



## **CAUSES OF PERINATAL HYPOXIC-ASPHYXIAL LESIONS AND THEIR IMPACT ON THE NERVOUS SYSTEM IN THE ARAL SEA REGION**

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In recent decades, the ecological crisis in the Aral Sea region has had a seriously negative impact not only on the natural environment but also on public health, especially on the health of mothers and newborn infants. The high concentrations of pesticides, heavy metals, saline dust, and other toxic compounds in the atmosphere, water, and soil disrupt oxygen exchange processes in pregnant women. As a result, fetal oxygen deficiency—hypoxia—occurs and becomes one of the main causes of central nervous system damage during the perinatal period [1].

Perinatal hypoxic-asphyxial injuries (PHAI) are characterized by damage to the central nervous system resulting from oxygen deficiency or impaired breathing (asphyxia) during childbirth. Such pathological conditions lead to morphological changes in fetal or neonatal brain tissues, necrosis of nerve cells, circulatory disorders, and increased oxidative stress. Moreover, PHAI often result in long-term neurological disorders, delayed motor and cognitive development, as well as complications such as cerebral palsy and epilepsy [2].

In the Aral Sea region, the high prevalence of environmental risk factors, combined with chronic maternal hypoxia, anemia, infectious-toxic effects, and metabolic disturbances, contributes to the increased incidence of PHAI. Therefore, scientifically studying these processes, identifying the interrelation between environmental conditions, maternal health, and perinatal nervous system injuries, and developing comprehensive preventive measures are among the most urgent areas of modern medicine and environmental science [3].

The severe disruption of the ecological environment and pollution of natural resources in the Aral Sea region have a direct negative impact on the health of pregnant women and newborn infants. The excessive presence of saline dust, heavy metals, pesticides, and other toxic compounds in the air leads to chronic hypoxic conditions in the body, causing metabolic changes associated with oxygen deficiency. During pregnancy, this condition particularly disrupts blood circulation in the placenta,



reducing the amount of oxygen delivered to the fetus. Consequently, it causes morphofunctional alterations during the formation stages of the central nervous system.

In the pathogenesis of perinatal hypoxic-asphyxial injuries, hypoxia and asphyxia play a leading role. Under hypoxic conditions, cerebral blood flow slows down, cellular energy supply becomes impaired, and oxidative stress in neurons intensifies. At the same time, the increased amount of free radicals damages cell membranes, resulting in neuronal necrosis and apoptosis. Asphyxia occurring during childbirth further exacerbates these pathological processes, leading to the development of hypoxic-ischemic encephalopathy in the brain.

Environmental factors specific to the Aral Sea region — such as the contamination of water resources with pesticides and heavy metal ions, the high concentration of saline dust particles in the air, and the presence of toxic residues in food products — are identified as major external factors that intensify oxygen deficiency in pregnant women. These factors reduce the oxygen-carrying capacity of the blood, decrease hemoglobin levels, and aggravate hypoxic conditions. Under such circumstances, placental blood circulation becomes impaired, resulting in insufficient delivery of oxygen and essential nutrients to the fetus.

According to medical observations, perinatal hypoxic-asphyxial injuries (PHAI) are among the most common pathologies observed in newborns in the Aral Sea region. In particular, women living in ecologically unfavorable districts show high rates of anemia, chronic intoxication, and hypoxic disorders. These conditions lead to insufficient development of the central nervous system in newborns, weakened reflex responses, impaired muscle tone, and delays in psychomotor development.

Furthermore, the long-term influence of environmental factors negatively affects the functioning of the nervous system not only during the perinatal period but also in subsequent stages of development. Chronic disturbances in cerebral circulation reduce the plasticity of neurons, resulting in intellectual and emotional developmental delays in children. Therefore, the prevention of PHAI in the Aral Sea region is closely linked to environmental rehabilitation measures, maternal health monitoring, prevention of hypoxia during pregnancy, and the improvement of resuscitation care during childbirth.

These scientific observations demonstrate the close relationship between perinatal hypoxic-asphyxial injuries and environmental factors in the Aral Sea region. This provides scientific evidence for the need to ensure maternal and child health,



reduce ecological risk factors, and strengthen the system of medical prevention in the region.

It has been established that the severe degradation of the ecological environment in the Aral Sea region is a direct cause of the high incidence of perinatal hypoxic-asphyxial injuries (PHAI). Toxic substances, pesticides, and heavy metals found in the air, water, and soil disrupt oxygen exchange in pregnant women, leading to chronic hypoxia and metabolic changes. This results in impaired placental blood circulation, oxygen deficiency in fetal brain tissues, and the development of degenerative processes at the cellular level. Consequently, newborns exhibit impaired central nervous system function, weak reflex responses, decreased muscle tone, and delayed psychomotor development.

The conducted analyses show that environmental pollution is the leading factor in the widespread occurrence of perinatal hypoxic-asphyxial injuries (PHAI) in the Aral Sea region, as it disrupts the physiological processes of both the mother and the fetus. In particular, saline dust in the air and chemical compounds in the water exacerbate oxygen deficiency and negatively affect the formation of the central nervous system.

To reduce these conditions, it is necessary to improve the ecological environment and strengthen the medical monitoring system aimed at the early detection of hypoxia and anemia in pregnant women. In addition, studying the medico-biological effects of environmental risk factors and implementing comprehensive preventive programs to protect maternal and child health are of great scientific and practical importance for ensuring the development of a healthy generation in the Aral Sea region.

### **References**

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