Childhood blindness
Overview

• This presentation covers the following topics:
• Definitions
• Epidemiology of childhood blindness
• The magnitude and prevention strategies for:
  ➢ Corneal blindness
  ➢ Childhood cataract
  ➢ Retinopathy of prematurity
  ➢ Refractive error and low vision
• Conclusion

Notes section – a more detailed explanation is provided in the notes along with key references.
Definitions

• Childhood: from 0 to 15 years old (UNICEF)
• Blindness defined as:
  ➢ corrected visual acuity < 3/60 better eye
  or
  ➢ central visual field each eye < 10 degrees
Magnitude of childhood blindness.

- Estimated prevalence (using under-5 mortality rate as country categories):
  - Low income countries 1.5/1000.
  - High income countries 0.3/1000.
- 3/4 in poorest regions of Africa and Asia
- Estimated 1.4 million blind children globally
- Estimated incidence 500,000 children/year
Changed this to make it clearer
Marissa Carter, 7/13/2011
Magnitude of blindness in children per 10 million population in different regions*

<table>
<thead>
<tr>
<th></th>
<th>Affluent</th>
<th>Middle income</th>
<th>Poor</th>
<th>Very poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>% children in the population</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Number children/10 million total population</td>
<td>2 million</td>
<td>3 million</td>
<td>4 million</td>
<td>5 million</td>
</tr>
<tr>
<td>Prevalence of Childhood blindness</td>
<td>0.3/1000</td>
<td>0.6/1000</td>
<td>0.9/1000</td>
<td>1.2/1000</td>
</tr>
<tr>
<td>Number blind children/10 million total population</td>
<td>600</td>
<td>1800</td>
<td>3600</td>
<td>6000</td>
</tr>
</tbody>
</table>
Causes of childhood blindness

• Poor countries: corneal scarring (vit A deficiency, measles, ophthalmia neonatorum, harmful traditional practices.
• Middle income countries: retinal conditions mainly hereditary, retinal dystrophies and ROP.
• High income countries: CNS disorders and retinal conditions.
WHO classification of causes of childhood blindness

- Anatomical classification
- Aetiological classification
WHO anatomical classification of causes of childhood blindness

- Whole globe (e.g. ano/microphthalmos)
- Cornea (e.g. corneal scarring, keratoconus)
- Lens (e.g. cataract, aphakia)
- Uvea (e.g. aniridia)
- Retina (e.g. retinal dystrophies)
- Optic nerve (e.g. atrophy)
- Glaucoma
- conditions where the eye appears normal (e.g. refractive errors, cortical blindness, amblyopia).
WHO aetiological classification of causes of childhood blindness

- **Hereditary** (at conception), e.g. genetic, chromosomal abnormalities
- **Intrauterine** (during pregnancy, e.g. rubella
- **Perinatal** (e.g. retinopathy of prematurity, birth injury, neonatal conjunctivitis/ophthalmia neonatorum)
- **Childhood** (e.g. measles, trauma vitamin A deficiency)
- **unknown/cannot be determined**
## Causes of blindness in children per 10 million population in different regions

<table>
<thead>
<tr>
<th>No of children blind by:</th>
<th>Affluent</th>
<th>Middle income</th>
<th>Poor</th>
<th>Very poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corneal scar</td>
<td>0</td>
<td>0</td>
<td>720</td>
<td>2000</td>
</tr>
<tr>
<td>Cataract or glaucoma</td>
<td>60</td>
<td>360</td>
<td>720</td>
<td>1000</td>
</tr>
<tr>
<td>ROP</td>
<td>60</td>
<td>450</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
<td>480</td>
<td>990</td>
<td>2160</td>
<td>3000</td>
</tr>
</tbody>
</table>

Adapted from Gogate and Gilbert. (1)
## Avoidable causes of childhood blindness

**Preventable**

- **Corneal scarring due to:**
  - Vit A deficiency
  - measles
  - ophthalmia neonatorum
  - traditional practices
  - infective corneal ulcers

- **Intrauterine factors:**
  - rubella
  - toxoplasmosis
  - other teratogens: alcohol

- **Perinatal factors:**
  - ROP
  - birth hypoxia

**Hereditary diseases** (consanguineous / genetic)

**Treatable**

- Cataract
- Glaucoma
- ROP
- Uveitis
- Corneal disease (corneal ulcers and opacity)
Magnitude and control strategies for priority causes of CHB

• Public health approach used to control the conditions:
  ➢ Primary prevention – to stop the disease from occurring
  ➢ Secondary prevention - to prevent the blindness from occurring due the disease
  ➢ Tertiary prevention – to treat the blindness caused by the diseases where possible.
Corneal blindness

- 70% of childhood blindness in poor countries
- Corneal scarring by Vit A deficiency is the single largest cause of childhood blindness
- Prevention requires multi-sector collaboration
## Corneal scar: public health approach

<table>
<thead>
<tr>
<th>Major causes</th>
<th>Primary prevention</th>
<th>Secondary prevention</th>
<th>Tertiary prevention</th>
</tr>
</thead>
</table>
| Vit A                         | Vit A supplementation  
Nutrition education | Treatment of xerophthalmia with Vit A                     | Corneal transplantation?  
Not always possible / suitable                           |
| Measles                       | Measles immunization                                   | Vit A treatment for children with measles  
Eye examination and treatment of corneal ulcers           |                                                          |
| Ophthalmia neonatorum         | Cleaning eyes of newborn at birth .  
Povidone Iodine prophylaxis | Treatment with intensive antibiotics for ulcers associated with traditional practices |                                                          |
| Traditional practices         | Education of traditional practitioners and birth attendants.  
Primary eye care services | Intensive, appropriate and rapid treatment of neonates with conjunctivitis |                                                          |
| Infective corneal ulcers      |                                                         | Prompt recognition and treatment by ophthalmic personnel |                                                          |
| Other                         | Avoid trauma                                           | Prompt recognition and treatment                         |                                                          |
This is a busy chart but I think it is very clear and would be difficult to break it down.
Childhood cataract

- Accounts for 10-30% of childhood blindness
- 190,000 children blind from cataract
- Management of cataract in children has changed dramatically in last 20 years
- Timely identification and case finding are essential
# Childhood cataract: public health approach

<table>
<thead>
<tr>
<th>Main causes of childhood cataract</th>
<th>Primary prevention</th>
<th>Secondary prevention</th>
<th>Tertiary prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital rubella syndrome (25%)</td>
<td>Immunization (not routinely available globally to date)</td>
<td>Early detection and surgery</td>
<td>Surgery and close follow up</td>
</tr>
<tr>
<td>Genetic (20%)</td>
<td>Genetic counselling</td>
<td>Early detection and surgery</td>
<td>Surgery and close follow up</td>
</tr>
</tbody>
</table>

* Early detection is important if surgical intervention is to have an impact. Follow up services are equally essential.
Retinopathy of prematurity

- Third “epidemic” of ROP in middle income countries, accounting for up to 60% of blindness.

- Latin America, former socialist economies of central and eastern Europe, cities in Asia

- 50,000 blind from ROP globally

- Principle risk factor ROP - unmonitored supplemental oxygen
ROP public health approach

<table>
<thead>
<tr>
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<th>Secondary prevention</th>
<th>Tertiary prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROP</strong></td>
<td><strong>Good neonatal care:</strong></td>
<td><strong>Screening and Examination of babies at risk</strong></td>
<td><strong>Surgery for stage 4 ROP</strong></td>
</tr>
<tr>
<td></td>
<td>-systemic steroids to mothers for premature births and</td>
<td><strong>Laser treatment of type 1 ROP</strong></td>
<td><strong>Low vision services and rehabilitation</strong></td>
</tr>
<tr>
<td></td>
<td>-O2 monitoring of neonates</td>
<td><strong>Follow up</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Reduce preterm births:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Reduce number of implanted embryos in fertility clinics and health education about</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>risks of in vitro and fertility drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Prevention of teenage pregnancies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Avoid unnecessary Caesarean sections</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Refractive errors in children

- Responsible for 95% of visual impairment in children.
- 12.8 million children (5-16 yrs) visually impaired from RE, global prevalence 0.96%
- Interferes with children’s education affecting their future opportunities in life.
## Refractive errors in children: public health approach

<table>
<thead>
<tr>
<th></th>
<th>Primary prevention</th>
<th>Secondary prevention</th>
<th>Tertiary prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Refractive errors</strong></td>
<td>Not possible</td>
<td>Vision screening programs to detect cases early</td>
<td>-Low vision services and visual rehabilitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Refraction and spectacles or contact lenses services</td>
<td>-Health education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Refractive surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Health education on vision hygiene (illumination, distance etc)</td>
<td></td>
</tr>
</tbody>
</table>
Low vision

• Definition:
  impairment of visual function even after treatment or refractive correction, and VA between 6/18 and light perception
  or
  <10 degrees from the point of fixation, but who uses or could use vision for the planning and/or execution of a task.

• Low vision is irreversible

• Global prevalence 0.3%
Low vision control strategies

- Establish the cause of visual loss
- Surgical interventions if appropriate
- Assessment of the child's various visual functions (distance vision, near vision, contrast sensitivity, and visual field)
- Refraction and provision of spectacles
- Low vision devices (magnifiers)
- Non-optical low vision devices (reading stands)
- Training in the use of devices with follow-up
Conclusion

- Obtaining reliable data in childhood blindness is very challenging.
- Causes of childhood blindness are different in poor, middle and high income countries.
- WHO’s priority areas in childhood blindness are: corneal blindness, cataract, ROP, refractive errors and low vision
- 28% is due to preventable causes and 15% due to treatable causes