p=0.011$), and associated pseudobulbar disorders ($p=0.041$). The leading risk factors for spastic diplegia, according to the literature, were prematurity (27-35 weeks, with a birth weight less than 1500 grams), hypoxic-ischemic brain damage, birth asphyxia, dysfunctional pregnancy (infectious or somatic pathology)².

Statistically significant risk factors for the formation of the hemiplegic form were: the age of the mother over 30 years ($p=0,030$), untreated anemia ($p=0,028$), concomitant - epilepsy ($p=0,017$), encephalopathy ($p=0,030$). P.S. Krivonozhkina in her studies, identified the following main factors in the formation of the hemiplegic form of cerebral palsy: deep prematurity of the newborn or low birth weight, history of abortions, severe preeclampsia, premature labor, a prolonged anhydrous period after the discharge of amniotic fluid, Apgar score very low, hyperbilirubinemia, which does not coincide with our data.

Statistically significant risk factors for the development of the dyskinetic form were: age of mother over 30 ($p=0,030$), microcephaly ($p=0,021$), tight entanglement of the umbilical cord ($p=0,017$). According to the literature, hyperbilirubinemia and hypoxic-ischemic brain damage in the neonatal period play the role in the development of the dyskinetic form of cerebral palsy³, extragenital pathology and infectious pathology of the mother, preeclampsia of the first half of pregnancy, premature birth⁴.

Atonic form of cerebral palsy was more often observed at birth from mothers over 30 years old ($p=0,030$). The study conducted by R. B. Ussembayeva and co-authors⁵ showed the predominance of hypoxic factors in the formation of the atonic form of cerebral palsy with various structural pathologies and severe neurological symptoms.

The mixed form of cerebral palsy is more common in tight umbilical cord entanglement with fetal hypoxia ($p=0,017$).

Thus, the most significant risk factors for the formation of spastic diplegia of cerebral palsy in the studied group of children were: untreated maternal anemia (60,7%), low birth weight (31,7%); hemiplegic form – untreated maternal anemia (60,7%), age of mother over 30 (31%); dyskinetic form - age of mother over 30 (31%), tight entanglement of the umbilical cord (6,9%); atonic form – age of mother over 30 (31%); mixed form - fetal hypoxia 25,5%, tight entanglement of the umbilical cord (6,9%).

The results of copying medical records showed that among the 145 children with cerebral palsy, premature babies accounted for 54.0%. Of these, with a gestation period of 28-33 weeks, 32.4% were born, with a gestation period of 22-27 weeks, 15.9%. With a gestation period of 37-42 weeks, 38.6% of children were born. With a normal weight category, 46.2% of children were born, 35.2% of newborns with low birth weight, and extremely low birth weight -5.5% of children. 47.6% of children were born with a mild form of asphyxia, 16.6% with a moderate form of asphyxia, and 9.7% with a severe form of asphyxia.

One of the postnatal factors for the development of cerebral palsy is hyperbilirubinemia, in our study, it was detected in 33.8% of cases. Nuclear jaundice is irreversible damage to the central nervous system. In our study, nuclear jaundice was detected in 9.7% of cases. Hemolytic disease of the newborn occurred in 9.7% of cases. Neonatal seizures occurred in 28.3% of cases.

According to neuro sonography in children with cerebral palsy, third-degree periventricular hemorrhages were diagnosed in 51.0% of cases and IV degree in 38.6% of cases.

Intraventricular hemorrhages of the II degree were detected in 47.6% of children with cerebral palsy. Intraventricular hemorrhages of the III degree in 35.2% of cases and IV degree in 16.6% of cases.

Spastic diplegia prevailed in the structure of cerebral palsy - 33.8%, mixed forms were diagnosed in 23.4% of cases.

Analysis of medical records shows that in 81.4% of children the level of speech development was below the age level. 57.2% of children with cerebral palsy have delayed intellectual development.

The gender ratio between male and female sex (1.95:1) was almost identical to world figures (1,9:1).

Children of primary and secondary school age at the age of 8 to 12 years old prevailed (46.2%), one third of children were pre-school children from 3 to 7 years old (33.1%), children from 13 to 18 (19.3%) and infants from 6 months to 2 (1.4%) years are less represented. Observed the facts of the birth of sick children in twins: 6 children from 3 mothers - 3 twins, where both children are sick, 8 of twins, but one child and 1 mother of children of the same age are sick, both of which have cerebral palsy); the majority of women in the most reproductive age (60.7%) are from 18 to 30 years old; 73.1% of the children were re-pregnant, 9.7% (14 children) of multiple pregnancies.

The highest percentage of children diagnosed with cerebral palsy was set at the age of 1 to 3 years old — 40.8%, up from one year to 36%; from 3 to 7 years old at 11.6%. In the structure of cerebral palsy, spastic diplegia was diagnosed in 33.8% of children, mixed form of cerebral palsy in 23.4% of children, hemiplegic in 15.2%, dyskinetic in 14.5% -, atonic form of cerebral palsy in 11%, the diagnosis of cerebral palsy was specified its form in 2.1% of children.

Thus, when analyzing the copying of data from medical records, statistically significant risk factors were the combined effect of adverse factors in the ante-intra and post-natal periods, which, aggravating each other, led to the development of cerebral palsy.

During the study, prenatal risk factors for the development of cerebral palsy of children of the study group were studied and analyzed. In our study, mothers of children with cerebral palsy who were married at the age of 18-30 (60.7%) were the most frequent, although this age period is considered the most favorable for childbirth⁶. Up to 18 years, this percentage was 6.9%, over 30 years-31%. No data was provided for 2 women (1.4%).

Occupational hazards were identified in 20% of men. Of them, there were such professions as painter, driver, factory workers. In 25.5% of men, no data was provided. The rest (54.5%) had no occupational hazards.

Occupational hazards occurred in 24.1% of women, these are patients who work in contact with household chemicals. In 23.2% of women, no data was provided. The rest (52.4%) had no occupational hazards.

The use of antibacterial drugs was divided into trimesters of pregnancy. According to our research, the highest percentage of this group of drugs was in the second trimester (7,6%). The main reason for taking medications was ARVI, exacerbation of chronic diseases during pregnancy. The lowest rates are observed in the first, third trimesters – 1,4%, 3,4% respectively. Patients took antibiotics such as rovamycin, amoxiclav, cef 3, ampicillin, and roxithromycin.

The most frequent extragenital disease during pregnancy was anemia (60.7%) (figure 2), complication - the threat of abortion (55,2%) and severe pre-eclampsia (46,2%) – conditions leading to fetoplacental insufficiency, morphologically confirmed in 22.8% of cases. Of the inflammatory diseases leading to intrauterine infection and impaired uteroplacental blood flow, ARVI, ARD (42.1), intrauterine infections were more common. (carriage of HSV, CMV, toxoplasmosis, ureaplasmosis, and chlamydia) (38,6%).

All these conditions lead to fetoplacental insufficiency, which was morphologically confirmed by 22.8%. Of the inflammatory diseases, which can lead to intrauterine infection and impaired uteroplacental blood flow⁸, ARVI and ARD were more common during pregnancy (42,1%), intrauterine infections, such as HSV, CMV, toxoplasmosis, ureaplasmosis and chlamydia (38,3%), much less in 7.6% exacerbation of chronic tonsillitis, which corresponds to the data of the literature.

Every fourth patient had a history of abortions (24.8%), which in turn lead to premature birth, threatened abortion, fetal growth retardation syndrome and other conditions, impaired uteroplacental blood flow⁹. Almost every third woman has blood disorders (29%) and every fifth one or another pathology of the endocrine system (18.6%). In 17% of cases, the pathology of the fetal membranes was found, and every 10 children were born during multiple pregnancies (9.7%). Rarely enough (4.9%) pregnancy with the help of ART and in 4.2% of patients' physical injuries during pregnancy and infertility.

As shown in figure 3, in 51% of cases there were premature births, in 35.2% of the births there was asphyxia, and chronic hypoxia was observed in 25.5% of newborns. Both the tight entanglement of the umbilical cord (6.9%) and the weakness of labor activity (8.3%), premature detachment of a normally located placenta (7.6%), a long anhydrous period (13.1%), prolonged labor (5.5%). Rapid labor, which leads to trauma to both the mother and the fetus, and asphyxia of the newborn occurred in 7.6% of cases. However, operative labor (cesarean section), which in recent times is often carried out in the interests of the fetus noted in our study in 33.1% of cases, that is, in every third patient, while the perinatal outcome did not improve surgery.

Figure 2. Obstetric-gynecological and extragenital diseases of mothers (n=141) of the studied group of children with cerebral palsy (extragenital diseases are highlighted in yellow)

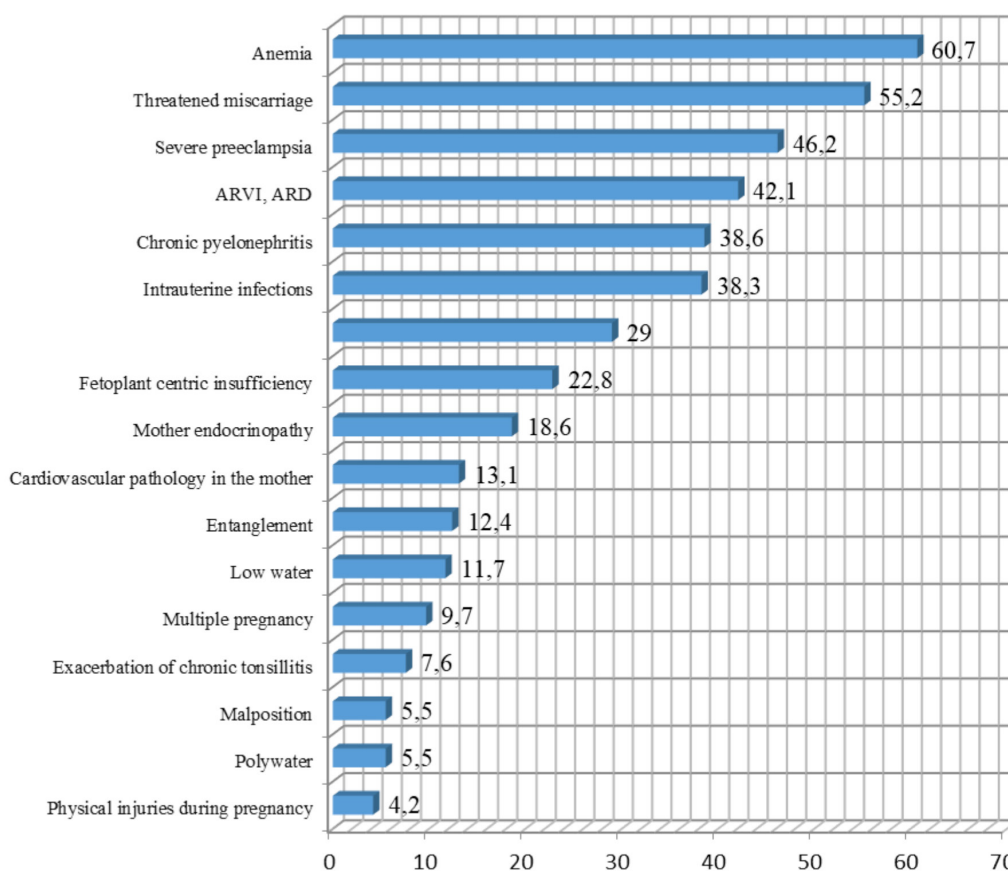
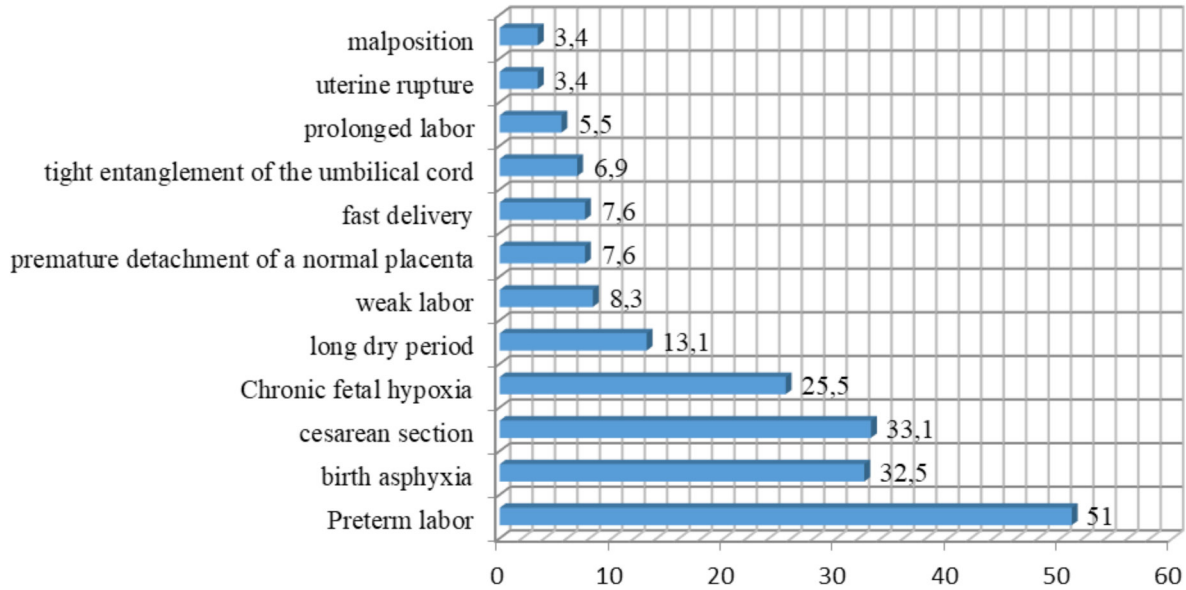


Figure 3. Complications of labor in mothers (n = 141) of the studied group of children with cerebral palsy



In 51% of cases, preterm labor was present, in 57% of cases, newborns needed resuscitation and in 35.2% at birth, asphyxia was noted, and chronic hypoxia in 25.5% of newborns. Operational labor (cesarean section) in our study was noted in 33.1% of cases.

Conclusions

The causes of cerebral palsy can be divided into three categories:

Prenatal Causes: Some causes cause the brain to malfunction in the fetal time. Many of the genetic diseases or some viral infections of the mother during pregnancy are of this category.

Causes at birth: Causes unnecessary oxygen to the baby's brain at birth and causes irreparable damage to it.

Postpartum Causes: Causes such as brain infections, lack of oxygen for a while, brain hemorrhage (due to trauma such as an accident, falling to the ground, or other blows to the head) can be extremely vulnerable after the baby is born and when the baby's brain is still in place. Is to do those irreversible injuries.

During the study, postnatal (neonatal period) risk factors were studied and analyzed: jaundice, degree of term, the presence of resuscitation, gestational age, assessment of the condition at birth, perinatal lesions of the central nervous system, vaccination status, timing of diagnosis of cerebral palsy and assessment of associated conditions, examples of rehabilitation therapy, the level of neuropsychic development.

Given the determinants of postpartum factors affecting cerebral palsy, we believe that a comprehensive treatment program can manage or improve many of the symptoms associated with cerebral palsy and its associated diseases. In most cases, there is a need for a team of different medical professionals. Each of these specialists provides specific treatment to the patient. These include:

1. Medication: To help manage this disease, various medications are often prescribed for people with cerebral palsy.
2. Physiotherapy: Usually, physiotherapy of cerebral palsy is the first and most important step towards the treatment of children with cerebral palsy. This treatment usually begins at a young age and gradually helps to improve one's movement.
3. Occupational Therapy: Therapists evaluate their needs by testing their child's motor, cognitive, and motor skills. The therapist can determine a treatment plan by observing how the child responds to gestures and touching. The treatment plan usually includes positioning, reaching the goal, grabbing and dropping.
4. Speech Therapy: Speech therapists can identify speech problems and help improve language skills. They can also help with other skills, such as breathing and eating, as they involve the mouth and facial muscles. Speech therapy in children with cerebral palsy also removes the barriers that affect the child's ability to eat. Oral movement exercises can effectively improve the ability to chew and swallow food.

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