Pulmonary hypertension in Sub-Saharan Africa:
unique diagnosis, challenges and solutions

Ana Olga Mocumbi, MD PhD FESC
National Health Institute & Eduardo Mondlane University, Mozambique
PVRI Co-Leader Sub-Saharan Africa

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Disclosures
None

Summary
- Epidemiology
- Unique causes
- Challenges
- Future Directions & Solutions

Epidemiology
- Pulmonary hypertension constitutes a major burden in sub-Saharan Africa. Besides forms of PH prevalent elsewhere there are several risk factors affecting particularly children in this continent, namely:
  - Untreated Congenital Heart Diseases
  - Valvulopathies: Rheumatic Heart Disease
  - Cardiomyopathies: Endomyocardial Fibrosis
  - Infectious: HIV/AIDS, Tuberculosis, Schistosomiasis
  - Sickle Cell Disease
  - Passive Indoor Smoking & Traditional Medications
- Lack of timely diagnosis & cardiac surgery

Unique Causes
- Untreated Congenital Heart Diseases
- Valvulopathies: Rheumatic Heart Disease
- Cardiomyopathies: Endomyocardial Fibrosis
- Infectious: HIV/AIDS & Schistosomiasis
- Other causes: Sickle Cell Disease

Epidemiology
- Lack of health personnel and access to health care determines the absence of accurate epidemiological data on the incidence and prevalence, as well as lack of quality research on the risk factors that are confined to this continent.
1. Congenital Heart Disease

Large systemic-to-pulmonary communications
Cyanotic defects with increased pulmonary flow

- 654 pts (5y) at admission; 272 (41.6%) had < 24 months
- 127 pts had major complications of which 74 (11.2%) permanent cardiac or lung damage
- Of the 471 suitable for surgery: 207 operated (34 died, 15 denied)

Mocumbi et al. Int J Card 2010

In Mozambique the median age at diagnosis was 4 years (0-79), only 52.8% were diagnosed before the age of two, the commonest defects being L-R shunts (354;66%): VSD(32%), ASD(14%), AVSD(11%), PDA(9%)

PH is present in over 60% of patients & fixed pulmonary hypertension is the most common reason for contraindication to surgery: in Nigeria PH is present in 11% of children with CHD at diagnosis

Although preventable pulmonary hypertension related to CHD is very prevalent in Africa due to unavailability of open-heart surgery, missed opportunities for diagnosis and lack of education of parents

2. Rheumatic Heart Disease

Sequelae of GrAS pharyngitis
- repeated infections that progressively damage the heart valves
  - Progression to valvulopathy can be avoided by secondary prophylaxis with long-term penicillin
  - Pulmonary hypertension can be prevented by timely treatment of mitral and aortic disease

- The disease is more severe and malignant in sub-Saharan Africa for reasons that are unclear, causing early mitral and/or aortic disease that leads to pulmonary hypertension if untreated.
  - In Cameroon secondary PH occurs in 20% of patients
  - In Kenya PH is the most common complication of mitral disease
  - PH in present in 20% of newly diagnosed RHD in South Africa
  - Severe PH in 61% of patients submitted to surgery in Mozambique

Marijon et al. NEJM 357;5: 470-476
Mitral stenosis affects children in Africa, as shown in these pictures from a 14 years old girl. Closed heart surgery is contraindicated in several patients due to presence of thrombus or severe disease. Prognosis is poor due to need of mechanical valves which determine the need for reoperation, long-term anticoagulation and jeopardize reproductive life.

- Valve repair needs expertise + mechanical valve are linked to thromboembolism & death
- RF recurrences occur under adequate prophylaxis + some cannot be diagnosed
- Post-surgery: active carditis, heart failure, thromboembolic/hemorrhagic accidents, reoperations

3. Endomyocardial Fibrosis

Restrictive cardiomyopathy with atrioventricular valve dysfunction

Both arterial and venous pulmonary hypertension:

Chronic or acute thromboembolism from (1) right atrial thrombi & (2) diastolic LV restriction

Is an important cause of PH in endemic areas in several countries

Mozambique, Côte d’Ivoire, Nigeria, Uganda, Rwanda…

EMF

Published Cases:

- 500 - 600
- 1 - 49
- 0

EMF / box

Is an important cause of PH in endemic areas in several countries

- Mozambique, Côte d’Ivoire, Nigeria, Uganda, Rwanda…

Buckman et al, 2008 PLoS Neglected Diseases

A Population Study of Endomyocardial Fibrosis in a Rural Area of Mozambique

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4. INFECTIONS

Pulmonary Schistosomiasis & HIV/AIDS

HIV

- HIV-related pulmonary hypertension has been increasing in Africa, being present in up to 5% of HIV infected patients including children.
- Vertical transmission is a major issue given the 24% maternal prevalence detected in antenatal clinics & unavailability of ART in some settings
- HIV/AIDS is the 3rd leading cause of death in children less than 15 years (8% of deaths in this group) in a rural area of Mozambique (after malaria and respiratory infections)
- Neonates & infants of HIV+ mothers have low ejection fractions and thrombi
Schistosomiasis

- Schistosomiasis-associated PH is likely driven by the host response to parasite antigens, approximately 1% of people chronically infected develop PH.
- A subacute immune complex-mediated hypersensitivity response develops as the parasite migrates through the lungs. Chronic schistosomiasis infection induces granulomatous inflammation around ova deposited in the tissue.
- Schistosoma mansoni migrates to the portal venous system and causes perportal fibrosis in a subset of individuals and appears to be a prerequisite for PH. Portal hypertension facilitates shunting of ova from the portal system to the pulmonary arterial tree, resulting in localized perivascular pulmonary granulomas.

Most countries where double infection with S. mansoni and S. haematobium is endemic are in sub-Saharan Africa, where schistosomal pulmonary arterial hypertension reaches 21.6% in some series.

The pulmonary vascular remodeling is likely a direct consequence of the host inflammatory response & portopulmonary hypertension is a contributor.

- Dyspnea on exertion, Fatigue, Cough, Palpitations, Atypical chest pain and signs of right heart failure (X-ray, echo, rectal biopsy).
- Blood tests are occasionally useful: serologies, and polymerase chain reaction (PCR)
- Tx: O2, diuretics, vasodilators, antiarrhythmics
- Praziquantel 40mg/kg (dosage not established in children under 4y)

5. Sickle Cell Disease
SCD is very prevalent in countries of Central Africa and PH related to this condition might be higher than reported.

In Nigeria where the incidence of PH in patients with SCD is very high, it is thought that interactions between prevalent infectious complications and SCD-related hemolysis could yield an even higher prevalence of PH in SSA (Aliyu, 2008).

The pathophysiology of PH in SCD is multifactorial and includes pulmonary arterial hypertension, pulmonary venous hypertension and pulmonary hypertension secondary to a hyperdynamic state.

Vascular occlusion in sickle cell disease:
Mean pressure levels are usually lower than in other forms of pulmonary vascular disease.

Challenges and Solutions

Diagnosis & Management
Research

Challenges

- Reduce the burden since most causes are preventable or manageable
  - Increase availability of drugs, cath labs and surgery
  - Implement registries and control programmes – RHD, SCHISTO & HIV

- Research needs to be done into
  - Diseases that are almost unique to this continent – EMF
  - Peculiar aspects of known conditions – HIV from HIV+ mothers
  - Local habits that might increase incidence – Biomass smoking & traditional medications

Mozambique

- Over 2000 Km north-to-south
  - 22 millions people with 45% under 15 years
  - 10 cardiologists (2 pediatric cardiologists)
  - 3 tertiary hospitals & 1 specialized institution
  - 80 surgeries/year since 2001
  - 3 new surgeons
  - O2, NO, Sildenafil, Warfarin

Future Directions & Solutions

- National/Regional Registries and Control Programmes
  - PASCAR (Pan African Society of Cardiology Programmes)

- Training of Health Personal & Strengthening of Health Systems:
  - Increase accessibility to health care (personnel & infrastructures)
  - Integration of Chronic NCD in Child Health Programmes
  - Increase availability of diagnosis & therapy
  - Drugs – include in projects of neglected diseases;
  - Cath labs and Surgery: collaboration projects North-South
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