Profile and Outcome of Congenital Heart Disease in Buea, South West Region of Cameroon: A Cross-Sectional Study

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Abstract

Background: Congenital Heart Disease (CHD) is a major cause of morbidity and mortality in children. There is scarcity of data on the profile and outcome of CHD in children in semi-urban settings in Cameroon.

Methods: A retrospective cross-sectional study was conducted from June 2016 to June 2021. The echocardiographic register was reviewed and outcome was examined.

Results: 77 children were diagnosed with a definite congenital heart disease. There were 44 (57.1%) females. The median age was 4 months (IQR: 1.5-24). The most common indications for echocardiography were murmur (45.5%), cyanosis (16.9%) and cardiomegaly (10.4%) on chest X-ray. The most common CHD was isolated ventricular septal defect in 23 (29.9%) children followed by Tetralogy of Fallot in 10 (13.0%) and patent ductus arteriosus 10 (13.0%) children. Out of the 77 cases diagnosed, only 9 (11.7%) underwent complete surgery correction in France via non-governmental organizations. The others cases (68/77) were either not eligible for surgery (17/77) or needed financial support (51/77).

Conclusion: The most common CHD was ventricular septal defect and only about 1 out of 10 children with CHD underwent surgery, with all surgeries done abroad.

Keywords: Congenital Heart Disease; Neonatal Risk Factors; Out Patient Department; Pregnancy; Neonatal

Introduction

Globally, considerable progress has been made to promote child survival and millions of children born today have better survival than in 1990s, with worldwide mortality rates falling to 39 per 1,000 live births in 2017 compared to 93 per 1,000 live births in 1990 [1,2]. It is estimated that in the period between 2000 and 2017, an annual reduction in child mortality rates of 4.2% was registered in sub-Saharan Africa [1,2]. This was possible largely due to considerable investments in public health interventions targeting common childhood illnesses such as vaccination programs, treatment of infectious diseases and ensuring access to clean water and sanitation among others. However, the story for children born with Congenital Heart Disease [CHD] is different [1,3]. Congenital heart disease is defined as an abnormality in the circulatory structure or function, which is either present at birth or detected much later in life [4-6]. Worldwide, CHD are the main heart diseases found in children and constitute one of the major causes of infant mortality, particularly in developing countries [7-9]. The prevalence of CHD is shaped by a wide variety of maternal, foetal and neonatal risk factors,
along with the rates of prenatal diagnosis and terminations of pregnancy, all of which have geographic variability. Epidemiology data availability from Low-and-Middle-Income Countries (LMIC) on CHD prevalence, morbidity and mortality are far more limited than from high income countries [10]. Despite advances in detection and treatment, congenital heart diseases account for 3% of all infant deaths and 46% of deaths from congenital malformations in developed countries such as the USA [7]. The situation is even worse for those living in Low- and Middle-Income countries, the majority of population cannot afford health care services. These regions depend entirely on the availability of public health funding to finance and support their healthcare [4].

To better appreciate the situation in Cameroon where there are limited data on the prevalence and management of congenital heart diseases, we aimed to determine the prevalence, profile and outcome of CHD in Buea, a semi-urban setting in Cameroon.

Methods

Study design
A hospital-based retrospective cross-sectional study was conducted in the South-West (Buea Regional Hospital) of Cameroon from June 2016 to June 2021. At the paediatrics Out-Patient-Department (OPD), following clinical evaluation patient aged 0-17 years in whom we suspected a congenital heart defect and were requested to do a cardiac ultrasound. The reports of cardiac ultrasound were noted in the echocardiographic register.

Study setting
In Cameroon, the health care landscape is structured according to three levels (central, intermediate and peripheral). Compared to peripheral level facilities, Intermediate level facilities (3rd category hospitals: regional hospitals and equivalent) provide specialized services (Internal medicine specialities: Cardiology unit). The site enrolled for the study is a 3rd category hospital in the South-west region (Buea Regional hospital) of Cameroon. This hospital which serves as teaching hospital is the reference cardiac unit of public hospital in the South west region. The hospital has a well experienced cardiologist and the only paediatrician in the region with cardiology as subspecialty.

Study population
It consisted of patients aged 0-17 years suspected to have a congenital heart defect for whom diagnostic echocardiography was done for the first time at Buea regional Hospital during the study period. We excluded patients who were referred from other structures with an ultrasound diagnosis of heart disease already available and who refused to be re-evaluated by paediatrician.

At Buea Regional Hospital, we use a SonoScape S8 portable echocardiograph designed in a new powerful lightweight architecture to meet all the high-performance application requirements. The same operator performs all echocardiograms, all transthoracic in TM-mode, two-dimensional, pulsed Doppler, continuous and colour. All diagnosis was based on standard criteria.

Data collection
Data were collected from registers at OPD and registers of heart ultrasonography at the cardiology department. All participants aged 0-17 years suspected to have a congenital heart defect and who had a report of a cardiac ultrasound were enrolled. The register of echocardiography had records of the exam numbers with: exam date, patient name, age, sex, indications of the echocardiography, ultrasound diagnosis. The data of patients diagnosed with congenital heart disease were transcribed to a register of paediatric heart disease. For the purposes of this study, congenital heart diseases will be classified as cyanotic and acyanotic congenital heart diseases.

Ethical considerations
This study was approved by the ethics committee of the Buea Regional Hospital. Data was anonymized and data entry in an encrypted database on a password-protected computer and non-maleficence was respected.

Statistical analysis
The data were entered into Excel and then transcribed in SPSS version 21. Continuous variables were expressed as median with Interquartile Range (IQR) and categorical variables as percentages. P-values <0.05 were considered significant.
Results

General characteristics
A total of 210 children were enrolled during the study period. Of these 36.6% [n=77] were diagnosed with a definite diagnosis of Congenital Heart Disease (CHD) and the rest were normal (63.4% [n=133]). Females represented 57.1% [n = 44] cases with CHD. The median age at diagnosis for patient with CHD was 4 months ([IQR] [1.5-24] months). Neonates comprised only 11.7% of cases at initial diagnosis, with infants representing most cases at 54.5% [n = 42], (Table 1).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, Female</td>
<td>44 (57.1%)</td>
</tr>
<tr>
<td>Median age at diagnosis (IQR), months</td>
<td>4 (1.5-24)</td>
</tr>
<tr>
<td>Age Category at initial diagnosis</td>
<td></td>
</tr>
<tr>
<td>Neonates (0-28 days)</td>
<td>9 (11.7%)</td>
</tr>
<tr>
<td>Infants (1-12 months)</td>
<td>42 (54.5%)</td>
</tr>
<tr>
<td>Young child (1-5 years)</td>
<td>18 (23.4%)</td>
</tr>
<tr>
<td>Older child (6-17 years)</td>
<td>8 (10.4%)</td>
</tr>
<tr>
<td>CHD type</td>
<td></td>
</tr>
<tr>
<td>Acyanotic CHD</td>
<td>58 (75.3%)</td>
</tr>
<tr>
<td>Cyanotic CHD</td>
<td>19 (24.7%)</td>
</tr>
</tbody>
</table>

Table 1: Baseline Characteristics in patients with CHD, total N= 77.

Indications of Echocardiography and Types of CHD
The most common indications for cardiac ultrasound were heart murmurs (45.5%), cyanosis (16.9%) and cardiomegaly (10.4%) confirmed by Chest X-rays (Table 2).

<table>
<thead>
<tr>
<th>Indications</th>
<th>N (percentage of total CHD n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murmur</td>
<td>35 (45.5%)</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>13 (16.9%)</td>
</tr>
<tr>
<td>Cardiomegaly</td>
<td>8 (10.4%)</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>6 (7.8%)</td>
</tr>
<tr>
<td>Palpitation</td>
<td>3 (3.9%)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Infections</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Others</td>
<td>9 (11.6%)</td>
</tr>
</tbody>
</table>

Note: Others included indications such as syncope, fatigue, rapid breathing, feeding difficulties.

Table 2: Distribution of Indications for cardiac ultrasound (Electrocardiogram).

The commonest CHD was isolated ventricular septal defect in 29.9% [n=23] of cases (Table 3), followed by Tetralogy of Fallot (TOF) in 13% [n =10] and Patent Ductus Arteriosus (PDA) in 13% [n =10].

Acyanotic CHD represented 75.3% of all cases of CHD. Ventricular Septal Defect (VSD) represented the commonest (Table 4), followed by Patent Ductus Arteriosus (PDA) and Atrial septal defect in 11.7% [n =9] of CHD cases. The commonest cyanotic CHD seen was Tetralogy of Fallot (TOF) in 13% [n =10] of CHD cases (Table 5), followed by pulmonary atresia in 5.2% [n =4] and transposition of great vessels in 2.6% [n =2].
<table>
<thead>
<tr>
<th>Types of lesions</th>
<th>N (percentage of total CHD n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular Septal Defect (VSD)</td>
<td>23 (29.9%)</td>
</tr>
<tr>
<td>Patent Ductus Arteriosus (PDA)</td>
<td>10 (13.0%)</td>
</tr>
<tr>
<td>Atrial Septal Defects (ASD)</td>
<td>9 (11.7%)</td>
</tr>
<tr>
<td>Atrioventricular Septal Defects (AVSD)</td>
<td>8 (10.3%)</td>
</tr>
<tr>
<td>Pulmonary Stenosis (PS)</td>
<td>5 (6.5%)</td>
</tr>
<tr>
<td>Aortic Stenosis (AS)</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Mitral Stenosis (MS)</td>
<td>1 (1.3%)</td>
</tr>
</tbody>
</table>

Table 3: Distribution of cases of CHD.

<table>
<thead>
<tr>
<th>Types of lesions</th>
<th>N (percentage of total CHD n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetralogy of Fallot (TOF)</td>
<td>10 (13.0%)</td>
</tr>
<tr>
<td>Pulmonary Atresia (PA)</td>
<td>4 (5.2%)</td>
</tr>
<tr>
<td>Transposition of Great Vessels (TGV)</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Persistent pulmonary hypertension of the new-born</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Tricuspid Atresia (TA)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Unique left ventricle</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Total Anomalous pulmonary vascular return</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Truncus arteriosus</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

Table 4: Distribution of acyanotic CHD.

<table>
<thead>
<tr>
<th>Types of lesions</th>
<th>N (percentage of total CHD n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary atresia</td>
<td>4 (5.2%)</td>
</tr>
<tr>
<td>Transposition of great vessels</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Aortic stenosis</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Tricuspid Atresia</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Persistent pulmonary hypertension of the new-born</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Mitral stenosis</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Unique left ventricle</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Truncus arteriosus</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Coarctation of the Aorta</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

Table 5: Distribution of cyanotic CHD.

Outcomes
Following clinical evaluation, all CHD cases needed interventions. Out of 77 cases only 11.7% \[n =9\] underwent surgical correction out of the country (in France). Following deeper paraclinical investigations, many cases \[22.1%; n =17\] were not compatibles for surgical corrections (Eisenmenger syndrome and hypertensive diseases, Down syndrome), others \[66.2%; n =51\] needed financial support but were not compatible with criteria requested by NGOs.

Discussion
In this study, our objective was to determine the prevalence, profile and outcome of CHD in Buea, a semi-urban setting in Cameroon. When then found that 36.6% \(77\) of children were diagnosed with a definite congenital heart disease; we identified heart murmur \(45.5\%) and isolated ventricular septal defect respectively as the most common indications for echocardiography and the most common type of CHD. Out of the 77 cases of CHD diagnosed, 9 (11.7%) underwent complete surgery correction.

Although much efforts have been done already in the world to reduce the mortality of children under 5 years, to attain the second target of the 3rd sustainable development goals by 2030, which is to end all preventable deaths under 5 years of age, multifocal strategies should be established. In multifocal approach, all the aspects worsening children mortality should be controlled. CHD have impacted children life and are non-negligible caused of infant mortality.

In this study, we have characterized the profile of CHD in a referral hospital in the south west Cameroon. At the Buea Regional Hospital 210 suspected cases of CHD (children aged from 0-17 years old) were seen and following the
echocardiograph report, the prevalence of CHD36.6% \( [n =77] \) in our study was lower than a study reported by Namuyonga, et al. [11]. Observed in Uganda heart institute (Kampala) and likely reflects the lower level of care in our setting compare to Uganda heart institute which is a more specialised centre.

The median age at diagnosis of 4 months seen in this study is similar to the study reported by Namuyonga, et al. and is substantially shorter than the study done by Aliku, et al., in the northern Uganda [1,11]. These findings of delayed CHD diagnosis in the northern Uganda likely reflects poor screening at lower-level of health facilities.

Like in most others studies, among the congenital abnormalities, Acyanotic heart diseases were the commonest at 75.3% \( [n =23] \) with VSD as the commonest type of CHD similar to what have been found in other studies [1,4,8,12,13]. After VSD, the commonest CHD was PDA at 13% \( [n =10] \) similar to other studies, followed by ASD in 11.7% \( [n =9] \) of cases of CHD. Among cyanotic heart diseases, TOF was the predominant at 13% \( [n =10] \) all children with heart diseases [1,11,12]. This is similar to most studies [1,11,12]. This was followed by pulmonary atresia and others hear lesions.

Following clinical examinations, the commonest indications of heart ultrasound was heart murmurs 45.5% \( [n =35] \) similar to Chelo, et al. [8]. This finding could be explained by the fact that most CHD have heart signs. After heart murmurs, the commonest indications were cyanosis 16.9% \( [n =13] \) and cardiomegaly on X-rays 10.4% \( [n =8] \).

In this study all participants needed surgical interventions and only 11.7% \( [n =9] \) of those were able to access the definitive therapy for CHD benefited from surgical corrections in France. This was similar to the study reported by Aliku, et al., an explanation this is the low socioeconomic index of the population in developing countries [1]. This study highlights the huge need for a high standard cardiac centre in the south west region of Cameroon specifically and in Cameroon generally for patients with hearts diseases. Adding to that a well-trained team.

**Conclusion**

CHD represent a burden in child’s disease in Cameroon; most cases are underdiagnosed and discovered late in stage of complications. Heart ultrasound is an important diagnosis tool, cost-effective and non-invasive technique to diagnose CHD. There are few possibilities of surgical management of cases in our settle therefore much to be done locally from the training of health personnel for the early detection of CHD to the availability and affordability of technical platform for surgical correction.

**Conflict of Interest**

The authors have no conflict of interest to declare.

**References**


