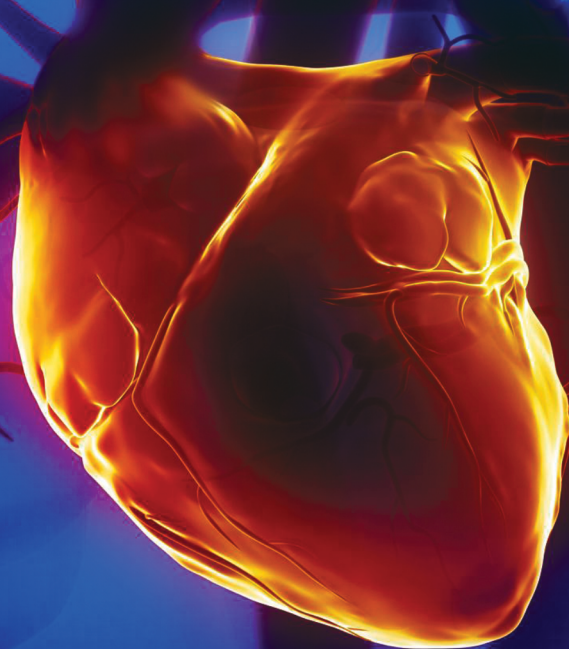


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Developing an African Cardiothoracic Surgery Database

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Abstract

Purpose: There is a paucity of dependable clinical data in most countries performing heart surgery in sub-Saharan Africa, making it difficult therefore to adequately identify and address challenges that may contribute to poor outcomes. The article aims at creating awareness and advocating for collaborative efforts for developing database for measuring cardiovascular surgical activities in Africa. Developing an African cardiothoracic surgery database with pooled datasets similar to the practice in other continents may help mitigate against these challenges and improve clinical outcomes. **Methods:** Through concerted efforts by electronic communication the authors working in six sub-regions of Africa have supported this initiative by providing their data on surgery of congenital and rheumatic heart diseases for evaluation. **Results:** 213 heart centres from 27 countries of Africa (6 sub-regions: North Africa (including the Maghreb- Algeria, Morocco and Tunisia), East Africa, The Horn, Central Africa, West Africa and Southern Africa) were identified. Of these 75 heart centres including 35 congenital and paediatric cardiac units in sub-Saharan Africa (SSA) excluding South Africa were performing heart procedures independently or with support from visiting charity heart missions. Six selected countries of SSA (population of 147.8 million) with six paediatric cardiac units performed 660 open heart surgeries (OHS) for congenital and rheumatic heart diseases in 2019 which project a ratio of 4.5 OHS/per million. In comparison to reported PASCATS data from 2014, valve repair has increased from 10-30% and the rate of valve replacement has decreased from 90% to 70%. **Conclusion:** The AfriCaTS database initiative is a wake-up call for joint efforts to develop the most needed south-south cooperation for sharing cardiovascular surgical data and outcomes. A continuing educational program (online or on-site) for the personnel engaged in this project at the African centres will be necessary to achieve efficiency and sustainability. The project will positively impact on patient care, outcomes, capacity building programs, inspire reskilling in complex procedures and research. Membership to the AfriCaTS database working group is open to all heart centres in Africa.

Keywords: Africa, datasets, heart surgery

INTRODUCTION

There is a lack of reliable data to measure the impact of cardiovascular surgical activities in sub-Saharan Africa (SSA) and to compare with those of the other sub-regions. Consequently, cardiovascular surgical programs in SSA remain less competitive and less sophisticated. The situation is further worsened by limited capacities in terms of poor infrastructure and funding.

Aims

In conjunction with our development programs in SSA, it is an urgent task to establish the needed reliable database for

cardiovascular disease diagnostics, surgical management, outcomes, and impact measurement.

The Pan African Society of Cardiothoracic Surgery (PASCATS) has responded accordingly by initiating the African database

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Table 1: Density of Heart Centers in Africa

Density of Heart Centers in Africa by sub-region and country	
Sub-regions/countries (<i>n</i> =6/27)	Number of heart centers/units (<i>n</i> =213)
Central Africa (<i>n</i> =4)	5
Angola	1
Cameroon	2
Gabon	1
Democratic Republic of Congo	1
East Africa (<i>n</i> =4)	12
Kenya	8
Rwanda	1
Tanzania	2
Uganda	1
Southern Africa (<i>n</i> =6)	40
Botswana	1
Mauritius	1
Mozambique	1
Namibia	1
Zambia	1
South Africa	35
The Horn (<i>n</i> =2)	2
Eritrea	1
Ethiopia	1
West Africa (<i>n</i> =5)	17
Cote d'Ivoire	2
Ghana	3
Mauretania	1
Nigeria	10
Senegal	1
North Africa (<i>n</i> =6)	137
The Magheb*	
Egypt	58.
Libya	3
Sudan	10
Algeria*	27
Morocco*	20
Tunisia*	19
Total 6 sub-regions/27 countries	213 heart centers/units

Table 2: Paediatric cardiac surgical units in sub-Saharan African countries (excluding South Africa)

Sub-Saharan African countries	Heart centers, <i>n</i>	Pediatric cardiac surgical unit, <i>n</i>
Single centers*	13	13
Cameroon	2	2
Cote d'Ivoire	2	2
Ghana	3	2
Kenya	8	3
Nigeria	10	7
South Africa	35	5
Tanzania	2	1
Total	75	35

*Angola, Botswana, DRC, Eritrea, Gabon, Mauritania, Mauritius, Mozambique, Namibia, Rwanda, Zambia, Senegal, Uganda

project following the positive response to questionnaires by African heart centers in 2012 which were published in 2014. The data serve as a benchmark for cardiac surgeons and cardiovascular scientists to address their challenges to the health authorities.^[1]

The cardiothoracic surgeon ratio to population in SSA is 1:25 million.^[1] Although cardiothoracic surgery practice in Africa is gradually expanding since the last decade especially in SSA, it is timely and appropriate, therefore, to ask ourselves where we are now and quo vadis?^[2] [Tables 1-5].

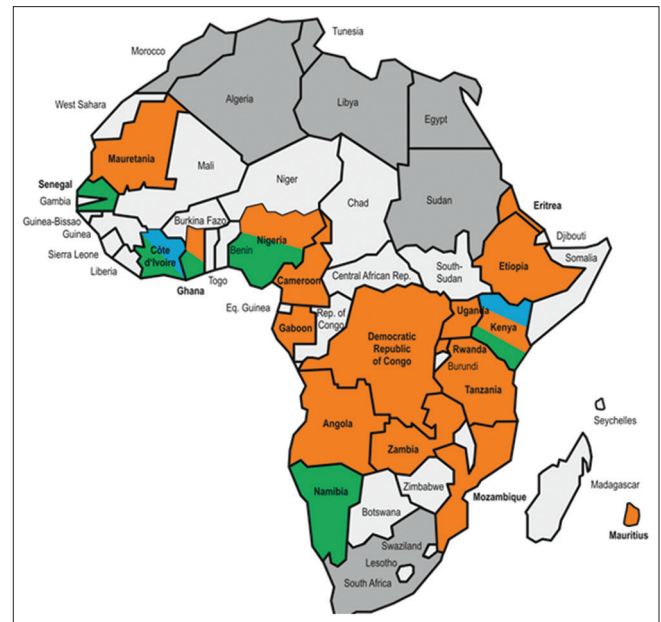
METHODS

Colleagues from many African heart centers have responded to our recent questionnaires and already submitted their data to participate in the AfriCaTS Database survey 2019. We are counting on their continuing cooperation and the available data will be treated with high confidentiality and be accessible to all participating centers.

Objectives and goals

Through concerted efforts and good planning, a database for cardiothoracic surgeries performed by both local and foreign cardiac mission teams could be established that will serve as a useful resource for quality improvement including but not limited to the following;

1. Clinical and academic research for improving medical/surgical patient management
2. Working instrument to evaluate the burden of disease

**Figure 1:** Cardiac programs and charity mission-dependent heart centers in Africa.

Light Gray	Dark Gray	Green	Orange	Blue
No Heart Centre available	Independent Centres	Indigenous leadership	Charity mission dependent	Previous expatriate leadership

and to develop strategies for prevention and treatment of cardiovascular diseases and associated morbidities

3. Developing useful guidelines for clinicians and policy-makers to assist with planning appropriate cardiovascular disease prevention and therapy.

Comments

The PASCATS study in 2012 showed a trend that mitral valve repair constitutes only 10% of valve procedures and only 2% of children with congenital heart disease have access to surgery in SSA, yet many of the children are deprived from athrombogenic valve repair procedures, which requires no long-term anticoagulation, promotes somatic linear growth with the repaired valve, event-free postoperative course, and better quality of life [Figure 2]. There is a downward trend in juvenile rheumatic valve surgery from 70% to 20% and an upward trend in congenital heart surgery which constitutes 60%–80% of the surgical load of major centers^[1] [Figure 1]. The relative increase in the congenital heart surgical volume is related to the increased engagements of humanitarian visiting heart teams in SSA.

Table 3: Gross domestic product and health expenditure/capita of countries in sub-Saharan Africa with heart centers (Source: World Bank)

SSA	GDP/capita \$	Health expenditure/capita \$	OHS/year OHS/million
Angola	3472	95.2	na
Cameroon	1526.9	64.47	83
Eritrea	811.4	29.89	3.4/million
Ghana	2202.3	67.51	80
Mozambique	490	19.21	17.8/million
Namibia	5931.5	402.76	115
Tanzania	1050.7	35.5	3.8/million
			124
			4.1/million
			100
			40/million
			158
			2.6/million

GDP: Gross domestic product, OHS: Open heart surgery, SSA: sub-Saharan Africa

The shift in the rheumatic valve surgical volume is related to the intensive and laudable work of the School Health Education Program and UN Millennium Development Goals program for availing the impoverished families more access to antibiotic treatment against rheumatic fever to eradicate rheumatic fever/heart disease (RF/RHD).

The authors of Cape Town Declaration rather advocate disastrous surgical replacement against valve repair in case of surgical treatment for RHD.^[3] Although only patients with acute rheumatic carditis have poor late results. The published data are controversial and unreliable for addressing the state-of-the-art of congenital and rheumatic heart disease in SSA.^[3]

Rheumatic mitral valve repair procedure in children in SSA countries is not popular among most surgeons because of lack of surgical skills (papillary muscle splitting, anterior/posterior mitral leaflet augmentations by autologous pericardium, neochordae, posterior suture annuloplasty, and annuloplasty ring). Intensive tutorial sittings including simulation skill training in rheumatic mitral valve repair should be encouraged and organized by regional hubs for the inexperienced surgeons (training the trainers) like the skill training programs

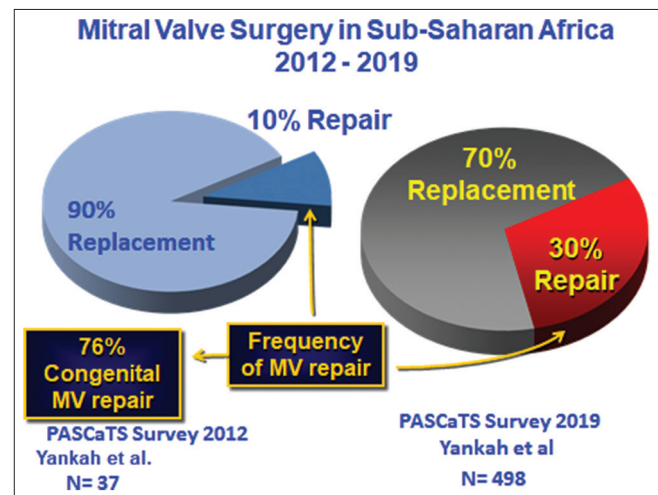


Figure 2: Mitral valve surgery in sub-Saharan Africa 2012–2019. PASCATS: Pan-African Society for Cardiothoracic Surgery.

Table 4: Selected Paediatric Cardiac Programs in Sub-Saharan Africa excl. South Africa.

Country - Sub-region of SSA	LS and CM		Leadership: Local and CM		Nr. local paediatric surgeons/LC	FCM per year/for n years	OHS/year n/million people
	LS	CM	Local	CM			
Cameroon 24.2 million 43% <16 years	1	1	3	1	1/3	4/10	83 3.4/million
Eritrea 4.5 million 42% <16 years	0	3	0	1	0/1	4/28	80 17.8/million
Ghana 30 million 38% <16 years	2	1	1	1	2/2	1/13	115 3.8/million
Mozambique 29.7 million 45% <16 years	2	5	1	5	2/9	3/10	124 4.1/million
Namibia 2.5 million 36% <16 years	2	0	2	0	2/2	0	100 40/million
Tanzania 57.3 million 45% <16 years	1	3	1	3	1/3	3/12	158 2.6/million
Total 147.8 million 41.2% <16 years	9	7	8	11	8/18	12/11.4	660 OHS 4.5/million

Six Countries (population: 147.8 million) with paediatric heart units performed 660 OHS in 2019: 4.5 OHS/million (2019), LS: Local Surgeons, LC: Local cardiologists, CM: Charity Mission, FCM: Frequency of charity missions, OHS: Open heart surgery, n: nr.

Table 5: A summary of cardiology and cardiac surgery capacity in sub-Saharan Africa

Variables	Description
1.107 bn. (2019)	SSA population
43% (43 million)	<15 years old
60% (600 million)	<25 years old
1.9% (0.4%-3.4%)	Prevalence of RHD <25 years old
817,000	Children with RHD requiring surgery
250,000	Children with CHD waiting for surgery
48%	Infant's mortality caused by CHD
70%	Mortality in adults with CHD
1:2, 14 million	Pediatric cardiologist/population ratio
1:25 and 1:14, 3 million	Cardiac surgeon/population ratio
1:33.5 million	Heart center/population ratio
2:1 million	OHS procedures/population ratio
2% (0.5%-3.4%)	Children have access to open heart surgery
63%/24%	CHD/RHD procedures
10/90%	MV repair/replacement ratio

World population 7.424 bn. Africa 1.34 bn. (Source: World Bank 2019), Estimated population of Africa in 2050: 2.25 bn. (Nigeria: 400 million). SSA: sub-Saharan Africa, RHD: Rheumatic heart disease, CHD: Congenital heart disease, OHS: Open heart surgery, MV: Mitral valve

for homograft aortic root reconstruction, transposition of the great arteries switch, Mustard or Ross operations, etc. In Africa, we have witnessed the premature demise of closed mitral valvotomy. Data from AfriCaTS can demonstrate whether closed mitral valvotomy by percutaneous balloon valvotomy and transatrial digital fracture in young patients without significant valvular calcification is a good alternative procedure for treating rheumatic mitral stenosis to save the lives of many children.

RESULTS

213 heart centres from 27 countries of Africa (6 sub-regions: North Africa (including the Maghreb- Algeria, Morocco and Tunisia), East Africa, The Horn, Central Africa, West Africa and Southern Africa) were identified. Of these 75 heart centres including 35 congenital and paediatric cardiac units in sub-Saharan Africa (SSA) excluding South Africa were performing heart procedures independently or with support from visiting charity heart missions. Six selected countries of SSA (population of 147,8 million) with six paediatric cardiac units performed 660 open heart

surgeries (OHS) for congenital and rheumatic heart diseases in 2019 which project a ratio of 4.5 OHS/per million. In comparison to reported PASCATS data from 2014, valve repair has increased from 10-30% and the rate of valve replacement has decreased from 90% to 70%.

CONCLUSION

A well-designed and sustainable survey of cardiac surgical activities in SSA is most desirable. PASCATS has, therefore, responded to this urgent need and challenge and aims at

establishing a database for Africa (AfroCaTS Database) with all the cardiac centers on the African continent. This initiative is a wake-up call for joint efforts to develop South-South cooperation, and heart centers on the continent are invited to participate in this novel AfriCaTS Database Working Group.

The results of the survey would be of great value for both surgeons and patients on the continent, as well as the international cardiothoracic surgical community in pursuit of joint efforts to developing and expanding cardiothoracic surgical practice on the continent.

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Conflicts of interest

There are no conflicts of interest.

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