

Fetal Malformations (Microcephaly) in Newborns in the City of Basra

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Abstract

This is a comprehensive and detailed description of a rare neurological disorder that results in microcephaly in infants, causing incomplete brain growth and development. It can occur during pregnancy while the fetus is in the mother's womb or during the early years after birth, often due to genetic changes from either a recessive or dominant gene affecting the fetus. Research aims to understand the causes, symptoms, treatment, and prevention of microcephaly.

Microcephaly can result from brain injury during growth, genetic or acquired factors post-birth like oxygen deficiency, infections such as measles, Zika virus, cytomegalovirus (CMV), malnutrition, severe hunger, endocrine gland problems, genetic changes, diseases like diabetes, meningitis, smoking, among other influences affecting fetal head growth.

Treatment focuses on helping affected children with intellectual disabilities reach their full potential in education, social skills, and overall development. Prevention methods include consuming nutrient-rich foods, avoiding factors that hinder fetal growth, and maintaining good health practices. Unfortunately, there is no cure for microcephaly, so medical attention involves managing treatable symptoms, aiding the child's mental and behavioral development, abstaining from known causes, and adhering to preventive health measures and growth-promoting foods.

The main goal of this research is to identify the causes leading to microcephaly and to understand how to avoid these factors that result in deformities. Prevention methods involve abstaining from smoking, avoiding drug and alcohol use, ensuring proper nutrition, and obtaining essential vitamins for pregnant women such as zinc, calcium, iron, and other important nutrients. Oxygen deficiency, excessive sun exposure leading to accelerated heart rates, causing fetal harm, as well as preventing infections and viruses that can result in fetal deformities such as microcephaly, are also crucial. Furthermore, prompt treatment for any illness is essential, as well as using insect repellents in densely wooded areas or regions known for mosquitoes to prevent diseases.

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Introduction:

This rare neurological disorder causes microcephaly where the child's head size is smaller and the brain growth is incomplete, resulting in the stunting of the child's brain development either during pregnancy in the womb or in the early years after birth^[1]. Compared to age and gender-matched peers, this negatively impacts cognitive abilities and genetic anomalies that interfere with brain cortical growth during the fetus's early months. Microcephaly can be congenital or acquired, meaning the child's head size was normal at birth but did not grow over time. Children with microcephaly often experience growth delays, intellectual disabilities, or medical issues such as cerebral palsy, epilepsy, and other diseases.^[2]

Mild microcephaly is defined as head size more than two standard deviations below the mean, while severe microcephaly is when head size exceeds three standard deviations below the mean. All degrees of the disorder can cause growth-related problems depending on their impact on brain structure.^[3]

Genetically, microcephaly can result from any gene mutation, either due to a recessive or dominant gene, affecting the fetus. When both parents are carriers of the microcephaly gene without symptoms, or if one parent has microcephaly symptoms, the likelihood of having a child with microcephaly due to a familial gene is up to 25%.^[4] Microcephaly typically occurs before 32 weeks of gestation and these genes are linked to early brain growth, often observed in children with Down syndrome and other genetic disorders.^[5]

Microcephaly is classified into:

1. Primary Microcephaly results from the failure of the brain to develop properly during pregnancy. This condition arises from a shortage of neural cells due to a failure in their production (neurogenesis).
2. Secondary Microcephaly is characterized by a normal head size at birth, but developmental issues arise later. The causes of secondary anencephaly can be attributed to various genetic and environmental factors, with affected children often experiencing developmental problems. Although there is no cure for the condition, early intervention may help promote the child's development and improve their quality of life^[6].

Causes of Microcephaly:

Anencephaly generally occurs due to brain damage during development, which can be either hereditary or acquired. Hereditary causes involve the transmission of genetic defects from the parents, leading to abnormal growth, as observed in conditions such as Down syndrome and other genetic disorders. Acquired causes may include oxygen deprivation, infections from the environment, bleeding, stroke, or postnatal brain injury. Additionally, spinal cord or brain defects may contribute to the condition. External factors such as maternal viral infections can also play a role.

1. Rubella (German Measles):

Rubella is a contagious disease that predominantly affects children. It manifests as a rash and is transmitted through droplets from sneezing or coughing, touching the nose, mouth, or eyes, or sharing utensils with an infected person^[7].

Symptoms of Rubella:

1. Nasal congestion or runny nose
2. Persistent headache and muscle pain
3. Redness and inflammation of the eyes
4. Fever
5. Fatigue and exhaustion
6. Swelling of the glands, particularly those behind the ears and at the back of the head

7. A red rash that begins on the face and spreads to other parts of the body

Complications:

Rubella can lead to bacterial pneumonia and otitis media, causing pain and widespread rash.

Infectious Period:

Symptoms typically appear 14 to 21 days after infection. The disease is contagious approximately 5 to 7 days before the rash appears.

Effects of Measles on the Fetus:

When a pregnant woman contracts measles during the first trimester, it can adversely affect the fetus, potentially leading to the following issues:

1. Physical deformities
2. Hearing impairment
3. Eye complications
4. Cardiac complications
5. Growth retardation
6. Intellectual disabilities
7. Increased stress

Treatment and Prevention:

1. Receiving the measles, mumps, and rubella (MMR) vaccine according to the childhood vaccination schedule.
2. Pregnant women should ensure they are vaccinated before conception or delivery.
3. Avoiding contact with individuals infected with measles to prevent transmission.

2. Zika Virus:

Zika virus is transmitted by mosquitoes and can cause brain damage and congenital abnormalities, including premature birth or miscarriage. Many individuals infected with Zika virus are asymptomatic, but those who do exhibit symptoms may experience ^[1]:

1. Rash
2. Fever and conjunctivitis
3. Muscle and joint pain
4. Malaise and headache lasting from two days to one week

Diagnosis: Confirmation requires laboratory testing.

Complications during Pregnancy:

Zika virus infection can lead to microcephaly and other congenital abnormalities in the infant, including limb contractions, muscle tone abnormalities, eye deformities, and hearing loss. It may also cause Guillain-Barré syndrome, neuropathy, and myelitis.

Transmission:

Zika virus is transmitted by infected mosquitoes of the Aedes genus (Aedes aegypti) and can be passed from mother to fetus during pregnancy. It can also be transmitted through sexual contact, blood transfusion, organ transplantation, and via the placenta, where it can affect the developing fetus.

Diagnosis:

Diagnosis based on symptoms alone is insufficient; laboratory testing is required. There is no specific treatment for Zika virus.

3. Cytomegalovirus (CMV):

Cytomegalovirus (CMV) is a common virus that often goes unnoticed in healthy individuals. Primary infection may present with mild symptoms such as (9_16):

1. Fatigue
2. Swollen glands
3. Fever
4. Sore throat
5. Muscle aches

In rare cases, CMV can cause:

1. Personality changes
2. Headaches and difficulty concentrating
3. Shortness of breath
4. Dry cough

Primary Symptoms of CMV:

Most healthy individuals with CMV infection are asymptomatic. When symptoms do occur, they are usually mild and include:

1. Fatigue
2. Swollen glands
3. Fever
4. Sore throat
5. Muscle aches

Congenital CMV Infection:

Infants born with congenital CMV infection may present with ^[17]:

1. Small size and low birth weight
2. Rash resembling bruises
3. Jaundice (yellowing of the skin or eyes)
4. Hepatomegaly and splenomegaly
5. Microcephaly
6. Seizures and hearing loss
7. Pneumonia and hepatitis

Causes and Transmission of Cytomegalovirus (CMV):

CMV is not typically contracted through casual contact but can be transmitted through direct contact with infected bodily fluids. This includes:

- Saliva

- Semen
- Vaginal fluids
- Blood
- Urine
- Breast milk
- Organ transplants
- Sexual contact

Complications in Children Born with CMV(17):

Children born with congenital CMV infection may face:

- ✓ Learning difficulties
- ✓ Brain damage or muscle coordination problems
- ✓ Seizures

Diagnosis:

CMV can be diagnosed in adults through blood tests, urine tests, saliva tests, or biopsy of tissues such as those from the intestines, lungs, or esophagus. Eye examinations may also reveal retinal inflammation, and imaging studies like CT scans can assist in diagnosis.

Virus Persistence:

Once infected, CMV can remain dormant in the body for life. In individuals with weakened immune systems, the virus can reactivate, potentially causing severe symptoms or organ damage.

Other Causes of Microcephaly and Related Conditions:

1. **Toxoplasmosis:** This parasitic infection, commonly found in cat and dog feces, can cause congenital abnormalities if the mother is infected during pregnancy ^[6].
2. **Malnutrition or Severe Hunger:** Inadequate nutrition during pregnancy can impact fetal development^[6].
3. **Alcohol Consumption:** Excessive alcohol intake can deplete essential nutrients, including Vitamin B, leading to fetal growth issues and sometimes miscarriage.
4. **Drug Use:** Maternal drug use, including uncontrolled conditions and certain medications, can affect fetal brain development. It is crucial to consult a healthcare provider before taking any medication to avoid complications.
5. **Craniosynostosis:** This condition involves the premature fusion of skull sutures, leading to brain growth restriction and often requiring surgical intervention.
6. **Endocrine Disorders:** Conditions such as hypothyroidism, hypopituitarism, and adrenal insufficiency can impair brain cell development, resulting in microcephaly.
7. **Genetic Changes:** Genetic disorders like Down syndrome (Trisomy 21) and other chromosomal or metabolic syndromes can cause microcephaly and reduce of oxygen in blood(24).
8. **Chemical Exposure:** Exposure to toxic chemicals, such as lead and high levels of mercury found in large fish, can harm fetal development. It's advisable to minimize exposure to these substances(18).
9. **Diabetes:** Maternal diabetes can lead to developmental complications in the fetus.
10. **Meningitis:** Inflammation of the protective membranes covering the brain and spinal cord can cause

developmental issues.

11. **Lead Poisoning:** Exposure to lead, especially from environmental sources, can affect brain development.
12. **Medication Use:** Particularly anticonvulsants, which should only be taken under medical supervision to avoid adverse effects.
13. **Smoking:** Maternal smoking can lead to various developmental issues in the fetus.
14. **Phenylketonuria (PKU):** This metabolic disorder impairs the body's ability to process the amino acid phenylalanine, affecting fetal brain development. It is often exacerbated by a diet high in phenylalanine-containing foods.
15. **Oxygen Deprivation:** Lack of adequate oxygen during pregnancy can lead to brain damage and microcephaly ^[25].

Genetic and Genetic Disorders Leading to Microcephaly (25):

1. Cornelia de Lange Syndrome:

This disorder impairs both intrauterine and postnatal growth. It is characterized by severe intellectual disability, limb and hand deformities, and distinctive facial features such as eyebrows that meet in the middle, low-set ears, and a small nose and teeth.

2. Down Syndrome (Trisomy 21):

Children with Down syndrome exhibit:

- ✓ Cognitive delay
- ✓ Intellectual disability ranging from mild to moderate
- ✓ Muscle weakness
- ✓ Distinctive facial features, such as almond-shaped eyes and a rounded face

3. CriduChat Syndrome:

Infants with this syndrome have a characteristic high-pitched cry similar to a cat's meow. The key features of this syndrome include:

- ✓ Intellectual disability
- ✓ Low birth weight
- ✓ Muscle weakness
- ✓ Distinctive facial features, such as wide-set eyes, a small jaw, and low-set ears

4. Rubinstein-Taybi Syndrome:

Children with Rubinstein-Taybi syndrome are typically shorter than average and may have broad thumbs and toes. They also have distinctive facial features. Severe forms of this syndrome often result in reduced life expectancy beyond childhood.

5. Seckel Syndrome:

This disorder is associated with growth retardation both in utero and postnatally. Its distinctive features include intellectual disability and characteristic facial features such as a narrow face, a saddle-shaped nose, and a receding jaw.

6. Smith-Lemli-Opitz Syndrome:

Children with Smith-Lemli-Opitz syndrome exhibit intellectual disability and behavioral disorders

similar to autism. Early signs of this syndrome include feeding difficulties, slow growth, and fusion of the second and third fingers on the hand.

Causes and Effects of Drug Use During Pregnancy:

Impact of Drugs on the Fetus During Pregnancy:

Drug use during pregnancy is highly detrimental as it adversely affects both the mother's and the fetus's health. It can lead to:

- **Slowed Fetal Growth:** Drugs can cause a slower rate of development in utero, resulting in low birth weight and increased risk of congenital abnormalities.
- **Neurodevelopmental Damage:** Exposure to drugs such as heroin, cocaine, and morphine can cause severe damage to the developing nervous system, potentially leading to neurological deficits or stillbirth due to insufficient immune protection.
- **Reduced Milk Production:** Drug use can also affect the mother's ability to produce adequate milk postnatally, further compromising the infant's health after 72 hours.

Effects of Parental Drug Addiction:

- **Genetic Impact:** When the father is a drug addict, the genetic material in his sperm may be altered, leading to congenital abnormalities in the child. These abnormalities may include birth defects, lower birth weight, and developmental issues due to the impact of drugs on cells and blood vessels.
- **Abnormalities:** Drug exposure can result in genetic changes that cause conditions such as intellectual disabilities, Down syndrome, incomplete brain development, cleft lip, and variations in the number of fingers or toes (21).

Brain Tissue and Organ Abnormalities:

- **Neural Tube Defects:** Congenital brain abnormalities not related to neural tube defects can lead to nerve damage, learning difficulties, and even death. Deficiencies in Vitamin B and the use of certain medications, such as valproate, contribute to these defects. They are often diagnosed before birth through blood tests, amniotic fluid analysis (measuring alpha-fetoprotein levels), or ultrasound.
- **Hydrocephalus:** Accumulation of cerebrospinal fluid within the skull due to obstructive issues can lead to brain swelling (22).

Specific Brain Abnormalities:

1. **Dandy-Walker Syndrome:** Characterized by underdevelopment or absence of parts of the cerebellum and the fourth ventricle.
2. **Holoprosencephaly:** Results from incomplete division of the brain into hemispheres during development.
3. **Macrocephaly:** Involves abnormal enlargement of the brain or head size.
4. **Microcephaly:** Occurs when the fetal brain does not develop properly in utero.

Prevention:

Taking folic acid during the first trimester of pregnancy can reduce the risk of neural tube defects by up to 75%.

Effects of Sun Exposure During Pregnancy:

Exposure to sunlight during pregnancy can lead to dehydration in the mother, which can negatively impact both maternal and fetal health. Dehydration can increase the mother's heart rate and decrease the amount of oxygen delivered to the fetus, potentially resulting in microcephaly (small head size).

Additionally, excessive sun exposure can degrade folic acid, a crucial nutrient that helps protect the fetus from neural tube defects, thereby increasing the risk of congenital anomalies. While moderate sun exposure is beneficial for vitamin D synthesis, prolonged exposure can lead to adverse effects ^[23].

Causes of Abnormal Brain Development in the Fetus:

Abnormal brain development in the fetus poses significant challenges, leading to a range of severe issues that may not have effective medical solutions. Such abnormalities can sometimes result in the infant's death immediately after birth ^[26].

1. Infections During Pregnancy:

Viral or microbial infections, such as herpes, can be transmitted from the mother to the fetus via the bloodstream. This can impair the delivery of oxygen and nutrients to the fetus, leading to abnormalities or malformations in brain development.

2. Placental Abruption:

Placental abruption, or the premature separation of the placenta from the uterine wall, can disrupt the oxygen and nutrient supply to the fetus. This condition negatively affects fetal health, particularly brain development, leading to potential malformations.

3. Amniotic Fluid Imbalance:

- **Low Amniotic Fluid (Oligohydramnios):** Reduced amniotic fluid can compress the umbilical cord, decreasing blood flow and oxygen to the brain, potentially causing brain abnormalities.
- **Excess Amniotic Fluid (Polyhydramnios):** Excessive amniotic fluid can result from maternal infections or inflammation, which can exert pressure on the developing brain and cause developmental issues.

4. Umbilical Cord Problems:

Issues such as cord knots, twists, or shortening can impair the delivery of oxygen to the fetus, leading to brain development problems.

5. Uterine Rupture:

A uterine rupture can cause maternal bleeding and impede the flow of oxygen-rich blood to the fetus. This can result in brain abnormalities, chronic health issues, and, in severe cases, fetal death. Insufficient oxygen can lead to brain atrophy, sensory impairments, and motor and speech issues.

These conditions emphasize the importance of careful prenatal care to prevent and manage complications that can affect fetal brain development and overall health.

Intellectual Disability:

“Intellectual disability” encompasses various terms, including:

1. Developmental Cognitive Disorder
2. Mental Impairment
3. General Learning Disability

Many individuals with intellectual disabilities have smaller skulls, but cranial size in this condition is specific and involves a genetic trait that affects brain development. The primary characteristic is a head circumference that does not exceed 7 inches, and the underlying issue is the underdevelopment of brain matter itself. Individuals with intellectual disabilities typically exhibit below-average intellectual and functional performance. Their brains do not develop cognitive functions correctly and do not perform their expected roles naturally, especially compared to healthy individuals. They often experience deficits in adaptive behavior—skills related to self-care, communication, and interaction with others—which

significantly impacts their daily and general activities. This leads to decreased or absent abilities in these areas. Additionally, their intelligence is below the average level, which substantially affects cognitive functions such as decision-making, problem-solving, and learning. Intellectual disability is associated with lower intelligence levels and includes issues such as difficulty with daily life adaptation, speech, physical and social disabilities, and challenges in educational processes(27,28).

Diagnosis of Intellectual Disability:

Intellectual disability can be diagnosed by measuring IQ and assessing adaptive behavior, considering the individual's background. The diagnostic team should include:

1. A pediatric developmental specialist
2. A pediatric neurologist
3. A speech therapist
4. A physical therapist
5. A psychologist
6. A social worker

Most cases of intellectual disability are diagnosed before the age of 18 through two main methods:

1. Clinical Assessment: Evaluates growth indicators and the nervous system.
2. Medical Examination: Involves observing:
 - General cognitive abilities and performance
 - IQ levels
 - Adaptive behaviors in various environments, including personal skills, social communication, and daily living activities, compared to peers of the same age.

Types of Intellectual Disability:

1. Mild Intellectual Disability:

- ✓ IQ range: 55-69
- ✓ Individuals may have difficulties with reading and writing.
- ✓ They benefit from special education plans and methods.
- ✓ They can live independently as adults but may struggle with general life responsibilities.
- ✓ They exhibit social immaturity and difficulties in learning and communicating even after learning.

2. Moderate Intellectual Disability:

- ✓ IQ range: 35-49
- ✓ Individuals can participate in some social activities and learn basic reading, arithmetic, and writing.
- ✓ They are unable to live independently.
- ✓ They face challenges in communication with others.
- ✓ They can navigate familiar places but have slow language comprehension and use.

3. Severe Intellectual Disability:

- ✓ IQ range: 20-34
- ✓ Individuals show significant motor impairments.

- ✓ They suffer from severe damage or abnormal development in the central nervous system.

4. Profound Intellectual Disability:

- ✓ IQ below 19
- ✓ Individuals may have limited or no ability to move.
- ✓ They require continuous supervision and care.
- ✓ They experience severe motor issues and urinary incontinence.
- ✓ They cannot live independently, have difficulties understanding and following instructions, and exhibit minimal non-verbal communication.

Children with profound intellectual disability may also face additional health problems, including:

1. Autism
2. Anxiety and other psychological disorders
3. Seizures
4. Additional levels of intellectual disability

Symptoms at this level include:

1. Inability to speak
2. Hearing impairments
3. Physical weakness
4. Motor disabilities

In cases where intellectual disability cannot be specifically classified, doctors may be unable to assign a precise level due to insufficient information.

Symptoms of Intellectual Disability:

The symptoms of intellectual disability vary depending on the level of impairment, but generally include:

1. Lack of understanding of the consequences of their actions.
2. Difficulty with learning.
3. Problems with speech and articulation.
4. Absence of curiosity.
5. Memory issues.
6. Difficulty with living independently due to challenges in communication, interaction with others, and self-care.
7. Limited ability to think logically or perform basic actions such as walking or sitting.
8. Developmental delays compared to peers of the same age.
9. IQ below 70.
10. Child-like behavior relative to their age.
11. Failure to reach intellectual milestones compared to peers.

Children with intellectual disabilities often exhibit one or more of the following characteristics:

1. Difficulty maintaining attention.

2. Attention-seeking behavior.
3. Difficulty coping with frustration.
4. Dependency.
5. Defiance.
6. Negativity.
7. Mental health disorders.
8. Low self-esteem.
9. Aggression.
10. Withdrawal from social activities.
11. Tendencies toward self-harm.

Depression in Adolescence:

Causes of Intellectual Disability:

Studies indicate that intellectual disability can result from exposure to conditions that impede the normal growth and development of the brain. Potential causes include:

1. Severe malnutrition or other nutritional issues during infancy.
2. Chromosomal disorders, such as Down syndrome.
3. Lead or mercury poisoning.
4. Birth-related injuries, such as oxygen deprivation or premature birth.
5. Early childhood diseases, such as whooping cough, meningitis, or mumps.
6. Maternal alcohol consumption during pregnancy, which can negatively impact the child and contribute to intellectual disability.
7. Exposure to toxic substances, infections, or injuries before birth.
8. Genetic disorders, such as phenylketonuria or Tay-Sachs disease.

Treatment for Intellectual Disability:

The goal of treatment is to help children with intellectual disabilities reach their full potential in education, life skills, and social interaction. Treatment includes:

- ✓ Continuous guidance for parents on managing the disability and assisting with educational needs through individualized education programs.
- ✓ Special education programs tailored to the needs of the child.
- ✓ Psychological counseling.
- ✓ Behavioral therapy.
- ✓ Occupational therapy.
- Medication, which may include:
 1. Incephabol, which stimulates brain function.
 2. Nootropil, which improves cognitive function and memory.
 3. Sedatives to reduce hyperactivity and behavioral issues, such as risperidone or haloperidol.

Prevention of Intellectual Disability:

Preventing Intellectual Disability During Pregnancy:

- ✓ Adopting a proper nutritional regimen.
- ✓ Avoiding factors that lead to premature birth.
- ✓ Steering clear of drugs, alcohol, and smoking.
- ✓ Preventing sexually transmitted diseases.

Preventing Intellectual Disability in Children:

- ✓ Treating diseases or infections as soon as they appear.
- ✓ Ensuring all necessary vaccinations are administered.
- ✓ Providing a healthy and appropriate diet for the child.

Support centers are available for adults with intellectual disabilities, helping them lead fulfilling and independent lives.

Intellectual Disability in Infants:

Intellectual disability, also known as mental retardation, is characterized by an IQ below average, cognitive impairment, and a lack of essential skills needed for daily life. Infants with intellectual disability often exhibit delayed cognitive development, which impacts their learning and thinking abilities, as well as adaptive behaviors necessary for interacting with others and managing daily life situations(29).

How is Intellectual Disability Diagnosed?

Diagnosis involves measuring IQ through standardized intelligence tests, where an average score is 100. Scores below 70-75 indicate intellectual disability. Additionally, specialists assess the child's adaptive behavior to determine their ability to interact and communicate with others, including family and peers.

Signs of Intellectual Disability in Infants:

Parents may notice signs of intellectual disability in their infants, though these signs often become more apparent as the child grows. Possible indicators include:

- ✓ Difficulty reacting to pain during breastfeeding and improper head positioning.
- ✓ Inability to roll over or move their body.
- ✓ Reduced appetite and reluctance to feed.
- ✓ Lack of response to parental voices and external sounds.
- ✓ Sleep disturbances.
- ✓ Frequent crying and irritability.

Signs of Intellectual Disability in Children:

Other signs that may help identify intellectual disability in children include:

- ✓ Late crawling or walking.
- ✓ Delayed or difficult speech development.
- ✓ Difficulty remembering things.
- ✓ Inability to feed or dress themselves independently.
- ✓ Struggles with mastering tasks or frequent boredom.

- ✓ Frequent complaints of physical symptoms like headaches and stomachaches.
- ✓ Poor academic performance.
- ✓ Difficulty socializing with peers and adjusting to their environment.
- ✓ Continued behaviors typical of a younger age, such as problem-solving and logical thinking challenges.

Causes of Intellectual Disability in Infants:

While sometimes the exact cause cannot be determined, potential causes include:

- ✓ Genetic factors, such as Down syndrome or Fragile X syndrome.
- ✓ Complications during pregnancy, such as drug or alcohol use, infections, poor nutrition, or preeclampsia.
- ✓ Issues during childbirth, such as premature birth.
- ✓ Health conditions or diseases, like meningitis, whooping cough, or encephalitis.

Strategies to Enhance Brain Development in Children:

- ✓ Avoid smoking.
- ✓ Breastfeed the infant.
- ✓ Include nuts in the diet, especially walnuts.
- ✓ Ensure the child consumes eggs, milk, yogurt, and sweet potatoes.
- ✓ Read stories to the child and limit television exposure before the age of two.

The Impact of Certain Foods on Fetal Development:

1. Fish High in Mercury:

Pregnant women should avoid fish with high mercury content to protect fetal health. Mercury accumulates in fish from contaminated waters, typically due to industrial waste. Excessive consumption of mercury-contaminated food can be toxic to the nervous, immune, and renal systems, potentially causing developmental issues in children. Fish with high mercury levels include shark, swordfish, king mackerel, and certain types of tuna, such as albacore. However, consuming fish with low mercury levels, up to twice a week, is beneficial due to omega-3 fatty acids crucial for fetal development. Pregnant women should select low-mercury fish and avoid overconsumption(30).

2. Raw or Undercooked Fish:

Raw or undercooked fish poses significant risks to both the mother and the fetus. It can carry various infections—viral, bacterial, or parasitic. Some infections affect only the mother, causing dehydration and weakness, while others can cross the placenta and lead to serious outcomes such as preterm birth, miscarriage, or stillbirth.

3. Raw and Processed Meats:

Raw or inadequately cooked meats should be avoided during pregnancy due to the risk of bacterial infections. These bacteria can adversely affect the fetus, leading to severe conditions such as stillbirth, blindness, or neurological disorders, including intellectual disability and seizures. Processed meats like hot dogs also pose risks due to potential bacterial contamination during processing or storage.

4. Raw Eggs:

Raw eggs are also prohibited during pregnancy because they may contain Salmonella bacteria. Symptoms of a Salmonella infection include nausea, vomiting, fever, and abdominal pain, which can be harmful to

the fetus. For instance, dehydration from vomiting and fever can delay fetal development, lead to preterm birth, or cause low birth weight. Foods containing raw eggs, which should be avoided, include:

- ✓ Mayonnaise
- ✓ Sauces
- ✓ Ice cream

5. Liver and Organ Meats:

Liver and other organ meats are nutritionally rich, containing high levels of vitamins A and B12, as well as copper. However, excessive consumption of these foods during pregnancy is discouraged due to the risk of vitamin A toxicity, which can cause birth defects and liver damage. Pregnant women should limit their intake of organ meats to no more than once a week, according to Health Line.

6. Caffeine:

Caffeine, found in coffee, tea, and sodas, should be consumed in moderation during pregnancy. It is recommended that pregnant women limit their caffeine intake to about 200 milligrams per day, equivalent to approximately two cups of coffee. Caffeine easily crosses the placenta and can accumulate in the fetus since the placenta lacks the enzyme to metabolize it. High levels of caffeine can lead to developmental issues such as growth retardation, low birth weight, increased risk of infant mortality, and long-term health problems like type 2 diabetes and heart disease.

7. Unwashed Vegetables:

Proper washing of vegetables and fruits is crucial during pregnancy to avoid parasitic infections. Such infections can cause serious health issues in the baby, including jaundice, pneumonia, and liver or spleen enlargement. In severe cases, it can lead to intellectual disabilities or sensory impairments. According to Tiny Steps, about 10% of babies with such infections may exhibit severe symptoms.

8. Fast Food:

Fast food can be detrimental during pregnancy as it typically lacks essential nutrients like protein, folic acid, and iron, and is high in fats, carbohydrates, and sugars. Excessive consumption of fast food is linked to fetal abnormalities, heart disease, and even mental health issues such as depression and anxiety, as noted by Tiny Steps.

9. Unpasteurized Dairy Products:

Consumption of unpasteurized milk, cheese, or juices poses a risk of bacterial infections, such as Salmonella, which can lead to vomiting, fever, and dehydration in the mother. This, in turn, can negatively impact fetal development, potentially causing growth delays.

Instant Noodles:

Instant noodles are a popular and affordable snack enjoyed by both adults and children due to their tasty flavor and low cost. While some may believe that instant noodles lack nutritional value, they do contain minimal amounts of certain nutrients such as:

1. Vitamin B: Helps reduce stress, improves concentration, and stimulates mental activity.
2. Zinc: Strengthens the immune system and aids in wound healing.
3. Calcium: Supports bone and dental health.
4. Iron: Assists red blood cells in transporting oxygen throughout the body and helps in weight management due to its low-calorie content. The protein and minimal fiber in instant noodles also contribute to a feeling of fullness and appetite control.

Adverse Effects of Instant Noodles:

Consuming instant noodles occasionally may not be harmful, but regular and excessive consumption can lead to numerous health issues, primarily due to the preservatives, artificial colors, and high sodium content. The potential adverse effects include:

1. **Nutritional Deficiency:** Instant noodles are deficient in essential nutrients and are high in harmful substances such as carbohydrates, fats, preservatives, and artificial colorings.
2. **High Blood Pressure and Kidney Problems:** Instant noodles often contain large amounts of sodium. While sodium is essential in moderate amounts, excessive intake can cause stroke, heart disease, arteriosclerosis, stomach cancer, and kidney issues in some individuals.
3. **Cancer Risk:** One of the potential risks associated with instant noodles is the release of dioxins from the cardboard packaging when hot water is added. These harmful substances can adversely affect hormonal function and increase cancer risk. Additionally, the inclusion of monosodium glutamate (MSG) in the seasoning can also be detrimental.
4. **Cognitive Damage:** Ingredients such as MSG and tertiary butylhydroquinone (TBHQ), which are used as preservatives and flavor enhancers, can impair cognitive function, memory, and contribute to neurodegenerative diseases like Alzheimer's and Parkinson's.
5. **Diabetes Risk:** Instant noodles may elevate blood glucose levels, increasing the likelihood of developing diabetes.
6. **Digestive Issues:** They contain petroleum-based substances, such as propylene glycol, which are used as preservatives and can cause digestive problems.
7. **Neurological Issues:** Frequent consumption of instant noodles can lead to migraines, increased body fat, and psychological disturbances, such as anxiety and irritability, due to the presence of synthetic additives and preservatives.
8. **Cholesterol Problems:** High consumption of instant noodles can raise blood cholesterol levels due to their high fat content, leading to arterial blockages and weakened heart function.

Impact of Instant Noodles on Pregnant Women:

Instant noodles should be completely avoided during pregnancy due to their serious health risks. One of the major dangers associated with instant noodles for pregnant women is the high sodium content, which can significantly increase the risk of hypertension and preeclampsia. Elevated sodium levels can adversely affect the health of both the mother and the developing fetus.

Effects of Instant Noodles on Children and All Age Groups:

1. High Blood Pressure: This can lead to strokes, heart disease, and cancer. The presence of dioxins from the packaging and the waxy substance used to prevent sticking can cause brain cell damage in children. The high carbohydrate content contributes to obesity as children's bodies respond quickly to caloric intake. Additionally, excessive consumption can lead to malnutrition, and the accumulation of propylene glycol—a chemical additive—can affect the heart, liver, and kidneys. Girls are particularly affected by metabolic issues, with a 65% higher rate compared to boys.

Complications of Microcephaly:

Microcephaly may not present any symptoms initially, but potential symptoms can vary depending on the affected brain region. These symptoms include(33):

1. Hearing and vision problems.
2. Motor and balance difficulties.
3. Intellectual disabilities, such as learning challenges and difficulties with daily tasks.

4. Developmental delays in milestones such as walking and movement.
5. Difficulty swallowing and issues with feeding and appetite.
6. Hyperactivity.
7. Problems with weight gain and normal growth.
8. Muscle issues.
9. Joint deformities, particularly if the condition is caused by the Zika virus.
10. Seizures.
11. Facial deformities.
12. Difficulties with swallowing and breastfeeding.
13. Tremors.
14. Intellectual disability.
15. High-pitched crying.

Diagnosis of Microcephaly:

1. Prenatal Ultrasound: Microcephaly can be diagnosed before birth using ultrasound technology, which employs high-frequency sound waves and a computer to create images of blood vessels and internal organs. Ultrasound helps assess blood flow and the functioning of internal organs. Microcephaly may not be detected until the third trimester, so early ultrasounds may not reveal the condition.

2. Head Circumference Measurement: This involves measuring the infant's head circumference and comparing it to a growth chart to determine if it falls within normal or abnormal ranges.

Diagnostic Tests for Confirming Microcephaly and Identifying Brain Abnormalities:

1. Head Circumference Measurement: This measurement is compared with growth charts to identify any deviations from normal growth patterns.

2. Computed Tomography (CT Scan): This imaging technique uses ionizing radiation (X-rays) and computer technology to create detailed images of the body, including bones, muscles, fat, and organs. CT scans provide more detailed images than standard X-rays and are used to evaluate brain disorders in childhood.

3. Magnetic Resonance Imaging (MRI): MRI uses large magnets, radiofrequency waves, and a computer to create detailed images of the body's internal structures, including the brain.

Additionally, diagnostic procedures may include:

1. Blood Tests.
2. Urinalysis.
3. Genetic Testing.^[32]

Treatment of Microcephaly (1):

There is no cure for microcephaly itself. Instead, medical professionals focus on managing the symptoms and assisting the child in developing cognitive and behavioral skills. Mild cases of microcephaly generally require only routine monitoring by a physician to track growth and assess the child's cognitive and motor abilities. More severe cases necessitate lifelong follow-up to manage symptoms effectively.^[1]

Prevention or Mitigation:

During pregnancy, several steps can be taken to attempt to prevent acquired microcephaly:

1. Maintain a Healthy Diet and Take Prenatal Vitamins: Consuming a nutritious diet and ensuring adequate intake of prenatal vitamins can support fetal development.
2. Avoid Alcohol and Drug Use: Refrain from consuming alcohol and using drugs, as they can negatively impact fetal development.
3. Avoid Exposure to Harmful Chemicals: Steer clear of toxic substances that could affect the fetus.
4. Practice Good Hygiene: Frequently wash hands and address any illnesses promptly.
5. Delegate Tasks: Ask someone else to handle tasks such as changing the cat litter, as cat feces can carry toxoplasmosis, which can contribute to microcephaly.
6. Use Insect Repellents: Apply insect repellent in areas with high mosquito activity or in regions known for mosquito-borne diseases. Ensure that the insect repellent is safe for use during pregnancy.

If you have a child with microcephaly and are considering another pregnancy, it is advisable to consult with a healthcare provider. Genetic counseling may help in understanding the potential risks of recurrence within the family.

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