"Risk Factors for Moderate and Severe Glaucoma in a Ghanaian Population"

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Background

- I am a third-year undergraduate at Yale University
- Majoring in Molecular, Cellular, and Developmental Biology
- Global Impact Corps Volunteer for Unite For Sight in Accra, Ghana in June and July of 2010
What is Glaucoma?

- Eye disease – damage to the optic nerve
- Permanent, irreversible loss of sight
- Correlated with high intraocular pressure (IOP)
- Two main types
  - Primary Open Angle Glaucoma (POAG)
    - GRADUAL
    - MAJORITY OF GLAUCOMA CASES
  - Primary Closed Angle Glaucoma (PCAG)
    - ACUTE
    - MINORITY OF GLAUCOMA CASES
- Treatment can only prevent further sight loss
Glaucoma in Ghana

- Developing Democratic Country in West Africa
- Greater impact for poor country + rural areas
- Many barriers to receiving proper eye care
  - Shortage of ophthalmologists and clinical staff
  - Financial and economic insecurity
  - Few hospitals and shortage of medical equipment
  - Low availability of care, especially in poor, rural villages and areas, transportation
  - Education
How to Treat Glaucoma

• Early detection
  – Visual test
  – Measurements
    • Intraocular pressure
    • Cup-to-disc ratio

• Treatment with medicated eye-drops
  – Timolol is a beta-adrenergic receptor blocker that slows aqueous humor production

• Surgery
  – Goniotomy
  – Iridotomy
Focus on Juvenile Glaucoma

- Glaucoma symptoms usually emerge in older patients
- Earlier affliction = greater loss of sight over time
- Juvenile: Patient age < 41 years old
Study Logistics

• Month of July at Emmanuel Eye Centre in Accra, Ghana
• Under mentorship of Dr. Michael Gyasi
• Compiled glaucoma patient chart reviews and expanded existing database
Sample Size Statistics

• Sample size: #
glaucmatous eyes = 1384
  – # juvenile glaucomatous
    eyes = 289
  – % juvenile glaucomatous
    eyes = (289/1384) = 20.88%
  – INTERESTING TREND
    • In world-wide studies, for
      any sample population,
      ~20% glaucoma patients
      are juveniles
# Distribution of Glaucoma Types

<table>
<thead>
<tr>
<th>Glaucoma Type</th>
<th># eyes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>POAG</td>
<td>125/289</td>
<td>43.3%</td>
</tr>
<tr>
<td>POAGS</td>
<td>95/289</td>
<td>32.9%</td>
</tr>
<tr>
<td>Disc Suspt</td>
<td>42/289</td>
<td>14.5%</td>
</tr>
<tr>
<td>NTG</td>
<td>24/289</td>
<td>8.3%</td>
</tr>
<tr>
<td>PACG</td>
<td>2/289</td>
<td>0.7%</td>
</tr>
<tr>
<td>SACG</td>
<td>1/289</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
## Glaucoma and Blindness (based on ISGEO standards)

<table>
<thead>
<tr>
<th>Eye(s)</th>
<th># eyes or patients blind</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral</td>
<td>3 / 148 patients</td>
<td>2.03%</td>
</tr>
<tr>
<td>O.D. only</td>
<td>10 / 144 O.D.s</td>
<td>6.94%</td>
</tr>
<tr>
<td>(right eye)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O.S. only</td>
<td>17 / 145 O.S.s</td>
<td>11.7%</td>
</tr>
<tr>
<td>(left eye)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- $X^2$-test for OD/OS following 50:50 distribution, $p<0.05$... what does this mean?
Age and Sex Distribution

• Basic Stats
  – Average age = 28.152
    • StDev = 8.233
    • Min = 10
    • Med = 29
    • Max = 40
  – Male/Female ratio
    • 144 males; 145 females
    • 0.993:1 male:female
Technical Data

- Cup to Disc Ratio (CDR)

Average CDR = 7.7
### Intraocular Pressure

<table>
<thead>
<tr>
<th>Eye</th>
<th>O.D.</th>
<th>O.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Right eye)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># eyes</td>
<td>144</td>
<td>145</td>
</tr>
<tr>
<td>Mean</td>
<td>29.01</td>
<td>29.06</td>
</tr>
<tr>
<td>StdDev</td>
<td>13.99</td>
<td>13.53</td>
</tr>
<tr>
<td>Min</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Median</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Max</td>
<td>75</td>
<td>70</td>
</tr>
</tbody>
</table>

- **Damage to optic nerve**
- **Pressure inside eye**
Regression

CDR versus IOP
\( r = 0.2024 \)

Visual Acuity versus IOP
\( r = 0.4711 \)

Visual Acuity versus CDR
\( r = 0.4111 \)
So what’s the big picture?

- Glaucoma is widespread in Ghana
- Juveniles are affected
- It can be DIAGNOSED
  - Simple measurements (Visual acuity, IOP< CDR, etc.)
- It is TREATABLE
  - Some components not enough data…
  - Need to reach out more!!
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Dr. Susan Forster
Director of Medical Studies, Ophthalmology & Visual Science at the Yale School of Medicine

On-site Advisor:
Dr. Michael Gyasi
Chief Ophthalmologist at Northwestern Eye Clinic and Emmanuel Eye Centre in Accra, Ghana

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