Epidemiology of Infant Heart Disease in Sub-Saharan Africa

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I have no conflict of interest
PLAN

• A: The Burden of Infant Heart Disease in Sub-Saharan Africa

• B: The Distribution of Infant Heart Disease in Sub-Saharan Africa
A: The Burden of Infant Heart Disease in Sub-Saharan Africa
A: The Burden of Infant Heart Disease in Sub-Saharan Africa:
Size of the Problem

High Infantile Population

High rate of infant Mortality

Real Public Health Problem

Difficulties with medical management
A: The Burden:
1/ High Infantile population in Sub-Saharan Africa

Sub-Saharan Africa

- 48 countries, 11% of the world’s population (850 M)
- ≈ 40% of individuals <18 years old in some countries (350 M).

- World population: 7 billion to 9 billion by 2050
A: The Burden:
2/ High rate of Infant Mortality in Sub-Saharan Africa

WHO Estimations for the year 2005 (United Nations, 2007):

- 10 millions children < 5 years died in the World (close to 20% of deaths)
- 50% in Africa, ≈ 5 millions (Africa ≈ 14% the World’s population)
## A: The Burden:
### 2/ High rate of Infant Mortality in Sub-Saharan Africa

<table>
<thead>
<tr>
<th>AFFECTIONS</th>
<th>Nb de cas</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affections parasitaires</td>
<td>309</td>
<td>18,3</td>
</tr>
<tr>
<td>Pathologie accidentelle</td>
<td>291</td>
<td>17,3</td>
</tr>
<tr>
<td>Pathologie infectieuse</td>
<td>226</td>
<td>13,4</td>
</tr>
<tr>
<td>Affections du sang</td>
<td>203</td>
<td>12,0</td>
</tr>
<tr>
<td>Affections digestives</td>
<td>130</td>
<td>7,7</td>
</tr>
<tr>
<td>Affections respiratoires</td>
<td>121</td>
<td>7,2</td>
</tr>
<tr>
<td>Affections ostéo articulaires, muscles et tissus conjonctifs</td>
<td>81</td>
<td>4,8</td>
</tr>
<tr>
<td>Affections psychiatriques et du système nerveux</td>
<td>65</td>
<td>3,9</td>
</tr>
<tr>
<td>Affections cardiovasculaires</td>
<td>43</td>
<td>2,6</td>
</tr>
<tr>
<td>Etats morbides mal définis</td>
<td>35</td>
<td>2,1</td>
</tr>
<tr>
<td>Affections des organes des sens</td>
<td>29</td>
<td>1,7</td>
</tr>
<tr>
<td>Affections du système génito-urinaire</td>
<td>27</td>
<td>1,6</td>
</tr>
<tr>
<td>Affections endocriniennes, métaboliques et nutritionnelles</td>
<td>23</td>
<td>1,4</td>
</tr>
<tr>
<td>Affections de la peau et du tissu cellulaire sous cutané</td>
<td>22</td>
<td>1,3</td>
</tr>
<tr>
<td>Affections tumorales</td>
<td>19</td>
<td>1,1</td>
</tr>
<tr>
<td>Malformations</td>
<td>6</td>
<td>0,4</td>
</tr>
<tr>
<td>Autres causes d’hospitalisation</td>
<td>54</td>
<td>3,3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1 684</strong></td>
<td><strong>100,0</strong></td>
</tr>
</tbody>
</table>

*Statistiques de causes de décès chez l’enfant - Brazaville, 1991*
A: The Burden:
3/ Difficulties with medical management in Sub-Saharan Africa

Difficulties with medical Management

- Insufficient Epidemiologic Data
- Insufficient financial resources of the population
- Insufficient specialized medical personnel
- Insufficient reference Health Infrastructures
A: The Burden:
3/ Difficulties with medical management in Sub-Saharan Africa

- Insufficient epidemiologic data
  - Poor knowledge on epidemiology and pathogenesis of neglected conditions
  - Research-funding sources are rare because there are few industries and trusts.
  - The interfering role of communicable diseases.
A: The Burden:
3/ Difficulties with medical management in Sub-Saharan Africa

- Insufficient financial resources of the population

Source: WHO
A: The Burden:
3/ Difficulties with medical management in Sub-Saharan Africa

- Insufficient specialized medical personnel

The Worldwide Environment of Cardiovascular Disease
Journal of the American College of Cardiology December 2012
A: The Burden:

3/ Difficulties with medical management in Sub-Saharan Africa

Insufficient reference health infrastructures

The problem with access to care in case of infantile heart disease

- Pathology of rural zones,
  - poorly served by health structures and health personnel
  - unsatisfactory quality of health care offered
  - low income of households
  - worsened by the failing National Health Systems to fight against Infant Heart Disease: “extreme” medical risk
A: The Burden:

In Sub-Saharan Africa, we find:

- 14% of the world population,
- 40% of the population < 18y
- 30% of people living in extreme poverty,
- The highest infantile mortality,
- A poor national policies for the management of children’s heart diseases.
B: Distribution of Infant Heart Disease in Sub-Saharan Africa
B: Distribution of Infant Heart Disease in Sub-Saharan Africa

- Rheumatic Heart Disease
- Congenital Heart Disease
- Other heart Diseases
8121 patients referred in cardiac centre, 462 with congestive heart failure, 198 females and 264 males, 8 - 86 years (42.5±18 years)

From 8 – 20y: valvulopathies, pericarditis, CHD
### Distribution of Heart Disease in Sub-Saharan Africa

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>38,5</td>
<td>58</td>
<td>36,5</td>
<td>49,1</td>
<td>39,3</td>
</tr>
<tr>
<td>Rheumatic Heart Diseases</td>
<td>25,6</td>
<td>13,8</td>
<td>22,9</td>
<td>13</td>
<td>14,5</td>
</tr>
<tr>
<td>MCP</td>
<td>22,5</td>
<td>16</td>
<td>18,1</td>
<td>18,1</td>
<td>7,4</td>
</tr>
<tr>
<td>EPC</td>
<td>0,6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,9</td>
</tr>
<tr>
<td>Coronary Heart Disease</td>
<td>0,9</td>
<td>3,1</td>
<td>2,2</td>
<td>1,8</td>
<td>6,5</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>5,8</td>
<td>9</td>
<td>2,5</td>
<td>3,5</td>
<td>8,8</td>
</tr>
<tr>
<td>Heart failure</td>
<td>5,8</td>
<td>3,1</td>
<td>13,6</td>
<td>9,8</td>
<td>-</td>
</tr>
<tr>
<td>Congenital Heart Diseases</td>
<td>4,8</td>
<td>4</td>
<td>1,1</td>
<td>2,3</td>
<td>3</td>
</tr>
<tr>
<td>Infectious endocarditis</td>
<td>0,9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3,3</td>
</tr>
</tbody>
</table>

B: Distribution

I: Rheumatic Heart Disease (RHD)

• Rheumatic Fever (RF) and Rheumatic Heart Disease (RHD) are the most frequent infant cardiovascular diseases worldwide.

• It is estimated that:
  – 15.6 M people (mostly children) suffer from RHD worldwide,
  – 2.4 M children 5 - 14 years,
  – 470,000 new cases of RF/year,
  – 233,000 deaths caused by RF or RHD/year,
  – Hundreds of thousands of survivors with sequelae do not have access to expensive medical and surgical care.

one of the most neglected diseases in the world.
Prevalence of rheumatic heart disease in children aged 5–14 years

The global burden of group A streptococcal diseases
Jonathan R Carapetis Lancet, vol 11, November 2005
B: Distribution
I: Rheumatic Heart Disease (RHD)

- clinical prevalence: 2.3/1,000;
- echocardiogram prevalence: 30.4/1,000.

It is likely that in parts of Sub-saharian Africa a similar prevalence would be found.

Prevalence of Rheumatic Heart Disease Detected by Echocardiographic Screening
VALVAFRIC study, tropical cardiology group

Pr. S. Kingue

- Retrospective multi centre registry, 2004-2008
- Seven countries (Cameroon, Ivory Coast, Guinée Conakry, Mali, Nigeria, Senegal, Togo)
- 27,822 patients, >3 years old
- Suspected rate: 12.3%
- 40.2% of cases detected, confirmed on echocardiography (Severe or complicated RHD)
VALVAFRIC study, tropical cardiology group, Pr. S. Kingue

- Decreasing cases of RHD in 4 centres
- Increase of other heart diseases
- Groups at risk:
  - Poor settings
  - Low socio-professional categories revenus
- Social Impact: school retardation or failure 66.25%, prolonged joblessness 62.6%, loss of job 51.1% of cases.
### Determinants of the persistence of RF and RHD in Africa

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Effects</th>
<th>Impact on the extension of RHD and RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Poor nutrition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Overcrowding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Low housing standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health system associated factors:</strong></td>
<td>1. Inappropriate diagnosis and treatment of streptoccocal pharyngitis</td>
<td>1. Higher incidence of RF and its recurrence</td>
</tr>
<tr>
<td>1. Limited health care resources</td>
<td>2. Missed or late diagnosis of RF</td>
<td>2. Missed diagnosis of RF first episode</td>
</tr>
<tr>
<td>2. Limited knowledge of the disease by the health care providers</td>
<td>3. Inappropriate administration of secondary prophylaxis</td>
<td>3. Inappropriate administration of secondary prophylaxis</td>
</tr>
<tr>
<td>3. Inadequate awareness on the disease</td>
<td></td>
<td>4. Higher rate of recurrence of RF with more frequent and more severe valvular affections</td>
</tr>
<tr>
<td><strong>Others:</strong></td>
<td>1. Higher incidence of RF and its recurrence</td>
<td>5. Higher rate of repeated hospitalisations and expensive valvular surgery</td>
</tr>
<tr>
<td>➢ potentially unidentifiable or more virulent group A streptococci</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ possible yet unexplained underlying genetic.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Occurrence, aetiology and challenges in the management of congestive heart failure in sub-Saharan Africa: experience of the Cardiac Centre in Shisong, Cameroon

Mitral valve: > 80 % of cases
Polyvalvular (Mi et Ao): 1/3 of cases

**Table 2:**
Type of valvulopathies diagnosed in Cameroon, from 2002 to 2008

<table>
<thead>
<tr>
<th>Type of the valvulopathy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitral valve regurgitation</td>
<td>59.7%</td>
</tr>
<tr>
<td>Mitral valve stenosis</td>
<td>26%</td>
</tr>
<tr>
<td>Mixed mitral valve disease</td>
<td>13.7%</td>
</tr>
<tr>
<td>Aortic valve regurgitation</td>
<td>15.3%</td>
</tr>
<tr>
<td>Aortic valve stenosis</td>
<td>7.2%</td>
</tr>
<tr>
<td>Combined aortic and mitral valvulopathy</td>
<td>5.2%</td>
</tr>
</tbody>
</table>

In Sub-Saharan Africa, RF is the first cause of cardiologic consultations and hospitalizations, is endemic and remains one of the greatest cause of cardiovascular disease (22%), and has a high morbidity.

In Addis-Abeba (in 2000, unpublished data)

- 26% of CV deaths are due to RF,
- 70% of patients with RHD died by age 25 y on average,
- RHD responsible for 1,200,000 strokes/year.
B: Distribution
II / Congenital Heart Disease (CHD)

- In developed countries:
  - Incidence: 0.8% of all live births (1.35 M/year).
  - Incidence of serious CHD: 0.4 - 0.6% of all live births.
  - 30% deaths before any diagnosis
  - 50% needing invasive diagnostic procedures
  - 40% needing open heart surgery every year

- Very few studies in developing countries, but it is expected that the incidence is similar.
From a survey conducted in Mozambique:

- total of 2170 public school children
- \( \text{prevalence of } 2.3 / 1000 \)
- 80% newly discovered during the survey.

Birth Prevalence of Congenital Heart Disease Worldwide: A Systematic Review and Meta-Analysis
B: Distribution

III / Other heart diseases

- 1/ Bacterial endocarditis
- 2/ Pericarditis
- 3/ Endomyocardial fibrosis
- 4/ Infectious and Toxic Myocardiopathies
- 5/ Heart disease during HIV infection
- 6/ Pulmonary hypertension, Takayasu arteritis
B: Distribution

III / Other heart diseases

1/ BACTERIAL ENDOCARDITIS

3746 hospitalised patients for heart diseases, 870 cases of RHD ➔ prevalence of 4.48%.
39 cases of infective endocarditis ➔ prévalence of 1.04%.
Age: 24 ± 11.5y (6 to 52y). 58.9% (23 patients< 25 ans)
M/F of 0.95

<table>
<thead>
<tr>
<th>Past medical history</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatic heart Disease</td>
<td>19</td>
<td>48.7</td>
</tr>
<tr>
<td>Heart failure</td>
<td>4</td>
<td>10.3</td>
</tr>
<tr>
<td>Infective endocarditis</td>
<td>3</td>
<td>7.6</td>
</tr>
<tr>
<td>Plastic aortic surgery</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Congenital Heart Disease</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Endocardite infectieuse en milieu cardiologique Dakarois: étude descriptive à propos de 39 cas
Mouhamadou Bamba Ndiaye, Dakar, Sénégal,
2/ PERICARDITIS

• Rising prevalence due to HIV but still unclear.

• Causes

  – **infectious**: viral, bacterial (pneumococcus), Tuberculosis (risk of chronic constrictive)

    *(M. tuberculosis is responsible for 70% to 90% of large pericardial effusions, accounts for > to 10% of all cases of congestive heart failure in sub-Saharan Africa)*

  – **Others**: auto-immune diseases (SLE, Still’s disease), cancers, kidney failure, traumat, toxics, post heart surgery
B: Distribution
III / Other heart diseases

3/ ENDOMYOCARDIAL FIBROSIS (EMF) OR DAVIE’S DISEASE.

- Commonest restrictive cardiomyopathy worldwide.
- Regional variations in distribution (Africa, Asia, and South America)
- Lack of large-scale data on epidemiologic features and early stages
- 5 - 15 y, rare < 4 y
- Role of helminthes, poverty, nutrition (cassava, low protein)
- Mozambique (A.O. Mocumbi, data 2007):
  - prevalence of 18% - 20% of the population,
  - children (11y to 15y)
4 / INFECTIONOUS AND TOXICS MYOCARDIOPATHIES

• Few epidemiologic data

• Causes
  – Infections: most frequent.
    • Viruses: (HIV and others)
    • Bacterial
    • Parasitic: Trypanosomiasis, Bilharziosis
    • Mycotic
  – Toxics or Drugs.
  – Auto-immune (SLE)
Heart Disease During HIV Infection

- Frequency: 30 to 40% (autopsy series in tropical zones)

Heart Abnormalities during HIV Infections
5 / HEART DISEASE DURING HIV INFECTION

- Pericarditis
- Myocarditis
- Endocarditis
- Vascular

Etiology: 60% infectious (HIV, TB), neoplasia (lymphomas, kaposi), toxic, …
B: Distribution

III / Other heart diseases

Lack of epidemiological data in Africa for:

6 / PULMONARY HYPERTENSION (PH)

- Limited data suggest Schistosoma induced PH and cor pulmonale, (parasite eggs in the lungs), young people, endemic areas in Africa
- Others causes

7 / TAKAYASU ARTERITIS

- Common in children in endemic regions for tuberculosis.
Take home message
Take home message

In Sub - Saharan Africa,

– Infantile heart diseases are real, posing a major public health problem notably with the management in the poorest regions of the world.

– Clinical data are few and non exhaustive but shows a predominance of RHD, which is declining with a parallel rise in CHD.

– Lack of resources and infrastructure, political social and economic instability, contributes to the persistence of a high burden of RHD.

– Lack of health infrastructures adequately equipped and absence of research, cause difficulties in management
Take home message

Multidisciplinary strategies may be used to increase research aimed at improving knowledge of epidemiology, mechanisms, and management of neglected Infant Heart Diseases in Sub-Saharan Africa.
Thank you for your kind attention