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Research Article

The Status of Congenital Heart Defects in Nigeria and Challenges of Surgical Treatment: 6 Year Review

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ABSTRACT

Background: Unlike in developed countries, the delivery of cardiovascular services to patients born with CHD in Nigeria is grossly inadequate. There are problems at both pediatric and adult ages with high morbidity and mortality. We aim to highlight the status of the patients born with CHD, and the challenges of their surgical management.

Materials and Methods: In the last 6 years, Foreign Cardiac Surgery missions were reinstituted at NCTCE/UNTH, Enugu, Nigeria. The participants performed cardiac interventions on a variety of patients with CHD. We performed a retrospective review of this endeavor. Patient demographics, number of patients, age ranges, types of CHD and clinical evaluation methodology were obtained from our hospital information technology department. We assessed the types of cardiac interventions, the outcome and the challenges including the impacts of the foreign cardiac surgery missions.

Results: During the study period, a total of 113 patients with CHD were evaluated. They were 61 males and 52 females with a ratio of 1.2:1. We studied both simple and complex anomalies. The highest age range affected was 1.1-2 years followed by 2.1-3 years. A VSD was the commonest anomaly (n=32, 24.6%), followed by tetraology of Fallot (n=25, 19.2%). One of the commonest challenges is inadequate educational program for the local team.

Conclusion: Large burden of diseases on limited health care resources and lack of trained personnel have made Nigeria to rely on Foreign Cardiac Missions. However inadequate educational program for the local team has created lack of independence of the local to treat CHD after 6 years.

Keywords: Carotid-cutaneous fistula; Emergency endovascular treatment; Life-threatening bleeding; Carotid pseudo-aneurysm; Covered stent-graft; Myocutaneous flap

INTRODUCTION

Congenital Heart disease is a structural or a functional defect in the heart and or proximal blood vessels that are present at birth. The incidence is about 8-10 per 1000 live births across the globe [1]. Geographically, populations may vary from country to country but the incidence has remained constant worldwide [2]. Children born with CHD in developing countries do not have access to adequate care. Such unfortunate Nigerians with CHD face lot of problems including death. There are limited resources both personnel and equipment to deal with increasing number of deaths. There are no country based data for the incidence of CHD birth in Nigeria. However, preliminary data from the National Paediatric Cardiac Registry estimate that about 1,296 children are born with CHD annually in Nigeria [3]. Moreover, in a survey by Chinawa, et al. 71(0.22%) of children with CHD were detected out of 31,795 children evaluated in an out-patient clinic over a 5-year period in a tertiary hospital in southeastern Nigeria [4]. Since a large number of births in Nigeria take place in the villages, mostly unsupervised by a qualified doctor or midwife, the above hospital statistics are unlikely to be truly representative. More extensive multicenter studies have provided a consensus that the incidence of CHD in Nigeria is similar to the world wide estimate of 8 in a thousand live births [5]. The distribution of the anomalies across the country is difficult to estimate. In the tribal inhabitants of parts of the country autopsy is a taboo. Thus determining the distribution of CHD in these areas is impossible.

In Nigeria and other African countries, resources for the management of CHD are overlooked. It is often overshadowed by communicable diseases like malaria, HIV and diarrhea [6].

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Therefore few children with CHD received cardiac interventions *via* medical tourism, which became popular in the country due to poorly funded and badly managed health sector. Few children whose parents had the financial wherewithal were referred to a neighboring country like Ghana and even too far away India. Indeed medical tourism offers relief to few patients. The country lost about eight hundred million dollars through medical tourism in 2013/2014 [7,8].

The first recorded foreign congenital cardiac surgery mission for children in Nigeria was in 2003 [9,10]. Few children with CHD received interventions but the participants were not satisfied owing to poor handling of essential drugs by the local team. Consequently, a period of abeyance occurred. In February 2013, the humanitarian cardiac missions resumed. The program included both children and adult patients. The missions were relatively regular and some cardiac interventions were carried out at NCTCE/UNTH, Ituku-Ozalla, which hitherto was abandoned due to bad military governance, brain drain, nepotism and interpersonal conflict [11]. However, these interventions in our center were largely limited to short term medical missions, not inappropriately nicknamed 'surgical safari' with resultant negative effect of inability of local team to independently undertake any surgical intervention after 6-years [12]*.

MATERIALS AND METHODS

In the last 6 years, February, 2013 to January, 2019, Foreign Cardiac Surgery missions restarted in our center and have performed cardiac interventions on some patients with CHD. Patients' selection for interventions was done by the local cardiologists alongside the local surgeons. Inclusion criteria for intervention after assessment included those whose New York Heart Association criteria were from 1 to 2. Those in stages 3 and 4 were often optimized to convert them to stage 2. Exclusion criteria included advanced stage 4 and those in stages 3 and 4 who fail to convert to 2 after optimization.

Table 1: Age range in years for both male and female.

Serial No.	Age range(years)	Male	Female	Total	Percentage (%)
1	0-1	10	2	12	10.7
2	1.1-2	18	11	29	25.7
3	2.1-3	5	8	13	11.5
4	3.1-4	9	3	12	10.7
5	4.1-5	3	7	10	8.9
6	5.1-6	-	4	4	3.5
7	6.1-7	1	2	3	2.7
8	7.1-8	3	3	6	5.3
9	8.1-9	1	2	3	2.7
10	9.1-10	-	1	1	0.9
11	10.1-11	1	-	1	0.9
12	11.1-12	3	1	4	3.5
13	12.1-13	-	1	1	0.9
14	13.1-14	1	2	3	2.7
15	14.1-15	-	-	-	-
16	15.1-16	1	-	1	0.9
17	16.1-17	-	-	-	-
18	17.1-18	-	-	-	-
19	>18	5	5	10	8.9
Total		61	52	113	100

Table 2: Spectrum of CHD.

S/No.	Types of CHD	Number	Percentages (%)	Remark
1	PDA	16	12.3	Cleft in AML+AR
2	ASD+PAPVD	1	0.08	
3	TOF	25	19.2	
4	PDA+PS+VSD	2	1.5	
5	ASD+cotriatrum dextrum	1	0.08	
6	PAVCD+Cleft AML+TR			
7	VSD	32	24.6	
8	Sv ASD+PAPVD	1	0.08	Clot in LA
9	VSD+ASD+PDA+cleft AMVL	2	1.5	
10	PA+MAPCAS	1	0.08	
11	DORV+large Suba-VSD	1	0.08	
12	PDA+Common Atrium	2	1.5	PDA
13	Mitra atresia+regressed LV+restricted PFO+PAH	1	0.08	
14	Subaortic membrane+LVOTO	4	3.1	
15	Severe TR(absent of both A+P leaflets)	1	0.08	
16	TA type 1	3	2.3	
17	CAVCD	2	1.5	
18	PAVCD+PAH	2	1.5	
19	ASD+PS	3	2.3	
20	TOF+os ASD	2	1.5	
21	PDA+MVS	1	0.08	
22	PDA+subaortic membrane	1		
23	Severe PS+TR+RV thrombus	1	0.08	RV thrombus
24	Os ASD+VSD	3		
25	Large ASD+PS	1	0.08	
26	DORV+hyoplastic LV+malposed GA+severe PS+PDA	1	0.08	
27	Os ASD	14	10.8	Co-triatrum dext
28	VSD+cotriatrum sinistrum	1	0.08	
Total		130	100	

We performed a retrospective review of those patients assessed during the period including those that were offered surgery and other cardiac interventions. Patient demographics, number of patients, age ranges and sex distribution were obtained from our hospital information technology department. Others were types of CHD, clinical evaluation methodology, types of cardiac interventions and outcome. The data were analyzed using Microsoft Excel and presented in percentages using tables.

RESULTS

The ages ranged from 0-1 to 17.1-18 years. Range of 1.1-2 was the highest (n=29, 25.7%), followed by 2.1-3(n=13, 11.5%). The age ranges above 18 years were regarded as untreated congenital heart defects presenting at adult age with (n=10, 8.9%) (Table 1).

This table shows the profiles of CHD encountered during the review. The most common was isolated VSD (n=32, 24.6%), followed

Table 3: Clinical presentations of CHD.

S. No.	Pattern of presentations of patient with CHD	Number	Percentage (%)
1	Failure to thrive/delayed milestones	15	13.16%
2	Cyanosis+/-squatting	5	4.38
3	Dyspnoea on exertion – feeding, etc	17	14.91
4	Paroxysmal nocturnal dyspnoea	2	1.75
5	Orthopnoea	5	4.38
6	Cerebrovascular accident/TIA	3	2.63
7	Leg oedema	13	11.40
8	Clubbing of digits	14	12.28
9	Recurrent chest infections(fever, cough)	25	21.93
10	Palpitations	10	8.88
11	Chest pain	8	7.02
Total		114	100

by TOF (n=25, 19.2%). There were other uncommon complex CHDs as shown in the table. Notably are pulmonary atresia with Major aortic Pulmonary Collaterals (MAPCAS), severe tricuspid regurgitation due to absence of both anterior and posterior leaflets of tricuspid valve, Mitral atresia with regressed Left ventricle and common atrioventricular canal defect. These complex CHD were thought to be nonexistent in Nigeria and indeed other African countries but with advanced technology coupled with expatriate expertise, some are being discovered and treatment offered to them with relatively good outcome (Table 2).

The above symptoms and signs were detected and used in making provisional diagnosis of CHD. They are not specific. Confirmation was usually obtained from echocardiography. The use of neonatal pulse oximetry in conducting deliveries in hospital is currently not obtainable in Nigeria. To this extent critical CHD are missed (Table 3).

Table 4 shows the types of CHD, the types of surgical interventions and the outcome. The outcome in the simple CHD appeared excellent unlike the complex types whose outcome is below 50th percentile. The overall outcome is (n=66, 81.5%), while in hospital mortality was (n=15, 8.5%). The out of the hospital mortality is difficult to estimate as some of them were lost to follow up. Of the 354 patients with CHD evaluated, only 113(31.9%) received surgical interventions.

DISCUSSION

Few other medical disciplines have required for their development the degree of daring courage, tenacity, and drive that characterized the efforts of early pioneers in the field of congenital cardiac surgery. Only a century ago, Theodore Billroth publicly condemned the dream of cardiac surgical interventions by stating that "any surgeon who wishes to preserve the respect of his colleagues would never attempt to operate on the heart" [13]. Over the last 6 decades, the specialty of pediatric cardiac surgery has evolved from a heroic effort with occasional success into a consolidated, sophisticated specialty with excellent outcome [13].

Table 4: Types of intracardiac/extracardiac repair for the CHD.

S. No.	Types of CHD	Types of repair	Percentage(%) outcome
1	PDA	PDA ligation with prolene and Silk sutures	1 died, 1 taken(aneurismal) taken to Italy for repair, 95% outcome
2	ASD	Closure with a pericardial patch/direct suture closure	100% outcome
3	VSD	Bovine pericardial Patch closure of the defect	82% outcome
4	TOF	Closure of VSD with a patch+infundibulotom/ infundibulectomy	45% outcome
5	Truncus Arteriosus(TA)	VSD closure+Pericardial conduit from RV to PA(2 patients); PAB(1 patient)	33% outcome
6	Co-triatrium dextrum+sextrum	Resection of the membrane	!00% outcome
7	Partial AVCD	Repair of the defect with a patch/direct suture closure	100% outcome
8	ASD+VSD	Patch closure of both VSD and ASD	100% outcome
	Complete AVCD	ASD+VSD closure+construction of R- and L-AV valve from available leaflets (2 patients); PAB(2patients).	50% oucome
9	Ruptured sinus of Vasalva Aneurysm to RV	Suture closure of the defect	100% outcome
10	Congenital absence of posterior+Anterior leaflets o tricuspid valve	Creation of artificial leaflets using pericardium	100% outcme
11	Double Outlet Right ventricle(DORV)	1 received total correction, the other Modified Blalock-Taussig Shunt(MBTS)	50% outcome, one awaits definitive treatment.
12	DORV+hyoplastic LV+malposed GA+severe PS+PDA	BDG(1st stage), Complete Fontan operation(2nd stage).	0% outcome
13	Mitral atresia+regressed LV+restricted PFO+PAH	BDG(1st stage), Complete Fontan operation(2nd stage)	0% outcome
14	PAVCD+Cleft AML+TR	ASD closure+repair of the cleft in AML	100% outcome
15	Sv ASD+PAPVD	ASD closure+baffling of RPV to LA	100% outcome
16	Pulmonary atresia with MAPCAS	Unifocalisation	0% outcome

The large strides made in the developed regions of the world in diagnostic accuracy and surgical catheter interventional management of complex CHD have not been replicated in Nigeria in particular and other African countries in general [14,15].

In low economic countries like Nigeria, the status of CHD is far

from desirable. The National Peadiatric Care Registry revealed that about 1,296 children are born with CHD in Nigeria annually [3], but this did not capture those born in rural areas without access to hospitals for appropriate diagnosis and documentation. Thus, an estimated figure of about 24,000 children is born with CHD in Nigeria annually. According to local studies, few of them are detected in the hospital setting and many of these children die due to lack of treatment [16,17].

Subsequently children born with CHD especially the critical ones died untreated and at times undiagnosed. Few of them however benefited by way of medical tourism to Ghana, Sudan, Egypt and India [18]. However, by 2013, another foreign cardiac surgery program started and this time it focused on both children and adults. Data from this mission revealed that in children and adults with CHD, the prevalence has been found to be dramatically higher than that observed in Sudan [19]. In our study the age of the patients treated ranged from 0-17 years to 18 years and above for the pediatric and adult CHDs respectively. In a similar study, Sadoh, et al. found 81.7% of patients with CHD to be <2 to 10 years and 6.9% among those above 10 years [18,20]. In Cameroun, 13.1% patients with suspected pathologies aged between 2 months and 41 years (mean 10±9 years) during a 4 year study period [21]. A survey conducted in Mozambique provided the prevalence rate of CHD in the general population of public school children in Maputo. 5 out of 2,170 with a prevalence of 2.3 in 1000, of which 80 were newly diagnosed [22].

In addition, data from Northern Nigeria (Northwest, Northeast, and North central geopolitical zones), showed that 1,312 patients aged between 9 days to 30 years had an abnormal echocardiogram, 122(9.3%), demonstrating CHD [23]. In this study, almost all types of CHD were represented with VSD topping the list of simple or common CHD (24.6%) and are closely followed by TOF (19.2%). Complex CHD like truncus arteriosus type 1, Common Atrioventricular Defect (CAVCD) and partial AVCD were managed more than once while the rest of other complex CHD like Pulmonary atresia with MAPCAS, severe pulmonary stenosis with tricuspid regurgitation with right ventricular thrombus and double outlet ventricle(DORV) with hypoplastic left ventricle with malposed great arteries, appeared in single (Table 2). The status of CHD in Nigeria is now known. We confirmed that in a similar study in Nigeria, the predominant lesions noted were VSD and TOF among acyanotic and cyanotic CHD respectively [24]. However, in our study and in others, critical congenital heart defects such as left sided obstructive lesions were rare, suggesting the poor survival of affected children. This finding suggests that Likelihood that the data available underestimate the true prevalence of CHD in Nigeria [15]. In this study, all the patients received traditional open surgical intervention despite the availability of Cardiac catheterization equipment [23]. This is because at the initial stage of the missions UPS (a protective electrical device) was not available to run the machine and also of the fact many of the visiting cardiac mission teams did not come with personnel with requisite skills in interventional technique. In similar work done in Croatia, Novick, et al. stated that International Children Heart Foundation (ICHF) interventional cardiologist was involved in training the local cardiologists during the 10-year International pediatric Cardiac Assistance in Croatia [22,25].

Nigeria like other sub-Saharan African countries is plagued with little or no cardiovascular surgical care for patients with CHD. Congenital Cardiac Missions recently offered relief to patients with CHD. However, in 2013, groups from North America and Western Europe embarked on congenital cardiac surgical missions. Prior then very few patients with CHD benefited from medical tourism. The cardiac missions mainly led by Nigerians in diaspora with the exception of Cardiostat international and NovicK Cardiac Alliance (1-2 missions in 6 years) focused on surgical safari with little or no education for the local team, not realizing that the ultimate success is not measured by number of successful operations of their missions but by the successful operations that the local team performs after their departure. Thus after 6 years, despite the total number of 113 patients treated, the local team is still incapable of independent existence.

The challenges of managing CHD by foreign cardiac surgery missions can be divided into five types, *viz*: 1. late presentation of patients, 2. Many patients to attend to in a limited period of time, 3. Inaccurate diagnosis of cases prior their visits due to the limited knowledge of the local team as well as nonavailability of the requisite equipment. 4. Poor postoperative management especially in cases with eventful and prolonged postoperative course, again due to the absent requisite skills from the local team to deal with them upon the departure of the visiting teams [12]. Lack of coordinated educational program for the local team makes it impossible for the local team to independently undertake congenital cardiac surgery after 6 years. These congenital cardiac missions led by Nigerians in diaspora focused on surgical safari making independence of the local team impossible.

CONCLUSION

The status of CHD in Nigeria calls for urgent attention from government including public spirited individuals, nongovernmental organizations and international Agencies. A properly structured pediatric cardiac program will bring the problems of CHD patients in Nigeria to a manageable size. While the International cardiac Surgery missions are providing some relief, their efforts are definitely not enough. They should in addition do more on educational program of the local team, who will in turn expand and take care of greater number of patients.

What is known about the topic?

1. Nigerians with CHD face a lot of problems, one of which is untimely death.
2. There are limited resources, both personnel and equipment to deal with the increasing number of CHDs.
3. Medical tourism offers relief to few patients.

What are new about the topic?

1. The status of CHD in Nigeria is now known.
2. Congenital cardiac missions recently offered relief to patients with CHD.
3. The congenital cardiac missions led by Nigerians in diaspora focused on surgical safari, making independence of local team impossible.

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AUTHORSHIP

Nwafor IA analyzed the data and wrote the manuscript

Eze JC edited the manuscript

Osemobor K collected the data

CONFLICT OF INTEREST

There is no conflict of interest whatsoever.

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