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Socially Significant Diseases of Childhood and Adolescence: Cerebral Palsy and It's Causes, Risk Factors

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Abstract: ***The article is devoted to the problems of state support for people suffering from socially significant diseases in Kazakhstan. The authors of the article give a description of the cerebral palsy. The article provides an analysis of the frequency and growth of children with cerebral palsy. The main risk factors for this disease, the causes of occurrence, as well as indicators of the effectiveness of national policies in the prevention of cerebral palsy are shown. One of the urgent tasks of the healthcare system is the medical and social rehabilitation of children with disabilities. Over the past few years, there has been a clear tendency toward an increase in childhood disability in our country, and more attention needs to be paid to the etiology and diagnosis of disabling diseases, and the problems of children with disabilities.***

Keywords: cerebral palsy, disability, risk factors, infancy, medical care.

1. Introduction

In the annual Presidential Address of Nazarbayev N.A. to the people of Kazakhstan, it is noted that socially significant programs are of paramount importance. In these programs, the main place is occupied by motherhood and childhood. Unfortunately, in recent years in the Republic of Kazakhstan, there has been a deterioration in the health of children, which is characterized by an increase in morbidity, changes in structure and chronicity, which causes an increase in the disability of the child population. On the other hand, the improvement and application of new diagnostic technologies in pediatrics has shown that pathologies that are not found in adults that require specialized care are detected in children. At the same time, in conditions of urbanization, large employment of women and their active involvement in social activities, growth of education and in general, improving the quality of life of the population, there is a limited family need for the number of children. Despite the positive changes in the demographic situation, the low level of health of women and children remains.

According to the Decree of the Government of the Republic of Kazakhstan № 2018 dated on 4th of December in 2009 "On approval of the list of socially significant diseases and diseases that are dangerous to others", diabetes and cerebral palsy are the most common socially significant diseases among the children population.

About a fifth of all childhood disabilities are formed by diseases of the nervous system, in the structure of which more than 50% are cerebral palsy - one of the most pressing problems of pediatric neurology. According to experts from the World Health Organization, an average of 10% of the world's population is disabled, of which 150 million are children. According to the data of the National Genetic Register of the Republic of Kazakhstan, from 2000 to 3500 children with congenital and hereditary pathology are born annually in Kazakhstan, which is 20.0-24.3 per 1000 newborns. According to the Ministry of Health of the Republic of Kazakhstan, the frequency of perinatal lesions of the central nervous system is 7.5-22.4% in the structure of the incidence of children in this age category. This position is defined as a social phenomenon, which has a tendency to increase, since by 2015 it is expected to increase the of perinatal lesions of the central nervous system by 11%. In the structure of childhood disability, the leading position (from 30% to 70%) is occupied by cerebral palsy - a disease that leads to early disability. In Kazakhstan, according to statistics, more than 44 thousand disabled children are registered, of which over 10 thousand are children with a diagnosis of cerebral palsy. Data on the frequency of cerebral palsy fluctuate in a wide range, averaging 2.0-5.9 per 1000 births and is largely determined by the level of development of society. At the same time, some authors note a downward trend in this pathology due to improved obstetric care, treatment and prevention of complications, while others believe that over the years, the frequency of cerebral palsy has remained stable, which is probably associated with damage to the nervous system mainly in the prenatal period [1].

The prevalence of the incidence of the nervous system in children, their inadequate rehabilitation and the increasing environmental degradation in Kazakhstan contribute to the growth of childhood neurological disability. The most common causes of disability in children are severe damage to the central and peripheral nervous systems, which account for 32.7% of all childhood disabilities, of which the main group is cerebral palsy.

In the structure of child disability, cerebral palsy takes a leading position from 30% to 70% [2,3]. In recent years, in connection with the development of medical technologies, opportunities have appeared for nursing deeply premature infants who have undergone various adverse effects in the perinatal period. Many of them subsequently develop a

picture of perinatal damage to various brain structures. Previously, such children did not survive, now they make up a significant part of patients with neurological disorders and often with cerebral palsy [4].

Cerebral palsy is a term that unites a group of chronic non-progressive symptom complexes of motor disorders that are secondary to brain lesions or abnormalities that occur in the perinatal (perinatal) period. False progression is noted as the child grows. About 30-50% of people with cerebral palsy experience a violation of intelligence. Difficulties in thinking and mental activity are more common among patients with spastic quadriplegia than among other types of cerebral palsy. Brain damage can also affect your native language and speech skills [5]. Cerebral palsy is not a hereditary disease. But it was shown that some genetic factors are involved in the development of the disease. In addition, the existence of many cerebral palsy-like diseases presents a certain difficulty.

Cerebral palsy is a whole group of childhood diseases with pathologies of the central nervous system, impaired coordination of speech, movement, delayed intellectual development, dysfunction of the muscular and motor systems. Children with CP exhibit a wide variety of symptoms, including:

- lack of muscle coordination when performing voluntary movements (*ataxia*);
- stiff or tight muscles and exaggerated reflexes (*spasticity*);
- weakness in one or more arm or leg;
- walking on the toes, a crouched gait, or a “scissored” gait;
- variations in muscle tone, either too stiff or too floppy;
- excessive drooling or difficulties swallowing or speaking;
- shaking (*tremor*) or random involuntary movements;
- delays in reaching motor skill milestones; and
- difficulty with precise movements such as writing or buttoning a shirt [6].

2. Literature Survey

For the first time, the prominent British surgeon John Little took up such violations in the 1830s when he lectured on birth injuries. In 1853, he published a work entitled “On the nature and treatment of deformations of the human skeleton” (Eng. “On the nature and treatment of the deformities of the human frame”). In a report in 1861 at a meeting of the Obstetric Society of London, Little stated that asphyxiation caused by pathology during childbirth leads to damage to the nervous system (he meant damage to the spinal cord) and the development of spasticity and plegia in the legs. Thus, he was the first to describe what is now known as one of the forms of spastic cerebral palsy - spastic diplegia. For a long time, it was called Little's disease.

A no less prominent Canadian doctor, Sir Osler, published the book “The cerebral palsies of children” in 1889, introducing the term cerebral palsy and showed that the disorders concern the cerebral hemispheres, and not damage to the spinal cord. Following Little, for more than a century, the main cause of cerebral palsy was considered asphyxiation in childbirth. Although at the end of the XIX century, Sigmund Freud did not agree with this concept, saying that the pathology in childbirth is only a symptom of earlier fetal disorders. Freud, being a neurologist, noticed a connection between cerebral palsy and some variants of mental retardation and epilepsy. In 1893, he introduced the term “cerebral palsy” (German infantile Zerebrallähmung), and in 1897 he suggested that these lesions are more associated with impaired brain development in the prenatal period. It was Freud who, based on his work in the 1890s, combined various disorders caused by abnormal post-neonatal brain development under one term and created the first classification of cerebral palsy.

Causes of cerebral palsy

Cerebral palsy due to abnormal development or damage to the developing brain. This event can occur during pregnancy, childbirth, the first month of life, or less often in early childhood. Structural problems in the brain are observed in 80% of cases, most often in white matter. It is estimated that more than three quarters of cases are associated with problems that occur during pregnancy [7]. Most children with cerebral palsy have more than one risk factor associated with cerebral palsy [8].

Risk factors [9]:

- premature birth;
- the presence of a twin;
- some infections during pregnancy (toxoplasmosis or rubella);
- exposure to methylmercury during pregnancy (formed as a result of the metabolism of bottom microorganisms when mercury is released into water bodies);
- difficult birth;
- head injuries during the first few years of life.

Although in some cases it is not possible to pinpoint the cause, typical causes include intrauterine growth problems (e.g. radiation, infection, fetal growth restriction), cerebral hypoxia (thrombotic events, placental conditions), trauma during childbirth or in early childhood [10].

In Africa, the main cause is asphyxia, high bilirubin and infections of the central nervous system in newborns. Many cases of cerebral palsy in Africa can be prevented by improved access to care [11].

Very often, a combination of several negative factors, manifested both during childbirth and during pregnancy, leads to such a disease. In the etiology of cerebral palsy, prenatal factors up to 90% are of primary importance, and in only 10% of cases, cerebral palsy occurs due to birth injury, meningoencephalitis and other intrapartum and postanatal diseases. Among the possible prenatal causes of the development of cerebral palsy are: infectious diseases of the fetus (rubella, cytomegaly, toxopasmosis, herpes, etc.); cardiovascular and endocrine diseases of the mother and fetus; intracranial birth injuries; intracranial hemorrhage; mental trauma; medications. An analysis of perinatal factors in Kazakhstan revealed that in 65% of cases, intrauterine infection of the fetus has the strongest effect. In 50% of cases, intrauterine hypoxia of the fetus; preterm pregnancy; somatic disease of the mother, of which endocrine disorders, cardiovascular disease, anemia. Of the intranatal factors, a significant influence is exerted by: severe asphyxia; intensive care after childbirth; prolonged labor; stimulation or weakness of labor.

3. Methodology

The authors used the method of system analysis during the process of the work on this article. A comparative analysis method was also used to compare data for individual states. Also, a statistical method was used for the transmission of accurate data. The authors analyzed the current legislation of the Republic of Kazakhstan in the field of healthcare. Cited various information published in the media on the topic of scientific research.

4. Discussion

There are some medical conditions or events that can happen during pregnancy and delivery that may increase a baby's risk of being born with cerebral palsy. These risks include:

- *Low birthweight and premature birth.* Premature babies (born less than 37 weeks into pregnancy) and babies weighing less than 5 ½ pounds at birth have a much higher risk of developing cerebral palsy than full-term, heavier weight babies. Tiny babies born at very early gestational ages are especially at risk.
- *Multiple births.* Twins, triplets, and other multiple births -- even those born at term -- are linked to an increased risk of cerebral palsy. The death of a baby's twin or triplet further increases the risk.
- *Infections during pregnancy.* Infections such as toxoplasmosis, rubella (German measles), cytomegalovirus, and herpes, can infect the womb and placenta. Inflammation triggered by infection may then go on to damage the developing nervous system in an unborn baby. Maternal fever during pregnancy or delivery can also set off this kind of inflammatory response.
- *Blood type incompatibility between mother and child.* Rh incompatibility is a condition that develops when a mother's Rh blood type (either positive or negative) is different from the blood type of her baby. The mother's system doesn't tolerate the baby's different blood type and her body will begin to make antibodies that will attack and kill her baby's blood cells, which can cause brain damage.
- *Exposure to toxic substances.* Mothers who have been exposed to toxic substances during pregnancy, such as methyl mercury, are at a heightened risk of having a baby with cerebral palsy.
- *Mothers with thyroid abnormalities, intellectual disability, excess protein in the urine, or seizures.* Mothers with any of these conditions are slightly more likely to have a child with CP.
- There are also medical conditions during labor and delivery, and immediately after delivery that act as warning signs for an increased risk of CP. However, most of these children will not develop CP. Warning signs include:
- *Breech presentation.* Babies with cerebral palsy are more likely to be in a breech position (feet first) instead of head first at the beginning of labor. Babies who are unusually floppy as fetuses are more likely to be born in the breech position.
- *Complicated labor and delivery.* A baby who has vascular or respiratory problems during labor and delivery may already have suffered brain damage or abnormalities.
- *Small for gestational age.* Babies born smaller than normal for their gestational age are at risk for cerebral palsy because of factors that kept them from growing naturally in the womb.
- Low *Apgar score*. The Apgar score is a numbered rating that reflects a newborn's physical health. Doctors periodically score a baby's heart rate, breathing, muscle tone, reflexes, and skin color during the first minutes after birth. A low score at 10-20 minutes after delivery is often considered an important sign of potential problems such as CP.
- *Jaundice*. More than 50 percent of newborns develop jaundice (a yellowing of the skin or whites of the eyes) after birth when *bilirubin*, a substance normally found in bile, builds up faster than their livers can break it down and pass it from the body. Severe, untreated jaundice can kill brain cells and can cause deafness and CP.
- *Seizures.* An infant who has seizures faces a higher risk of being diagnosed later in childhood with CP [12].

The Ministry of Health of the Republic of Kazakhstan is already implementing the Roadmap for the organization of rehabilitation care for children with cerebral palsy in the Republic of Kazakhstan for 2019-2020. Plans are also being developed for the development of rehabilitation assistance in the region. Within the framework of the "Kamkorly" Road Map, it is planned to open rehabilitation centers in Atyrau, East Kazakhstan, West Kazakhstan, Kostanay, Pavlodar, Turkestan, Mangistau, Almaty, North Kazakhstan, Aktobe regions.

In addition, to further improve the quality of medical services provided in this area, a group of regional coordinators for rehabilitation services were trained on improving the rehabilitation service in a foreign clinic (Lithuania) from October 14 to 27, 2019. Work in this direction continues. In November 2019, master classes were held for multidisciplinary groups from the regions on the basis of Medical Education Organizations in the cities of Nur-Sultan and Karaganda.

Currently, children undergo medical rehabilitation in 12 rehabilitation centers, including 3 centers of the republican level and 9 rehabilitation centers of the regional level. There are 1273 beds in 12 rehabilitation centers. In addition, in the republic there are 39 departments of rehabilitation treatment and medical rehabilitation of round-the-clock stay for children in hospitals with 1384 beds.

Today, in the country, children with disabilities in order to overcome social problems that have arisen and expand opportunities for participation in society on an equal footing with other citizens are provided with special social services in a hospital, semi-hospital, home care.

So, in the field of social protection of the population there are 4 stationary medical-social institutions for children with a violation of the musculoskeletal system. About 200 children receive help per year. Also in 16 medical and social institutions annually about 2 thousand children with neuropsychiatric pathologies are admitted.

It should be noted that currently the provision of services in a semi-hospital and at home is an alternative to the existing network of stationary organizations and is aimed at keeping the child in the family.

About 2 thousand disabled children are covered with special social services in 50 day care organizations. In these departments, work is carried out by psychologists, defectologists, speech therapists, physical therapy instructors, masseurs, etc. Persons attending departments receive support for domestic services, medical rehabilitation, assistance in drawing up eligible benefits and allowances, psychological and pedagogical assistance.

The opening of these departments contributed only last year to the return of 727 children from boarding schools to families and the employment of 856 parents.

Along with this, the service of providing social assistance at home to families with disabled children is actively developing and functioning in the country. So, in 205 departments more than 13 thousand children are covered with special social services. At the same time, the child is not closed in the family, but has the opportunity to develop through attending classes with speech therapists, psychologists, various groups, sports sections, hippotherapy, and art therapy together with parents.
A large positive effect in the provision of special social services was obtained as a result of placing a state social order in the non-governmental sector. If in 2014 the number of non-governmental organizations providing special social services was 62, with coverage of more than 3,482 people, now more than 11,048 people, including over 3 thousand children, receive special social services in 177 non-governmental organizations.

In Kazakhstan, almost all children's hospitals have departments where children with a diagnosis of cerebral palsy and neurological disorders can undergo full rehabilitation. At the same time, if you can get into the republican rehabilitation centers once a year, then in the departments at children's hospitals little Kazakhstanis can undergo rehabilitation every two months [13].

5. Conclusion

1 in 2 people with CP live in chronic daily pain. Children with moderate to severe CP, often lag behind in growth and development. The muscles and limbs affected by CP tend to be smaller than normal, especially in children with spastic hemiplegia, whose limbs on the affected side of the body may not grow as quickly or as long as those on the normal side. Globally over 17 million people in the world have CP.

According to the roadmap for 2019-2020, many centers for children with cerebral palsy have been planned and are being opened, however, over the past 10 years, the number of children with cerebral palsy has increased by 1.6%. Children with disabilities under 16 receive 43,657 tenge in 2020, however, the lack of places and beds for children with disabilities leads to the fact that many parents have to treat children for a fee, which costs a lot of money.

The Republic of Kazakhstan ratified the Convention on the Rights of Persons with Disabilities by Law No. 288-V of 20th of February in 2015, and accepted all the norms specified in this Convention as its obligations and must fulfill its provisions [14].

The principles of this convention are respect for dignity, autonomy and independence; non-discrimination; fully and effectively involved and inclusion in society; respect for the characteristics of persons with disabilities and their adoption as a component of human diversity and part of humanity; equality of opportunity; availability; gender equality; respect for the developing abilities of children with disabilities and respect for the right of children with disabilities to preserve their individuality.

In addition, States parties to the convention prohibit any discrimination on the basis of disability, and guarantee persons with disabilities equal and effective legal protection against discrimination on any grounds [15].

According to the convention, member states must take all appropriate measures, including legislative ones, to ensure an adequate standard of living for persons with disabilities and their social protection.

Based on this, the situation of children with cerebral palsy should be given due attention and appropriate measures should be taken to prevent this disease. The presence of rehabilitation centers throughout Kazakhstan could help not only children with a diagnosis of cerebral palsy, but also the opening of several centers for early intervention and rehabilitation of children with cerebral palsy in each region.

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