

**EDITORIAL****Status of Cardiac Care in Sudan: available venues, alternative routes and financial burden.**

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Fawzia came to see me at a morning clinic. She looked in a good shape and mood. I first saw her back in 1982, when she was 16 years old. It turned out, later, that she was suffering from severe mitral stenosis and recurring carditis. The following 5 years would subsequently be the most difficult of her life. She developed endocarditis with ruptured chordae, and was operated on in 1984, by a visiting team of surgeons to Khartoum. She later, also had to undergo an open-heart surgery for mitral valve replacement in Kuwait in 1987. The surgeon who operated on her in Kuwait City was Hani Shuhaibir, a cardiac surgeon who is well remembered by the few patients who are still living with “his” prosthetic valves. Fawzia’s free surgery was offered by the Kuwaiti government and the Bank of Sudan covered the cost of air travel and subsistence.

Today, after thirty years, Fawzia’s prosthetic valve is still in place and functioning normally. With rising rates of coronary heart disease and the unfinished agenda of rheumatic heart disease, the pattern of patients travelling abroad for surgery and to seek medical treatment has remained undiminished, in fact it has dramatically increased throughout the last three decades, as people continue to travel for coronary intervention, coronary artery bypass graft surgery (CABG), valve surgery and correction of congenital abnormalities. Some patients receive government support through referrals by Sudan National Medical Commission (SNMC), while others travel abroad because they can afford the cost or have no trust in the local health providers and resources. And for some of the patients it is more of a tradition rather than a necessity. Complicating matters even more, some government departments, at one time, were contracting with hospitals abroad to care for their staff.

All would agree that the available resources cannot meet the expanding demand created by the increasing rates of cardiovascular disease (CVD), and despite the recent “reinforcements” cardiac services remain highly stretched and scarce. In this article, we intend to appraise the current issue of cardiac care, including the available venues and the alternative routes for treatment abroad.

The enormity of the burden of heart disease requiring intervention and surgery has been discussed before [1, 2]. Currently, the average prevalence of rheumatic heart disease (RHD) in Sudan is 20-30/1000, meaning that there are currently 600,000 patients who are afflicted by one type or another of the disease. The situation is also more complicated as children account for nearly 40% of the total load of RHD and the prevalence in rural communities reaches 60/1000 [3]. These figures unveil astounding backlog and burden of disease that await attendance. Most patients with RHD end up with chronic valvular disease requiring either percutaneous trans-mitral commissurotomy (PTMC) for single valve such as pliable mitral stenosis, or more complex surgery for single or multivalvular disease in the majority of patients. It is estimated that there are more than 300,000 patients with chronic valvular disease, who will require surgery during the next five years (extrapolated from the present statistical data). In 2016, the total cases of patients

with RHD who underwent valve replacement for single or multivalvular disease in both government and private hospitals was 786 and 98 received PTMC [4].

Coronary heart disease (CHD) is emerging as a main cause of CVD and heart failure reaching 20-30 % of the total. During 2016, the available data from all the country shows that; 585 of patients underwent coronary artery bypass grafting (CABG), 1377 had percutaneous intervention (PCI) in the form of single or multiple stents and 4694 had diagnostic catheterization. In the area of pediatrics 245 had pediatric surgery and intervention [4]. This data is pooled from Ahmed Gasim, Al Shaab, Sudan Heart Center, Medani Heart Center, Mac Nimir center and the private heart units in Zaytouna, Mawada, Risala and Faisal Hospitals. The data includes only the patients who received government financial support (Unified Treatment Scheme), other patients who paid their own treatment expenses are not included in this list, but may amount to 15-20% of the figures above.

<b>STATES</b>	Total Population in thousands	Population % of Sudan Population	Population % of Sudan Population	Available cardiac Setup/ number of Catheterization Laboratories.
Northern	699	1.8		3
River Nile	1120	2.9	4.7	
Red Sea	1396	3.6		0,0
Gedarif	1348	3.4	11.6	
Kassala	1789	4.6		
Khartoum	5274	13.5	13.5	CL 6+(7) OR 3+ (1)
Gezira	3575	11.6	17.2	CL 1 OR 1
White Nile	1730	5.6		
Sinnar	1285	4.1	6.8	0,0
Blue Nile	0832	2.7		
Kordofan North	2920	9.4	13.9	0,0
Kordofan South	1406	4.5		
Darfur North	2113	6.8		0,0
Darfur West	1308	4.2	21.5	
Darfur South	4093	10.5		

CL = cardiac catheterization Laboratories. OR = Operating Room

Table 1: Shows population census figures and the number of CL and operating rooms (OR) in each State of Sudan. (Adapted from Sudan in Figures 2004-2008. Based on Sudan Census 2008)

Manning the whole cardiac service are 17 interventional cardiologists distributed as: 7 in Shaab Hospital, 3 in Ahmed Gasim Center, 4 in Sudan Heart Center, 2 in the private sector, one in the

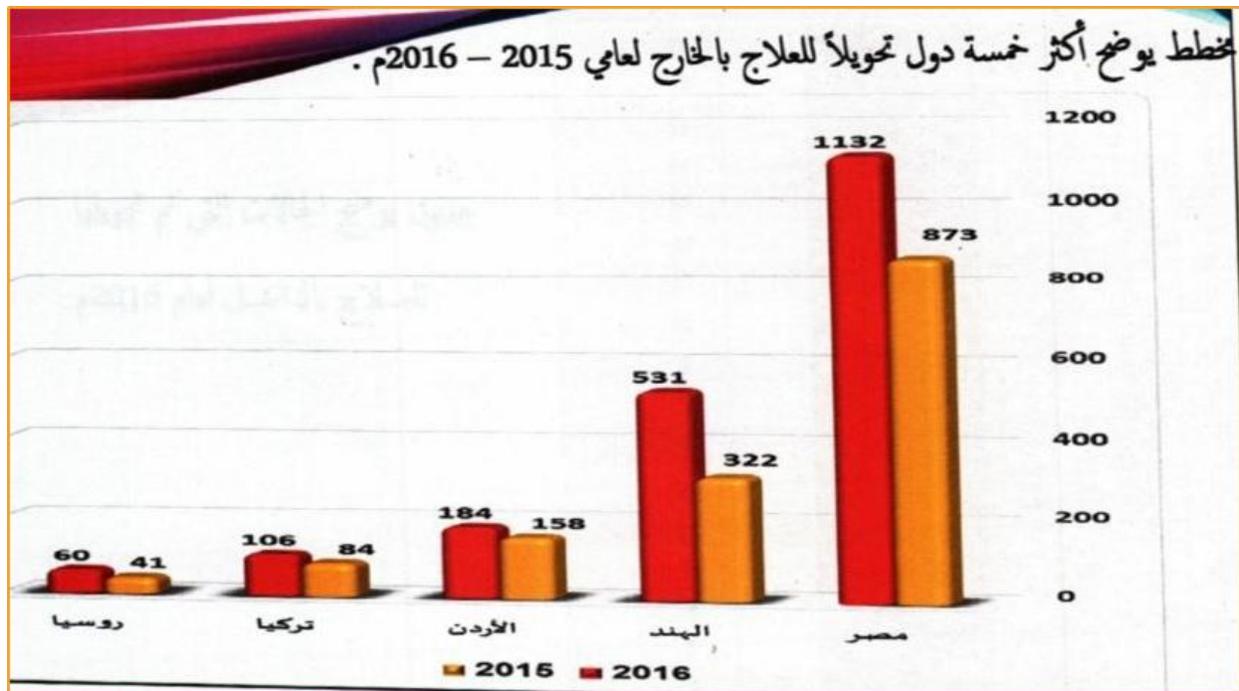
new Omdurman Cardiac Center and one in Wad Medani Heart center. There is presently a total of 11 cardiac surgeons in: Ahmed Gasim Center 4, Shaab Center 3, Sudan Heart Center 2 and Wad Medani Center 1. In Pediatrics cardiology service, there are 3 interventional cardiologists and one pediatric cardiac surgeon at Ahmed Gasim Center. Resource-wise there are: 13 catheterization laboratory (CL) scattered as follows one at Al Shaab Hospital, two at Ahmed Gasim, one in Sudan Heart Center, one in Medani and the new CL at Omdurman. Add to this the new Police Hospital CL and the private CL in Asia, Mawada, alzaytouna, Risala, Faisal and Fedail Hospitals. None of the CLs in Shendi, Atbara and Merowe are functioning at the present time. There are three government operating rooms and two in private hospitals. Table 1, show distribution of CL and operating rooms in Sudan per population.

	Cath Labs	Cardiac Operating Rooms	Adult Interventional Cardiologists	Adult Cardiac Surgeons	Pediatric Interventional Cardiologists	Pediatric Cardiac Surgeon
<b>Shaab Hospital</b>	1	1 <sup>^</sup>	7	3		
<b>Ahmed Gasim Hospital</b>	2	1	3	4	3	1
<b>Sudan Heart Center</b>	1	1	4	2		
<b>Omdurman Cardiac Center</b>	1		1			
<b>Ribat University Hospital</b>	1					
<b>Khartoum Private Sector</b>	6	2	2			
<b>WadMedani Heart Diseases and Surgery Center</b>	1		1	1		
<b>Shendi</b>	1*					
<b>Atbara</b>	1*					
<b>Merowe</b>	1*					
<b>Total</b>	<b>17</b>		<b>17</b>			

Table 2: A summary of resources and specialist staff in Sudan

\*not functioning

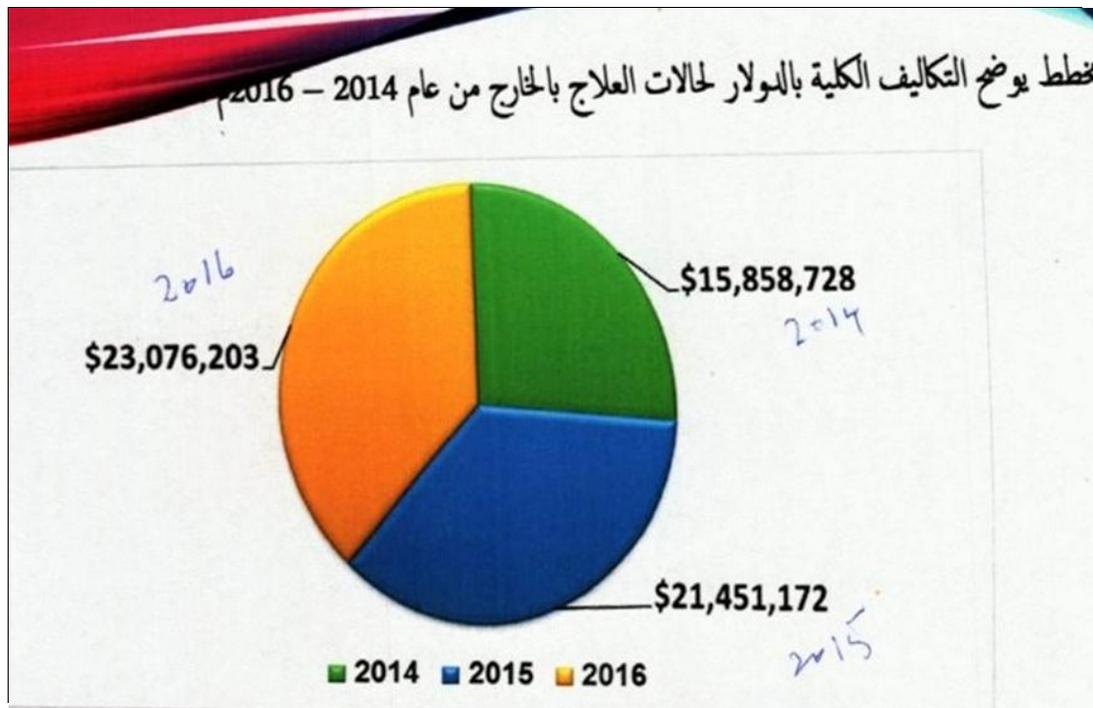
<sup>^</sup>shared with thoracic surgery



**Figure 1: Data from SNMC showing the five countries receiving referred patients.**

The SNMC report for the years 2015-2016 shows a marked increase in patients going for treatment abroad in 2016 compared to 2015 (Figure 1). This is also paralleled by significant increase in money transferred in US dollars (Figure 2). It would be noticed that the foreign transfer amounted to more than 16 million US dollars in 2014, and increased to 21 million by 2015 reaching 23 million dollars in 2016. This is a considerable transfer of hard currency that is badly needed domestically to procure instruments and drugs for the treatment of the rest of the patients with similar conditions.

Most of the patients referred by SNMC go to Egypt (56%), while the rest go to India, Jordan, Turkey and Russia. Another group of patients arrange their own travel to Egypt and Jordan and pay for their treatment from their own resources. This group constitute an additional hard currency transfer. It would therefore be reasonable to calculate that the amount of foreign transfer of money for medical treatment amounts to nearly 40 million US dollar a year.



**Figure 2: Source SNMC. Amount of money transferred per year in the period 2014-2016**

When the above information is appraised, the following findings become strikingly apparent: the burden of cases that need either intervention or surgical treatment is immense and the available services covers only 1-2% of the total load. Consequently, recourse for treatment abroad is adopted by the few who can afford it. Others have to go through SNMC. Both means are done against the loss of large amounts of foreign currency desperately needed to improve the local cardiac service. It follows, therefore, that there is crucial need for improvement and restructuring of the available resources.

1. The present resources are not evenly distributed, while Khartoum State has 13 catheterization laboratories (6 government, 7 private) there are none in the rest of the country except for the CL in Wad Medani and 3 nonfunctioning CLs in the Northern and Nile State. These last two states have population of 4.7% of the total country population compared to Southern Darfur with population of 10.5%. It is, therefore, recommended that the next CLs to be authorized should be in the following cities: Dongola, Port Sudan, Gedarif, Duaim, Obied and Nyala in order to provide an even geographic and demographic distribution of service.
2. Strengthening of the present Cardiothoracic Institute as the number of staff in the interventional and surgical premise is negligible when compared to the load of CVD. Throughout the world cardiac training centers are considered a necessity to train staff in the field of cardiac intervention, surgery, anesthesia, electrophysiological studies (EPS), nuclear medicine, pharmacy and research. The staff should include both medical and paramedical personnel as the need for trained cardiac care nurses, technicians and technologist cannot be overstressed.

3. Creation of improved primary cardiac care and emergency service in the main hospitals throughout all states. This is by simple means e.g. simple coronary care unit, thrombolytic therapy, emergency drugs and appropriate ambulance service. All general physicians are capable of running this service.
4. Ambulance service in Sudan should be better organized e.g. improve easy localization of patient's address, and create ambulance lane or fast tracks to improve movement of ambulance vehicles. With eminent delays expected a doctor should be available on board to administer lifesaving medicine, intubation and DC shock if required. Better still, telecommunication system should be installed to transmit information about the patient and receive help from the receiving center.
5. Patients admitted as an acute emergency and those with chronic valvular RHD should receive treatment free of charge, including surgery and prosthesis.
6. The available service can be largely improved by government centers adopting the strategy of primary PCI which will reduce costs and improve outcome. Interventional cardiologists are doing a great job and it is expected that they will avail themselves to receive calls for Primary PCI throughout the 24 hours of the day. This will reduce mortality, load of waiting cases and improve the flow of work. The finance of such service including pay of cardiologists and CL staff should be met.
7. The concept of private wing for cardiac cases is on its way at Ahmed Gasim Hospital. It is expected that the patient receives care similar to what he gets abroad. This can be done by better physician and nurse care, immediate PCI or surgery. Improvements should extend to the laboratory, pharmacy, housekeeping and the provision of waiting place for patients' relatives. This policy should be applied to all government hospitals with cardiac setup. Implementation of a private wing is simple, possible and will certainly solve the greater part of the problem.
8. If the treatment for heart cases is provided locally a good amount of foreign currency can be saved and used to support the local cardiac service with consequent improvement in the overall outcome.

This report is written with the intension of shedding light into the deficiencies of our present cardiac care service and to suggest some achievable solutions, to that extent one can only hope that the Federal and Khartoum State ministers of health would give it due consideration.

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