Neonatal (newborn) seizures are seizures in a baby who is less than 28 days old. Many different problems can cause neonatal seizures.

Most neonatal seizures are considered provoked seizures, rather than a true epilepsy syndrome. A baby with neonatal seizures will not necessarily go on to have epilepsy later in life, although her chances of developing epilepsy are much higher.

What causes neonatal seizures?

Neonatal seizures are usually symptomatic or cryptogenic, but a small number of neonatal seizures are idiopathic and seem to have a genetic origin.

Symptomatic neonatal seizures may be caused by:

- lack of oxygen before or during birth because of problems such as placental abruption (premature detachment of the placenta from the uterus), a difficult or prolonged labour, or compression of the umbilical cord
- infection acquired before or after birth, such as bacterial meningitis, viral encephalitis, toxoplasmosis, syphilis, or rubella (German measles)
- stroke before or after birth
- venous sinus thrombosis (a blood clot in the brain)
- bleeding in the brain
- congenital brain abnormalities, either genetic or acquired during fetal development, such as tuberous sclerosis
- blood sugar or electrolyte imbalances, including hypoglycemia (low blood sugar), hypocalcemia (low calcium), hyponatremia (low sodium), or hypernatremia (high sodium)
- metabolic problems, such as maple syrup urine disease, pyridoxine dependency, or phenylketonuria (PKU)
- drug withdrawal, which may be seen in infants born to mothers addicted to barbiturates, alcohol, heroin, cocaine, or methadone

The risk of seizures is higher if the baby is premature or of low birth weight.

Benign familial neonatal seizures

Benign familial neonatal seizures (also known as fifth-day convulsions or fifth-day fits) are an idiopathic epilepsy syndrome in which the baby has a mutation in one of several possible genes. This is an active area of research and new genes are being identified. Most of the affected genes disrupt the potassium ion channels in the brain. This condition is often inherited in an autosomal dominant pattern, so the baby's mother or father will also have had this disorder.

Benign nonfamilial neonatal seizures

The cause of benign nonfamilial neonatal seizures is unknown. They may be caused by zinc deficiency or a virus.

What are the features of neonatal seizures?

Neonatal seizures occur in babies who are less than 28 days old. Seizures in a newborn are often short and subtle; it can be difficult to tell whether a baby is actually having a seizure.

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Seizures in newborns can include any or all of the following:

- repetitive facial movements, including sucking, chewing, or eye movements
- unusual bicycling or pedalling movements of the legs
- staring
- apnea (stopping breathing)
- clonic seizures, which are rhythmic jerking movements that may involve the muscles of the face, tongue, arms, legs, or other regions
- tonic seizures, which are stiffening or tightening or muscle groups; the head or eyes may turn to one side, or the baby may bend or stretch one or more arms or legs
- myoclonic seizures, which are quick, single jerks involving one arm or leg or the whole body

Many of these movements may also occur in a normal newborn, so it may be necessary to get an EEG to confirm that they are really seizures.

Benign familial neonatal seizures

Benign familial neonatal seizures usually begin when the baby is two to eight days old, although they can begin at up to three and a half months. There is always a family history of seizures. The baby will have partial or generalized tonic or clonic seizures, often with apnea. The seizures usually last from one to two minutes and the baby may have up to 20 to 30 seizures per day. The baby usually grows out of the seizures by the time she is 16 months old.

Benign nonfamilial neonatal seizures

Benign nonfamilial neonatal seizures usually begin when the baby is four to six days old. There is no family history of seizures. The baby will usually have partial, clonic seizures, often limited to one side of the body. The seizures may lead to status epilepticus, lasting from two hours to three days. There is not much information available on outcomes for children with benign nonfamilial neonatal seizures, but the seizures do not often continue in later life.

How many other children have neonatal seizures?

Different studies give widely different rates of neonatal seizures, depending on the definition of neonatal seizures, whether the seizures were confirmed with EEG, and the age and other characteristics of the babies that were studied. It is estimated that neonatal seizures occur in one in every 200 to 500 babies. However, one study that confirmed seizures by using an EEG found that only one baby in 5,000 had true neonatal seizures.

A Newfoundland study found that premature babies and babies weighing less than 2.5 kg at birth were at much higher risk of neonatal seizures.

Benign familial neonatal seizures are rare. It is estimated that approximately 6% of neonatal seizures are benign familial seizures, but there may be more than is realized. Benign nonfamilial neonatal seizures are also rare.

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How do you know that a child has neonatal seizures?

Many of the movements that are caused by seizures in newborns, such as sucking, chewing movements, stretching, jitteriness, posturing, jerking, and bicycling movements, also occur in normal, healthy babies. It may be necessary to get an EEG to determine if a newborn is having a seizure. It may also be necessary to do other laboratory tests, an MRI, or a CT scan to determine the cause of the seizures.

If you can stop the event by changing the position of the baby's limbs, it is not a seizure.

Benign familial neonatal seizures are diagnosed on the basis of family history, assuming that other causes have been ruled out.

A diagnosis of benign nonfamilial neonatal seizures is based on the age of onset, a lack of obvious cause, and a lack of family history.

How are neonatal seizures treated?

A newborn baby with seizures will usually be admitted to hospital, either in a ward, the neonatal intensive care unit (NICU) or the paediatric intensive care unit (PICU). There is some evidence that seizures affect brain metabolism and development in babies, so it is important to try and get the seizures under control.

Doctors will look for the underlying cause of the seizures, such as a blood clot or infection, and treat it as needed. They will try to correct any imbalances of blood sugar or electrolytes. If the seizures still happen when these are corrected, the doctors will give the baby anti-epileptic drugs. It is usually possible to control seizures with anti-epileptic drugs in up to 85% of babies.

If the baby does not respond to anti-epileptic drugs, it is possible that her body has difficulty metabolizing pyridoxine (a form of vitamin B6) and therefore needs higher amounts than usual. This is known as "vitamin B6 dependent epilepsy" or "pyridoxine-dependent seizures" (PDS). Pyridoxine dependency is rare, but easy to treat, so a high dose of pyridoxine will usually be tried.

For benign neonatal seizures, the effect of anti-epileptic drugs is not clear, since many seizures go away on their own. However, the baby will usually be given anti-epileptic drugs at least for a short period.

More information

- Drug Therapies for Epilepsy

What is the outlook for a child with neonatal seizures?

There are so many possible causes of neonatal seizures that it is difficult to give general information about the outlook. Talk to your child's doctor about her situation, how large the chances are that she will develop epilepsy, and the warning signs to look for. However, we do have some general information about the outlook.

The outlook for a child with neonatal seizures depends partly on the underlying cause and the type of seizures. If a child's seizures are caused by an underlying brain injury, her prognosis may be poor.

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A child with neonatal seizures that survives may have neurological problems later in life. Approximately 20% to 30% of children with neonatal seizures go on to develop epilepsy, most of them within the first year of life, although some studies show higher or lower figures. The variation probably depends on factors such as the definition of seizures, the different gestational ages and underlying conditions of the children studied, the length of follow-up, and so on.

The risk of a poor outcome is higher with:

- abnormal EEG between seizures
- tonic seizures
- premature birth
- underlying brain abnormalities

Benign neonatal seizures

The outlook for a child with benign familial neonatal seizures is better than for children with symptomatic neonatal seizures. In most cases, the seizures go away by the time the child is 16 months old. About 11% of children go on to develop other types of seizures. The rates of learning disabilities and mental retardation are only a little higher than the expected rate for all children. Some unexpected deaths have been reported in children with benign familial neonatal seizures.

There is not much information available on outcomes for children with benign nonfamilial neonatal seizures, but the outlook appears to be favourable and seizures usually remit. In some cases there is mild developmental delay.

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