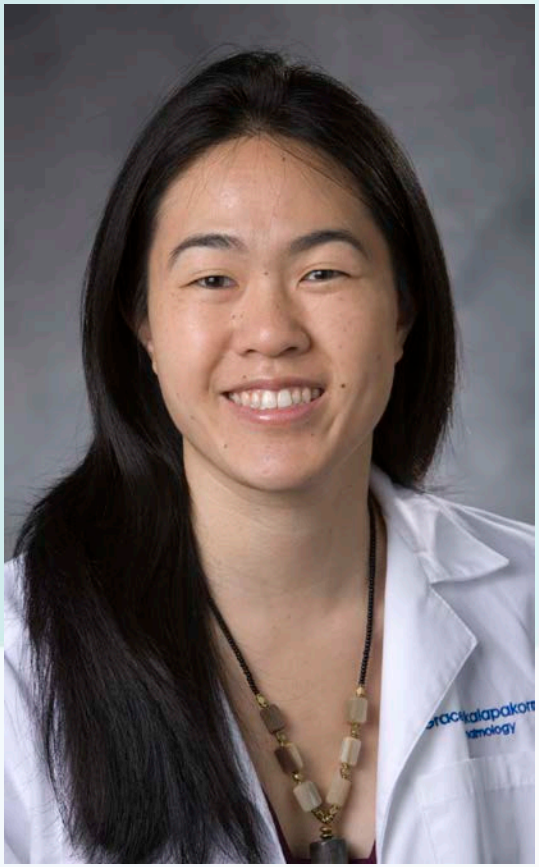

Zika Virus and Your Eyes

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Ophthalmology 101

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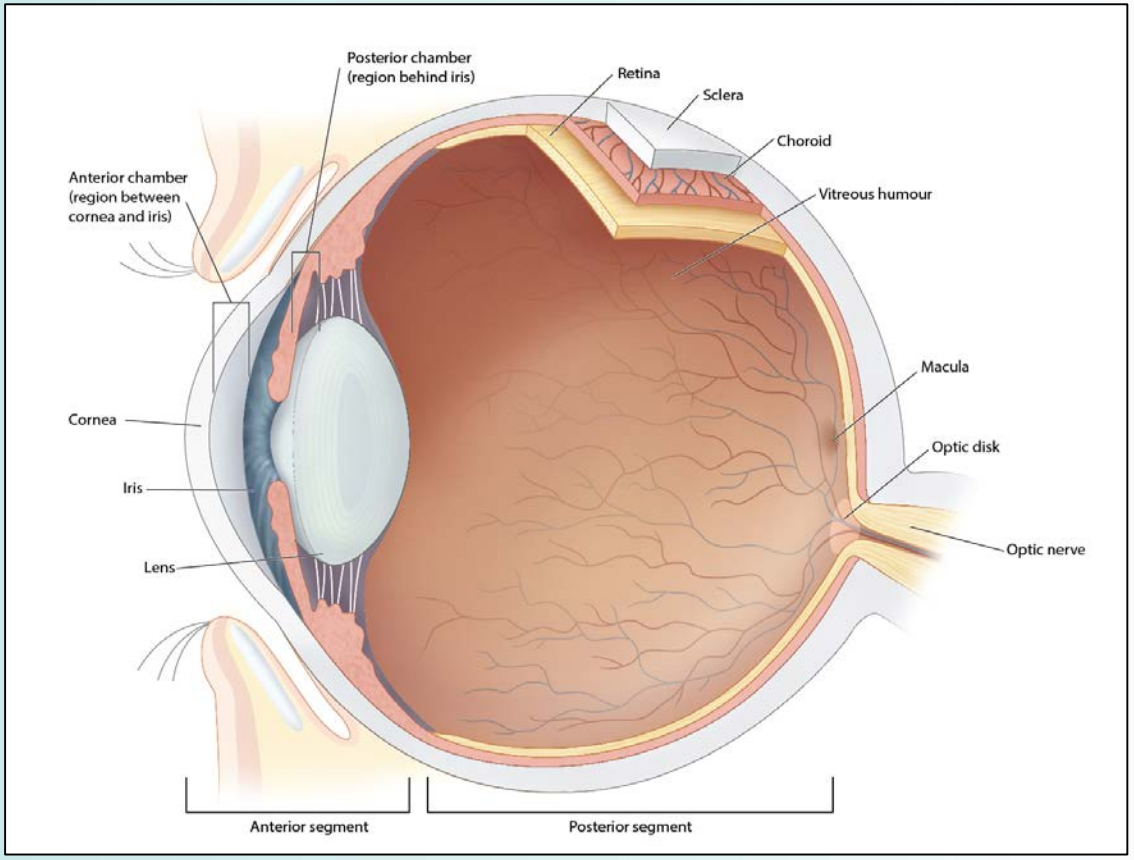
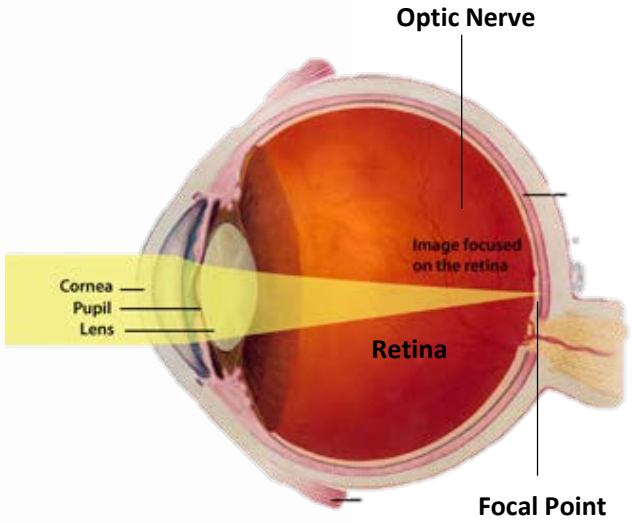
Ocular Anatomy





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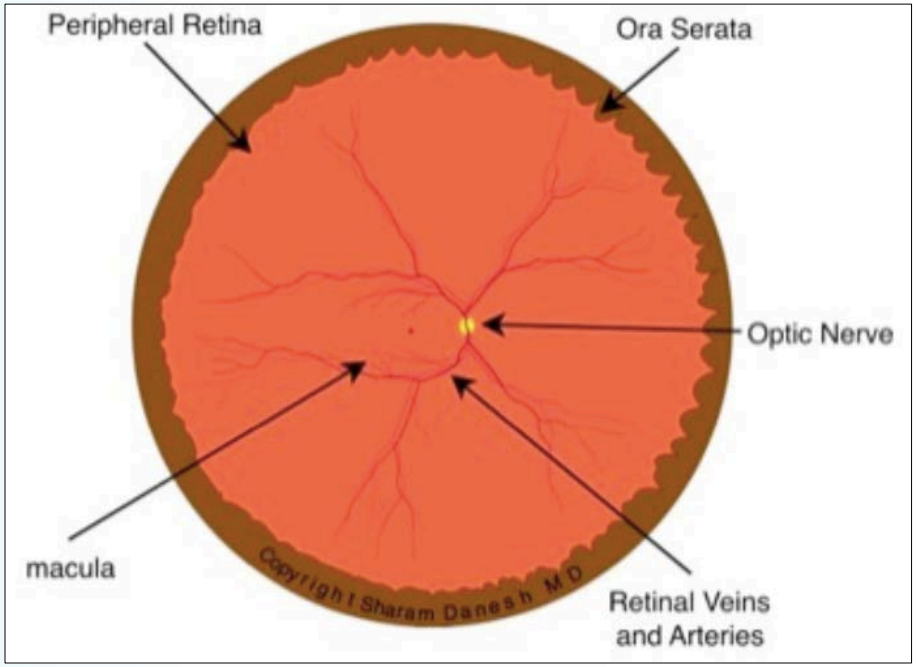
Normal Retina

Wikimedia Commons



Arizona Eye Institute

Ocular Findings in Congenital Zika Infection

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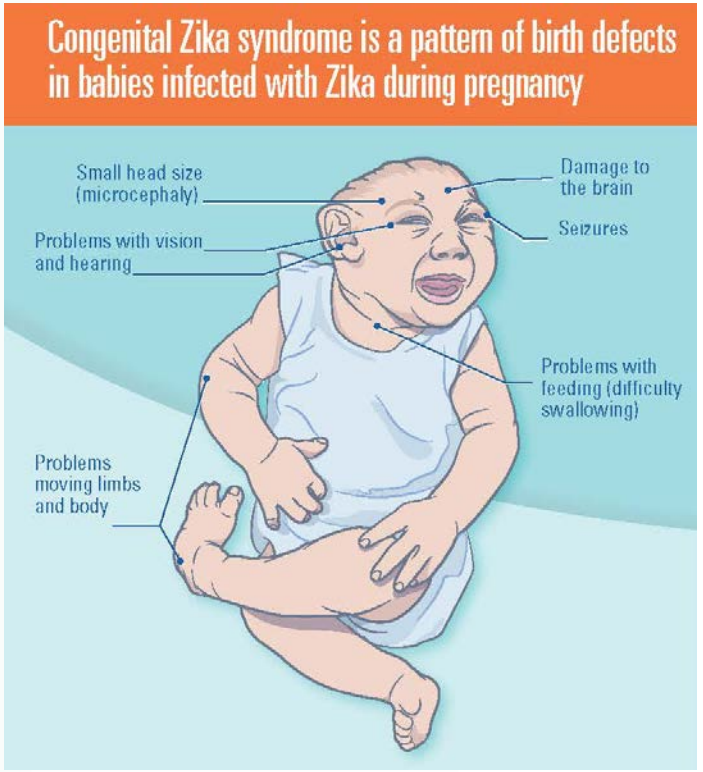
Ocular Findings Associated with Congenital Zika Virus Infection

- Ocular abnormalities have been identified in infants with and without microcephaly
- Abnormalities have been found in the anterior and posterior ocular structures
- Cortical visual impairment might be the most common cause of blindness among children with congenital Zika syndrome



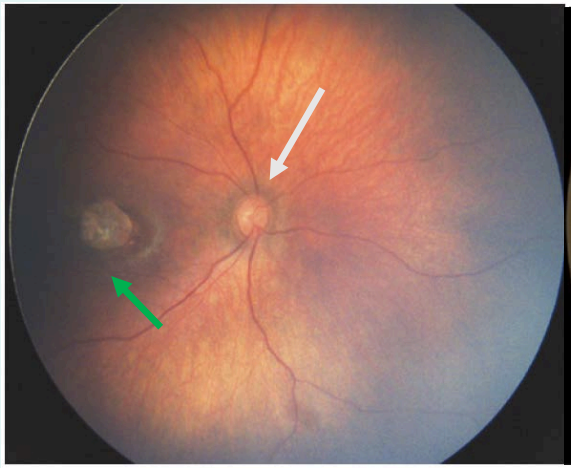
Macular and Optic Nerve Findings

Commonly reported macular findings

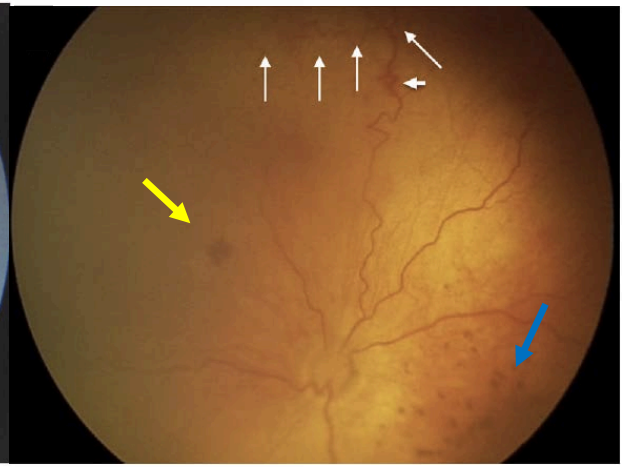
- Macular mottling
- Chorioretinal atrophy

Commonly reported optic nerve findings

- Hypoplasia
- Increased cup to disk ratio
- Pallor



Macular mottling, chorioretinal atrophy, and optic nerve hypoplasia



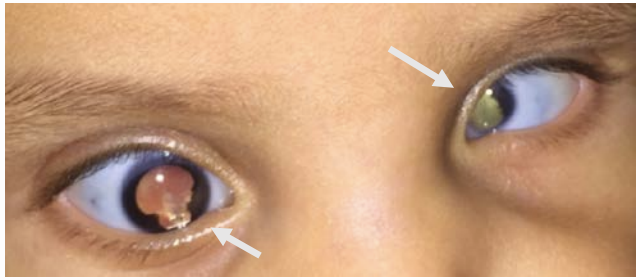
Subretinal hemorrhages, vascular tortuosity, abnormal vessel termination, and focal area of dilation

Ventura CV, et al. Ophthalmological findings in infants with microcephaly and presumable intra-uterus Zika virus infection. Arq Bras Oftalmol. 2016 Feb;79(1):1-3.
Miranda HA, et al. Expanded Spectrum of Congenital Ocular Findings in Microcephaly with Presumed Zika Infection. Ophthalmology. 2016 Aug;123(8):1788-94..

Other Ocular Findings

- Congenital glaucoma
- Iris colobomas
- Microphthalmia
- Subluxation of the lens
- Cataract
- Intraocular calcification
- Strabismus
- Nystagmus

Congenital Glaucoma



Iris colobomas

Microphthalmia

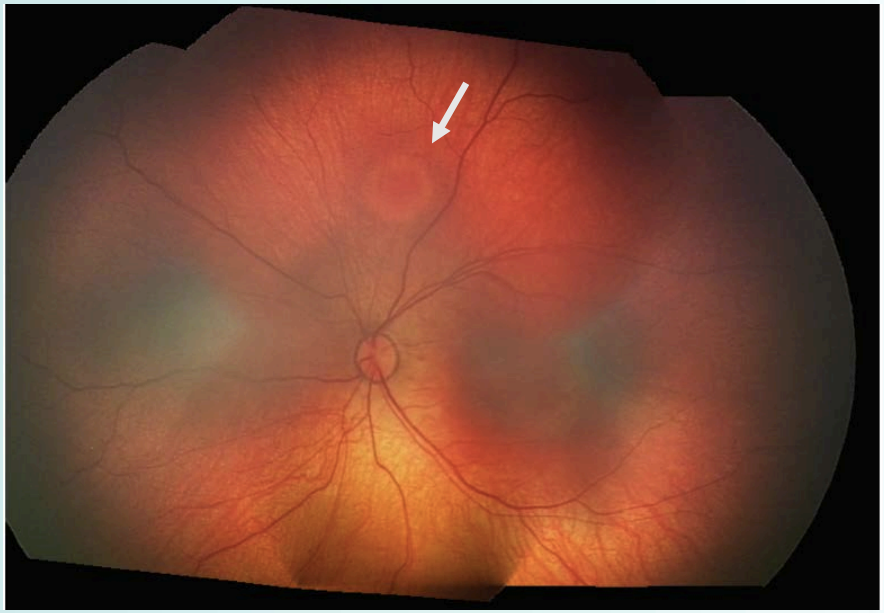
de Paula Freitas, et al. Anterior-Segment Ocular Findings and Microphthalmia in Congenital Zika Syndrome. Ophthalmology. 2017 Jul. [Epub ahead of print]
Yepez JB, et al. Ophthalmic Manifestations of Congenital Zika Syndrome in Colombia and Venezuela. JAMA Ophthalmol. 2017 May 1;135(5):440-445

Risk Factors for Ocular Findings

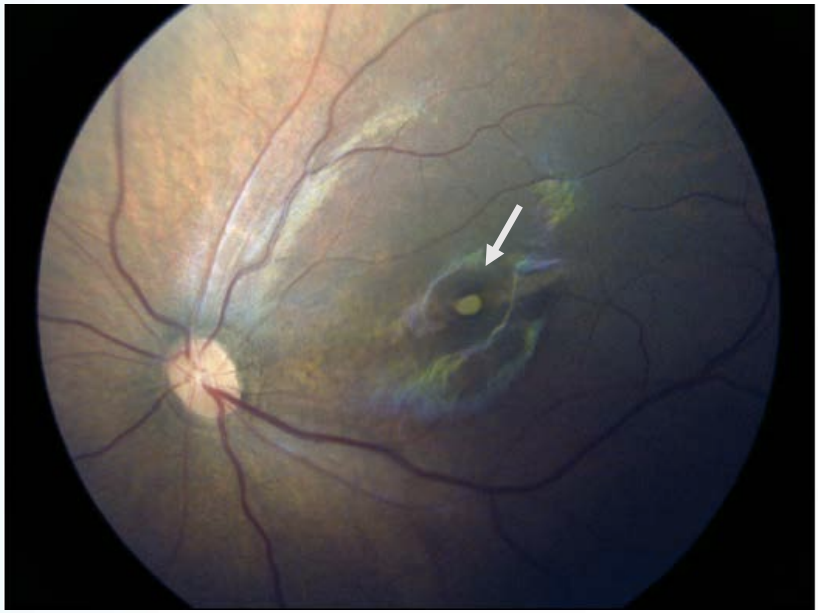
- Smaller head circumference
- Microcephaly
- Other CNS abnormalities
- Earlier trimester infection in pregnancy
- Arthrogryposis

Ventura CV, et al. Risk Factors Associated With the Ophthalmoscopic Findings Identified in Infants With Presumed Zika Virus Congenital Infection. JAMA Ophthalmol. 2016 Aug 1;134(8):912-8.
Zin AA, et al. Screening Criteria for Ophthalmic Manifestations of Congenital Zika Virus Infection. JAMA Pediatr. 2017 Jul 17. [Epub ahead of print]
Moore CA, Staples JE, Dobyns WB, et al. Characterizing the Pattern of Anomalies in Congenital Zika Syndrome for Pediatric Clinicians. JAMA Pediatr 2017;171:288-95.

Infants with Possible Zika Virus Infection WITHOUT Microcephaly



Hypopigmented retinal lesion



Chorioretinal atrophy

-Ventura CV, et al. Zika: neurological and ocular findings in infant without microcephaly. Lancet. 2016 Jun 18;387(10037):2502.
-Honein MA, Dawson AL, Petersen EE, et al. Birth Defects Among Fetuses and Infants of US Women With Evidence of Possible Zika Virus Infection During Pregnancy. JAMA. 2017;317(1):59-68.
-Ventura CV, et al. First Travel-Associated Congenital Zika Syndrome in the US: Ocular and Neurological Findings in the Absence of Microcephaly. Ophthalmic Surg Lasers Imaging Retina. 2016 Oct 1;47(10):952-955.
-de Paula Freitas, et al. Anterior-Segment Ocular Findings and Microphthalmia in Congenital Zika Syndrome. Ophthalmology. 2017 Jul. [Epub ahead of print

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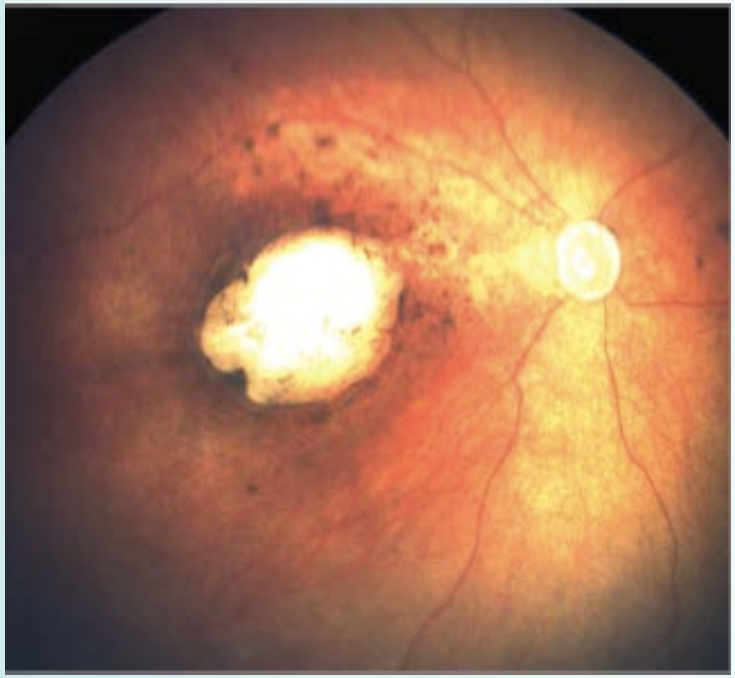
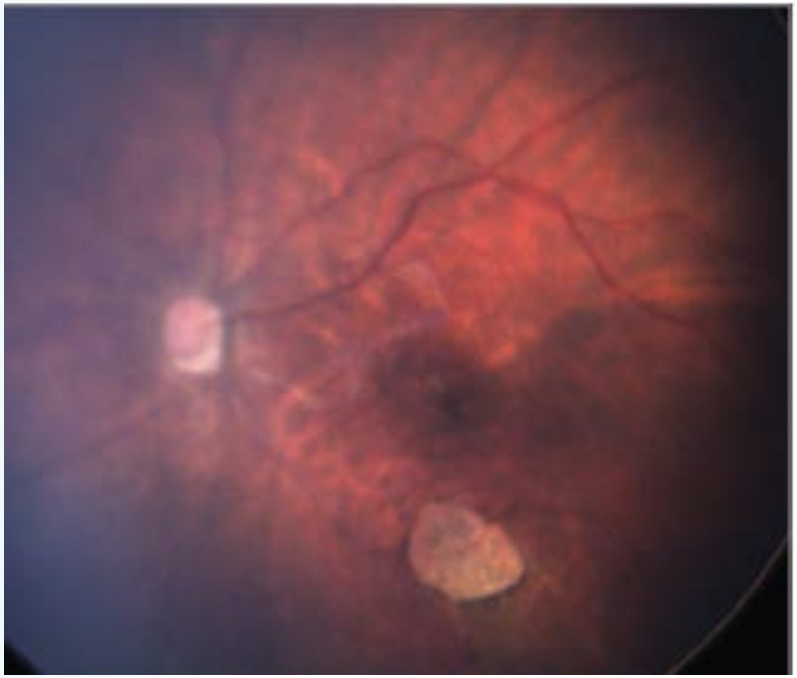
Eye findings in Infants Without CNS Abnormalities



Optic nerve hypoplasia, chorioretinal atrophy, and macular mottling



Optic nerve hypoplasia and chorioretinal atrophy

Zin AA, et al. Screening Criteria for Ophthalmic Manifestations of Congenital Zika Virus Infection. JAMA Pediatr. 2017 Jul 17. [Epub ahead of print]

Eye Findings in Congenital Infections

	Zika	Toxoplasmosis	Rubella	CMV	Herpes Simplex	Syphilis
Conjunctivitis					+	
Keratitis					+	+
Macular Mottling	+ focal pigmentary clumping		+ granular (Salt-and-pepper retinopathy)			+ granular (Salt-and-pepper retinopathy)
Chorioretinal Atrophy	+	+				
Optic Nerve abnormalities	Hypoplasia, cupping, pallor		pallor	pallor		
Cataract	+		+	+	+	
Microphthalmia	+		+	+		
Iris Coloboma	+					
Active inflammation: uveitis or chorioretinitis		+	+	+	+	+

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CDC Recommendations: Ophthalmic screening

Who should be referred for screening and when?

- **Before hospital discharge:**
  - Infant whose mother has risk factors for maternal Zika virus infection (travel to or residence in an area with risk of Zika or sex with a partner who traveled to or resided in such an area)

  AND
  - Maternal test results are not available

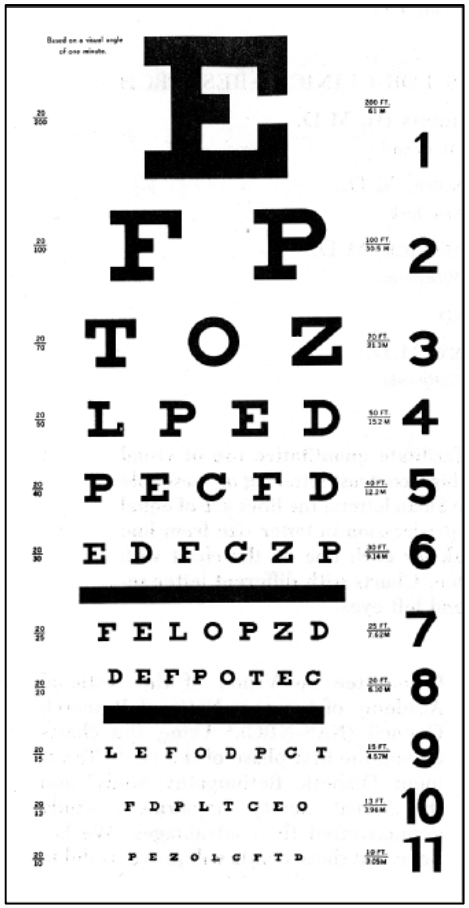
  AND
  - There is a concern about infant follow-up care
- **Before 1 month of age:**
  - » All infants with laboratory evidence of congenital Zika virus infection

  OR
  - » Abnormal findings consistent with CZS
- **Follow up should occur**
  - » If the ophthalmologic examination within the first month of age is normal
  - » Another complete examination at 3 months of age

Russell K, Oliver SE, Lewis L, et al. Update: Interim Guidance for the Evaluation and Management of Infants with Possible Congenital Zika Virus Infection — United States, August 2016. MMWR Morb Mortal Wkly Rep 2016;65:870–878.

Screening should include

- Ophthalmologic assessment:
  - Visual acuity assessment
  - Intraocular pressure measurements
  - Slit lamp examination
  - Dilated fundus examination
- Resources for children with vision impairment or loss
  - Low vision specialist
  - Early intervention



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How can primary care providers help?

- For infants without laboratory evidence of Zika virus infection but for whom suspicion for congenital Zika virus infection remains
  - Consider referral to an ophthalmologist before hospital discharge or within 1 month of birth
- Outpatient management of infants with possible congenital Zika exposure but without abnormalities consistent with CZS
  - During routine infant follow-up with primary care providers, at each well child visit
    - Vision screening, including assessment of visual regard
    - Referral to an ophthalmologist for any caregiver or provider concern
- Tips for screening vision in young infants
  - For very young infants (1-2 months of age): test wince to light
  - At about 3 months of age: fix and follow
  - Test vision with both eyes open first, then try one eye at a time

Russell K, Oliver SE, Lewis L, et al. Update: Interim Guidance for the Evaluation and Management of Infants with Possible Congenital Zika Virus Infection — United States, August 2016. MMWR Morb Mortal Wkly Rep 2016;65:870–878.

Summary

In infants with congenital Zika infection:

- While ocular findings have been noted in infants with congenital Zika infection with and without microcephaly, the incidence of ocular findings in these infants is unknown
- Both anterior and posterior ocular findings have been reported, but the main ocular findings involve the macula and optic nerve
- Cortical visual impairment might be the most common cause of blindness among children with congenital Zika syndrome
- Primary care providers serve an important role in screening and referring infants to an ophthalmologist according to published recommendations and for any caregiver or provider concern

Thank you!

More information on Zika: **www.cdc.gov/zika**

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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