

## **Cardiovascular diseases in the tropics**

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### **ABSTRACT**

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Cardiovascular diseases are widely distributed throughout the world. In Africa they account for about 15% hospital admissions and 10 - 20% fatalities. In the tropics, cardiovascular pathology can be divided into two groups: cardiovascular diseases typical of the tropics (group I) e.g.,: Chagas heart disease, endomyocardial fibrosis and cosmopolitan cardiovascular diseases

(group II) e.g.,: arterial hypertension, rheumatic fever, infective endocarditis, pericarditis or ischemic heart disease. Nutritional deficiencies, severe anemia, parasitic diseases and primary cardiomyopathies are most commonly implicated in the pathogenesis of group I diseases.

**Key words:** cardiovascular diseases, Africa, tropics

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Cardiovascular diseases are widely distributed throughout the world. They account for about 15% hospital admissions and 10 - 20% fatalities in Africa. In the tropics, cardiovascular pathology can be divided into two groups: 1. cardiovascular diseases typical of the tropics, e.g.,: Chagas heart disease, endomyocardial fibrosis; 2. cosmopolitan cardiovascular diseases, e.g.: arterial hypertension, rheumatic fever, infective endo-carditis, pericarditis or ischemic heart disease.

There are four major causes of group 1) cardiovascular diseases; 2) nutritional deficiencies, severe anemia; 3) parasitic diseases; and 4) primary cardiomyopathies

Ad 1) Shortage of food and starvation are recurring features in the developing world. The causes of malnutrition are multifactorial and include dietary deficiencies, infections, pregnancy and inadequate breastfeeding. Children suffering from kwashiorkor (protein-energy malnutrition) or marasmus (deficiency in energy) have small atrophic hearts, with clinical evidence of a low output state. There is a predisposition of an atrophic heart to sudden cardiac arrest or ventricular fibrillation. Nutritional heart disease may be also associated with beriberi (vitamin B1 deficiency) or trace element deficiency (zinc, chromium, copper, magnesium).

Ad 2) There is a high prevalence of anemia in all tropical countries. The most common causative factors are hookworm and malaria infection, dietary lack of iron, protein and folate deficiencies, and genetic hemoglobin disorders, including sickle-cell anemia and thalassemia. Hookworm infection may account for 50% - 70% of hospital admissions with anemia [1]. Frequently several factors operate together. Between 2002-2010 anemia was confirmed in 37% of patients admitted to the Madonna University Teaching Hospital in Elele, Nigeria (7 unpublished data). The cardiac response does not depend on the type of anemia but is related to the hemoglobin level. Until the hemoglobin level falls to about 4.4 mmol/l (7 g/dl) no compensatory mechanisms appear. As it continues to fall, compensation continues until 1.9 - 2.5 mmol/l (3-4 g/dl) is reached. As a result cardiac output increases and the circulation time is shortened, triggering a hyperkinetic state leading to decompensation. In sickle-cell anemia, cardiomegaly may appear in the first year of life and often gradually increases with age. Pulmonary hypertension leads to an acute or chronic cor pulmonale.

Almost 80% of children with beta-thalassemias major may have evidence of cardiac involvement by the age of 10 [1]. Recurrent

pericarditis with effusion often complicates this condition.

Ad. 3) Cardiac involvement is an important feature in several endemic parasitic diseases (trypanosomiasis, schistosomiasis (bilharziasis)). Chagas disease, caused by *Trypanosoma cruzi*, is endemic in many South American countries (Brazil, Argentina, Chile, Venezuela and Uruguay). In the acute, invasive period of American trypanosomiasis cardiac features are not always present. As a rule, after a latent phase lasting 10 - 20 years, chronic Chagas cardiomyopathy develops and manifest as a heart failure [2]. The great majority of patients are aged between 20 and 50. Frequent arrhythmias and conduction disturbances (right bundle branch block and A-V conduction defects) are typical of the chronic phase of Chagas disease. Cardiac pathology is characterized by thinning of the apex of the left ventricle with aneurysm formation. In the chronic form, there is hypertrophy and dilatation of all the chambers (more marked on the right). In African trypanosomiasis, cardiac manifestations are more prominent in *Trypanosomiasis rhodesiense* infection (Rhodesian sleeping sickness) than in *T. gambiense*. Radiographic cardiomegaly and pericardial effusion are often seen. Congestive heart failure with gallop rhythm is common.

In schistosomiasis, cardiac manifestations are usually the result of the pulmonary arterial hypertension causing schistosomale cor pulmonale. Eggs of *Schistosoma haematobium*, *S. mansoni* or *S. japonicum*, migrate to the lungs and provoke an inflammatory and fibrous reaction in the pulmonary parenchyma and arterial walls.

Ad.4) Cardiomyopathy or primary myocardial disease is a disease that affects the heart muscle primarily and spares the coronary vessels, heart valves and pericardium [3]. In the tropics of particular importance are:

- Endomyocardial fibrosis
  - Dilated (congestive) cardiomyopathy
- The other cardiomyopathies, like Chagas cardiomyopathy and postpartum cardio-myopathy, can be regarded as a group of secondary heart muscle diseases.
- Endomyocardial fibrosis is an endemic heart disease in several tropical countries characterized by ventricular endomyocardial fibrosis, affecting, in particular, the apex and subvalvular regions. The cause of endomyocardial fibrosis is ill-defined. Some hypotheses however incriminate malnutrition, viruses, plantain consumption (plantain with high serotonin content in the diet of East and West African groups), infection with *Loa loa* (loiasis) and rheumatic heart disease. In Nigeria, the initial illness usually begins in the rainy season; relapses also tend to occur

during this season [4]. There may be a febrile onset of the illness. The patient is often a child or adolescent about 15 years old with a bilateral or unilateral (mostly right-sided) heart failure. Dysrhythmias are common (especially with right-sided lesions); A-V and intraventricular blocks are prevalent.

- Dilated cardiomyopathy is characterized by the dilation of cardiac chambers (in particular the ventricles) with possible moderate myocardial hypertrophy and its reduced function. An infectious-immune theory is plausible [5]. A viral infection may precede the onset of the disease. Among the viruses, Coxsackie B are highly incriminated. Viral myocarditis can be regarded as a precursor of dilated (congestive) cardiomyopathy. Reduced T cell suppressive function is an important immunologic defect in this cardiomyopathy. An acute viral myocarditis may evolve into chronic myocarditis, leading to a dilated cardiomyopathy in an individual with the above defect. Arterial hypertension is one of the most common reasons for outpatient or hospital consultation. In tropical Africa, arterial hypertension affects about 10% of the population and up to 16-17% in certain countries. It is more frequent in the elderly. We have reported on some aspects of this pathology in our previous paper (6). Although arterial hypertension was found in 22% of the elderly, ischemic heart disease was rarely recognized. The latter was related to eating habits and life-style of those people. Bedouins show a remarkable endurance, being able to sustain the burden of a hard life in the desert. Their diet is extremely low in calories and mainly based on vegetable or plant oil (e.g. olive oil) and a small amount of animal and vegetable proteins.

In contrast to Europeans, in whom retinal and renal consequences of hypertension are more frequently found, in Africans cerebrovascular accidents (stroke) prevail.

Further studies on the world-wide spread of cardiovascular diseases are required to control and reverse this trend.

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