FETAL MICROCEPHALY FACTS AND CLINICAL CONSIDERATIONS

This resource is intended to help public health and clinical providers educate clients and guide care regarding the occurrence of microcephaly and/or related brain abnormalities before birth.

Microcephaly Overview

Microcephaly is the term for a baby's head that is smaller than expected when compared to babies of the same sex and age.

When microcephaly is present before or at birth, it is called **congenital microcephaly**. When microcephaly develops later in infancy or childhood, it is called **acquired microcephaly**. **Proportional microcephaly** means that the head size, length (or height), and weight are all less than expected in proportion to each other. **Relative microcephaly** is when the head size is small compared to height and weight, but inside of the normal range for age and sex. It is important to use age specific growth charts and to account for prematurity.

About 100 Michigan babies are born with microcephaly each year. This is about nine babies in every 10,000 live births. National estimates range from two babies per 10,000 births to 12 babies per 10,000 births. There are many causes of microcephaly. Some are genetic and some are environmental. In most cases, the cause is not known.

A baby with microcephaly has a smaller brain that might not have developed properly. Microcephaly varies from mild to severe. Microcephaly may occur with a range of other problems related to improper or damaged brain growth such as seizures, developmental delay, feeding problems, hearing impairment, or vision impairment.

Microcephaly is a life-long condition. The need for special services is very individual and depends on underlying problems in brain development, severity, and presence of related health problems. Babies born with microcephaly need routine check-ups to follow growth and development and identify related issues early.

Brain Growth and Development

Cerebral hemispheres are the large paired areas making up most of the brain. They grow and develop very rapidly during the second and third trimesters of pregnancy. This is when the gyri (grooves and folds) of the normal brain surface develop from a smooth surface to nearly complete by 38 weeks gestation. The term microencephaly refers to an abnormally small brain.

Brain growth and development is rapid through the first 2-3 years of life and continues until adulthood. Brain and sensory organs are vulnerable to environmental exposures before and after birth. Harmful exposures early in pregnancy may not become apparent until later in pregnancy or after birth. Genetic abnormalities and environmental exposures have overlapping signs and symptoms.

Even with the best medical care and medical technology, it may be impossible to diagnose major brain anomalies. Likewise, it is sometimes impossible to diagnose the cause of serious health conditions.

Source: U.S. Centers for Disease Control and Prevention, Facts about Microcephaly

Clinical Considerations

Growth Parameters to Check

- ☐ **Head circumference (biparietal diameter (BPD))**
- ☐ **Small for gestational age (SGA); intra-uterine growth restriction (IUGR)**
- ☐ **Gestational age**
- ☐ Prior growth measurements (specify gestational age)
- ☐ Singleton or multiples
- ☐ Structural anomalies
- ☐ Amniotic fluid level
- ☐ Fetal movements

Additional History to Ask About

SOCIAL:

- ☐ Maternal age, education, occupation, travel, and sexual partners
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FAMILY HISTORY:

- ☐ Three generations maternal and paternal standard; include half siblings; consanguinity (mother and father related);
- ☐ Central nervous system (CNS)/developmental problems (seizures, cerebral palsy, cognitive impairment, metabolic disorders)

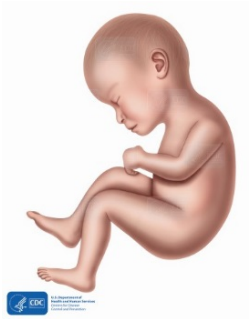
PHYSICAL AND MENTAL HEALTH:

- ☐ Chronic conditions such as diabetes, hypothyroidism, hypertension; infection, medications (e.g., antiepileptics, antihypertensives), immunizations, tobacco, alcohol, substance abuse
- ☐ Prior pregnancies, pregnancy loss (miscarriage and stillbirth)

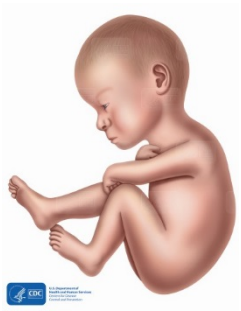
Normal Gestation Progression

Fetus at 14 weeks gestation (normal).

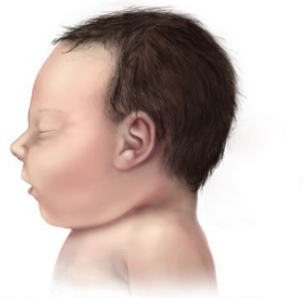
Fetus at 28 weeks gestation (normal).



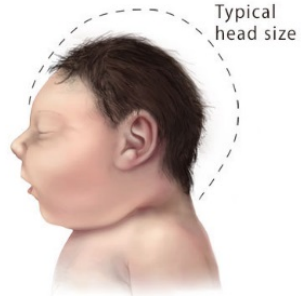
Fetus at 38 weeks gestation (normal).



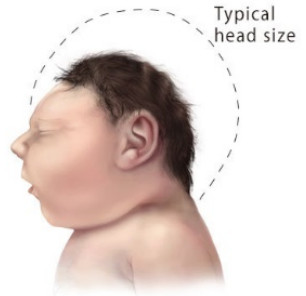
Microcephaly Comparisons Reference



Baby with Typical Head Size



Baby with Microcephaly



Baby with
Severe Microcephaly

Images courtesy of the U.S. Centers for Disease Control and Prevention.

Possible Causes*

Genetic:

- Inherited or de novo (spontaneous)
- Isolated or syndromic
- Chromosomal; autosomal recessive; autosomal dominant; X-linked, mitochondrial

Infectious:

- TORCH (stands for Toxoplasmosis, Other infections (such as Varicella Zoster, Human Immunodeficiency (HIV) and Zika viruses), Rubella, Cytomegalovirus (CMV) and Herpes Simplex Viruses

Ischaemic:

- Infarction; hemorrhage

Metabolic:

- Severe malnutrition; maternal phenylketonuria (PKU)

Potential Evaluations* *(per findings)*

Invasive:

- Chorionic Villus Sampling (CVS)
- Amniocentesis: amniotic fluid
- Percutaneous Umbilical Cord Sampling (PUBS)/ Cordocentesis
- Fetal biopsy

Fetal Imaging:

- Ultrasound/ sonogram
- Doppler imaging
- Echocardiogram
- Magnetic Resonance Imaging (MRI)

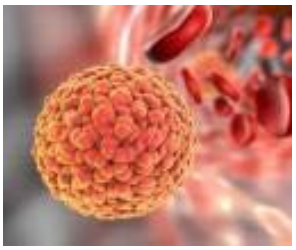
Prenatal Signs of Congenital Infection* *(nonspecific, suggestive)*

- Microcephaly; structural CNS anomalies (e.g., calcifications, underdevelopment of gyri: agyria, pachygyria, ventricuolomegaly)
- Some structural anomalies, e.g., holoprosencephaly, anencephaly, are not suggestive of infection.
- Miscarriage; stillbirth
- Fetal growth restriction (IUGR; SGA)

NOTE: microcephaly may not be detectable until later in pregnancy. Serial ultrasounds may be done. Prenatal diagnosis of microcephaly is not always accurate.

** Not Comprehensive*

DNA



Virus in blood stream

Pregnancy, near term

Severe microcephaly

Resources for Providers and Families

- Children's Special Health Care Services (CSHCS) (www.michigan.gov/cshcs)
- *Early On*® (early intervention for 0-3 years) (http://1800earlyon.org/)
- Michigan Early Hearing Detection and Intervention Program (EHDI) (www.michigan.gov/ehdi)
- Michigan Home Visiting Program (www.michigan.gov/homevisiting)
- Supplemental Nutrition Program for Women, Infants, and Children (WIC) (www.michigan.gov/wic)
- Michigan Family to Family Health Information Center (http://f2fmichigan.org)
- Michigan's Genetic Resource Center (www.migrc.org)
- Zika virus (www.michigan.gov/zika)

National Links

- **Growth charts** from the World Health Organization (WHO): International Fetal and Newborn Growth Consortium for the 21st Century: https://intergrowth21.tghn.org/
- **Microcephaly**: http://www.cdc.gov/ncbddd/birthdefects/microcephaly.html
- **Microcephaly Surveillance Webinar** (slides): http://www.nbdpn.org/docs/Conducting_Surveillance_for_Microcephaly_Final_022616.pdf
- **ACOG:** http://www.acog.org
- **March of Dimes:** http://www.marchofdimes.org
- **Organization of Teratology Information Specialists:** www.mothertobaby.org [toll free hotline-English and Spanish language services]
- **Zika Virus**: www.CDC.gov/Zika

References

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2. Ashwal S, Michelson D, Plawner L, Dobyns W. Practice parameter: evaluation of the child with microcephaly (an evidence-based review). Neurology 2009;73:887-897.
3. Den Hollander NS, Wessels MW, Los FJ, et.al. Congenital microcephaly detected by prenatal ultrasound: genetic aspects and clinical significance. Ultrasound Obstet Gynecol 2000;15:282-287.
4. Melamed N, Yogev Y, Danon, D et. al. Sonographic estimation of fetal head circumference: how accurate are we? Ultrasound Obstet Gynecol 2011;37:65-71.

Michigan Department of Health and Human Services, Birth Defects Education and Outreach Program
www.michigan.gov/birthdefectsinfo | BDRFollow-up@michigan.gov

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