Child growth impairment associated to Schistosomiasis

Mónica Botelho
UPSPDNT
Centro Gonçalves Ferreira
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1. *Schistosoma haematobium*: facts and figures

2. The case of Guinea Bissau: school children

3. Nutritional Status and Growth Indicators
   - Stunting
   - Wasting
   - Underweight
Schistosomes: Life cycle

1. Infective Stage
2. Diagnostic Stage
3. Sporocyst in snail (successive generations)
4. Cercariae released by snail into water and free-swimming
5. Penetrates skin
6. Cercariae lose tails during penetration and become schistosomulae
7. Circulation
8. Migrate to portal blood in liver and mature into adults
9. Eggs hatch releasing miracidia
10. Paired adult worms migrate to: mesenteric vessels of bowel/rectum (laying eggs that circulate to the liver and shed in stools)

Urogenital Schistosomiasis

- Eggs provoke granulomatous inflammation that leads to small fibrotic nodules known as “sandy patches”, ulceration, and pseudopolyposis of the vesical and ureteral walls. Urinary granulomas.
- Dysuria, pollakisuria, proteinuria and HEMATURIA
- Bacterial superinfection
- Obstructive uropathy. Hydronephrosis

PJ Hotez et al., Lancet 2010
Gryseels et al 2006
Orihel and Ash
The most neglected schistosome among schistosomes

Table 1. Number of citations in PubMed over the last five years, 2008–2012.

<table>
<thead>
<tr>
<th>Parasite Species</th>
<th>Approximate Number of Human Cases</th>
<th>Number of PubMed Citations over the Last Five Years(^b)</th>
<th>PubMed Citations per Millions of Human Cases</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Schistosoma japonicum</em></td>
<td>1 million</td>
<td>644</td>
<td>644</td>
<td>Steinmann et al. 2006 [1]</td>
</tr>
<tr>
<td><em>Schistosoma mansoni</em></td>
<td>54 million(^a)</td>
<td>1,371</td>
<td>25</td>
<td>Van der Werf et al. 2003 [3]</td>
</tr>
<tr>
<td><em>Schistosoma haematobium</em></td>
<td>112 million(^a)</td>
<td>342</td>
<td>3</td>
<td>Van der Werf et al. 2003 [3]</td>
</tr>
</tbody>
</table>

\(^{a}\) Sub-Saharan Africa only
\(^{b}\) Search conducted on July 14, 2012

1. Group 1 carcinogen responsible for a unique squamous cell carcinoma of the bladder

2. Female Genital Schistosomiasis (FGS) – Infertility?

3. FGS: 3 – 4 times increased risk in acquiring HIV infection
Guinea-Bissau is one of the less developed countries in the world.

The 1.6 million inhabitants live under extreme poverty, and water supply and sanitation cover less than half of the population.

Although the WHO (2012) considers Guinea-Bissau to be a highly endemic country for schistosomiasis, to our knowledge this is the first study addressing the prevalence of this neglected tropical disease in this part of sub-Saharan Africa.

90 schoolchildren aged 6 – 15 were targeted in this study.
Growth Indicators

Body weight and height were measured using a standardized method of anthropometric techniques.

Height was measured to the nearest 0.1 centimeters and weight was measured to the nearest 0.1 kg using portable digital scales.

Body Mass Index (BMI) of each child was calculated as weight in kilograms divided by the square of height in meters (kg/m²).
Nutritional Status

Z scores of height-for-age (HAZ) and weight-for-age (WAZ) were calculated using Nutritional Index Calculator (WHO, 1995).

HAZ and WAZ values less than -2 were considered as stunting and wasting respectively as described by WHO (1995).

BMI<15 kg/m2 was considered as underweight (WHO, 1995).

12-year-old boy suffering from stunting and wasting due to schistosomiasis
Stunting and wasting associated to Schistosomiasis

Urinary schistosomiasis in Guinea Bissau: the first epidemiologic report
Botelho M.C.1,2 *, Machado A.3, Carvalho A.4, Vilaça M.1, Conceição O.1, Alves H.1, Richter J.5, Bordalo A.A.4
1 INSA, National Institute of Health, Rua Alexandre Herculano, 321, 4000-055 Porto, Portugal
2 Department of Pathology and Molecular Immunology, Institute of Biomedical Sciences (ICBAS), University of Porto, Porto, Portugal;
3 Laboratory of Hydrobiology and Ecology, Institute of Biomedical Sciences (ICBAS), University of Porto, Porto, Portugal
4 Division of Endocrinology, Diabetes and Metabolism, Hospital Santo Antonio – Centro Hospitalar do Porto (CHP), Porto, Portugal
5 Tropical Medicine Unit, Department for Gastroenterology, Hepatology and Infectious Diaseases, Medical Faculty, Heinrich-Heine University, Düsseldorf, Germany

Table 2. Overall growth indicators among children positive (Sh +ve) and negative (Sh –ve) for S. haematobium.

<table>
<thead>
<tr>
<th>Growth Indicators</th>
<th>Sh -ve; n=72</th>
<th>Sh +ve; n=18</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAZ (mean±SD)</td>
<td>-0.58±1.11</td>
<td>-0.87±1.11</td>
<td>n.s.</td>
</tr>
<tr>
<td>WAZ (mean±SD)</td>
<td>-0.80±1.04</td>
<td>-1.48±1.08</td>
<td>p=0.01</td>
</tr>
<tr>
<td>BMI (mean±SD)</td>
<td>14.6 2.16</td>
<td>13.9 2.67</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

n - number of individuals; HAZ – height-for-age z-score; WAZ – weight-for-age z-score; BMI – Body mass index.
Conclusions

1. This survey provides for the first time data on the prevalence of *S. haematobium* infection and undernutrition among schoolchildren across Guinea-Bissau.

2. All *Schistosoma* species cause non-specific but disabling systemic morbidities including malnutrition and impaired childhood development, as a result of the effect of continued inflammation on normal growth, iron metabolism, physical fitness, and cognitive function.

3. Efforts to provide nutritional interventions, deworming and vaccination to children are indicated.
1. Investigate schistosome catechol estrogen in urine of Schistosoma infected children from Guinea Bissau.

2. Evaluate impact of these catechol estrogens on growth impairment in these informative human cases.
Thank you for your attention