

Cardiac Echography in Pediatrics at the Regional Hospital of Diourbel: Indication and Result

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Abstract

Childhood heart disease is a real public health problem. In our contexts, care remains a major challenge. Doppler echocardiography remains the essential examination for diagnosis. The objective of our study was to describe the different clinical indications for cardiac ultrasound in children and the main pediatric heart diseases at the Diourbel Heinrich Lübke Regional Hospital. This was a descriptive and analytical retrospective study spanning from 2020 to 2022; covering a series of 140 cases. The study was carried out using patient clinical observation sheets and consultation sheets. We identified 140 ultrasounds. The average age of patients was 35.96 months with extremes of 0.03 months and 192 months. The female sex was predominant, with an M/F sex ratio of 0.72. Ultrasound was systematically requested in 67.14% of the study population. The indications found were mainly: heart murmur, polymalformative syndrome, respiratory failure, bronchiolitis, cardiomegaly, suspicion of heart disease, cardiomegaly, pre-therapeutic and pre-operative assessment. A total of 71 cardiac abnormalities were found in 65 patients, *i.e.* a prevalence of 46.42%. Congenital heart disease was more frequent (found in 49 patients, a prevalence of 35%) and was dominated by the CIA. There was a female predominance in almost all heart diseases except in the case of endocarditis where codominance is found. Our study has made it possible, through echocardiography, to evaluate the indications for echocardiography in children, to determine the prevalence of heart disease in children and also to assess the relevance of requests for echocardiography.

Keywords

Echocardiography, Pediatrics, Indications, Diourbel

1. Introduction

Childhood heart disease is a real public health problem. In our contexts, care remains a major challenge linked to the low socio-economic level of the populations and the insufficiency of suitable technical platforms. Doppler echocardiography remains the essential examination for diagnosis. In the pediatric population, these heart diseases can be congenital or acquired. Congenital heart disease accounts for approximately one third of child malformations [1]. Acquired heart disease, which is significantly less frequent, accounts for 29% of heart disease in children [2]. In Senegal The hospital prevalence according to the studies of Basse, Fall and Sow were respectively 8.7; 2.4 and 10.6 per 1000 [3]. This high prevalence is a worrying public health problem. In sub-Saharan Africa, particularly in Senegal, despite progress in care, we encounter many difficulties, including the delay in the diagnosis of heart disease, with the major consequence of the arrival of patients at the stages of complications. Efforts have been made especially in Dakar in urban areas with the presence of the CUOMO centre, but the problem still remains in rural areas; In the pediatric department of the Diourbel Heinrich Lübke Regional Hospital, that's to say in a rural environment, the constraints of a cardiologist specializing in pediatric and congenital cardiology as well as the difficulty of access to pediatric echocardiography (probe pediatrics) are encountered every day. No study has yet been carried out on heart disease in children. We deemed it necessary to carry out some in this context, the objectives of which were to evaluate the epidemiology of heart disease in the pediatric population and to specify the clinical situations in children motivating a request for an echocardiography examination.

2. Methodology

This is a retrospective descriptive and analytical study carried out during the period from April 1, 2020 to February 28, 2022 in the pediatric department of the Diourbel regional hospital center which is a level II public health establishment. Echocardiograms were performed by a pediatrician trained in pediatric cardiology. We used a 6 MHz cardiac probe on a Vivid 5 device equipped with pulsed, continuous and color Doppler. We included in this study all patients aged from 0 days to 16 years of life, received for the realization of a cardiac ultrasound in the context of suspicion, evaluation or follow-up of a heart disease. We excluded all patients whose information on the reasons for requesting an echocardiography examination was not well specified. The input mask was created on epi info and the questionnaires (appendices) were completed using data from the files as well as the consultation sheets. For each patient, the following parameters were studied: socio-demographic aspects: age, sex; Doppler echocardiography: indications and results. After data entry on sphinx, data processing and analysis were carried out using EPI INFO, EXCEL and SPSS. The significance threshold was retained for a p-value < 0.05 (Chi-square test). We performed a univariate and bivariate analysis.

3. Results

During the study period, 140 echocardiographic examinations were performed in as many children. Echocardiography was requested systematically in 67.14% of cases and allowed the detection of 71 cases of heart disease in children. Congenital heart disease was found in 49 patients, *i.e.* a prevalence of 35%, rheumatic valve disease was found in 10 patients, *i.e.* 7.14%. Cardiomyopathies were found in 6 patients, *i.e.* 4.29% (**Table 1**). The average age of the study population was 35.96 months with a median age of 7 months and extremes [0.03 months to 192 months]. Patients aged 1 to 30 months represented 49.29% of the study population. The sex ratio was 0.72 and 0.63 for congenital heart disease. **Table 2** gives the distribution of cases according to the echocardiography indication(s) and according to age groups. The heart murmur was the subject of 20.71% (29 cases) of the requests for cardiac ultrasound examination. It was more common in the age group [1 - 30 months] with 17 cases. Cardiac ultrasound was performed in 12 patients (8.57%) for bronchiolitis; cyanosis was the reason for requesting echocardiography in 6 children (4.28%). Heart failure had been the subject of 8 requests for echocardiography, *i.e.* 5.7% of cases and all of them were pathological; cardiomegaly had the same number but only 62% of echocardiograms came back pathological. Of the 29 echocardiograms performed for a

Table 1. Distribution of heart disease cases.

Characteristics of heart disease	Number	Percentage
Congenital heart disease	49	35
→ Cyanotic congenital heart disease	12	24.49
→ PAH	24	48.98
→ Complex congenital heart disease	6	12.24
→ Repercussions on the cardiac cavities	19	38.78
→ impaired heart function	11	22.45
Rheumatic valve disease	10	7.14
→ Valve disease with cardiac repercussions	7	70
→ heart function not preserved	2	20
Cardiomyopathy	6	4.29
→ Dilated cardiomyopathy	3	50
→ Hypertrophic cardiomyopathy	3	50
Pericarditis	4	2.86
→ Pericarditis with effusion without signs of tamponade	4	100
Endocarditis	2	1.43
→ Endocarditis of mitral origin	1	50
→ Pulmonary endocarditis	1	50

Table 2. Distribution of cases according to the indication(s) and according to age groups

Directions for ultrasound	Age range (months)				Total	Percent- age %
	<1	[1 - 30]]30 - 60]	>60		
Heart murmurs	4	17	2	6	29	20.71%
Heart disease	4	11	1	5	21	15%
Suspicion of heart disease	4	9	0	1	14	10%
Heart disease monitoring	0	1	1	4	6	4.28%
Poly malformation syndrome (T21)	7	7	0	1	15	10.71%
Bronchiolitis	0	12	0	0	12	8.57%
Respiratory distress	7	3	1	0	11	7.86%
Preoperative assessment	2	3	4	0	9	6.43%
Malformative poly assessment	3	5	0	0	8	5.71%
Dyspnea	0	3	0	5	8	5.71%
Cardiomegaly	2	5	1	0	8	5.71%
Acute articular rheumatism	0	0	1	5	6	4.28%
Cyanosis	1	4	0	1	6	4.28%
Global heart failure	1	3	0	1	5	3.57%
Chest pain	0	0	0	3	3	2.14%
Sickle cell disease	0	0	0	2	2	1.42%
Right heart failure	0	0	1	1	2	1.42%
Omphalocele	0	1	0	0	1	0.71%
Tachycardia	0	0	1	0	1	0.71%
left heart failure	0	0	1	0	1	0.71%
Low birth weight	1	0	0	0	1	0.71%
PAH	0	0	0	1	1	0.71%
PAH monitoring	0	0	0	1	1	0.71%
Ischemic stroke	0	0	0	1	1	0.71%
Auscultatory arrhythmia	0	0	1	0	1	0.71%

heart murmur, 17 came back pathological, for bronchiolitis 11 out of the 12 cases came back normal. All cardiac ultrasounds requested in the face of cyanosis came back pathological except for one (Table 3). Echocardiography revealed 49 cases of congenital heart disease with 58 nosological entities. (Table 4) gives the nosological distribution of cases of congenital heart disease by sex, showed that interatrial communications (ASD) were the most represented with 16 cases (27.58%) including 12 in women and 4 in men. male sex, followed by interventricular communications (VID) with 12 cases (20.68%) with a codominance according to sex. Persistence of the arterial duct (PAD) accounted for 9 cases

Table 3. Distribution of cases according to the main indications and their results.

Indications	Normal result	Pathological results
Heart murmur	12	17
Polymalformative syndrome	9	15
Respiratory failure	11	7
Bronchiolitis	11	1
Cardiomegaly	3	5
Congenital heart disease suspected	9	5
Preoperative assessment	7	2
Heart failure	0	8
Cyanosis	1	5

Table 4. Nosological distribution of heart disease cases.

Type of heart disease	Sex		Total	Percentage %
	F	M		
Mitral atresia	1	0	1	1.72%
Bicuspid aortic valve	1	0	1	1.72%
AVC	4	1	5	8.62%
ASD	12	4	16	27.58%
VID	6	6	12	20.68%
Dextrocardia	0	1	1	1.72%
Persistent oval foramen	1	0	1	1.72%
PAD	7	2	9	15.51%
Pulmonary stenosis	1	2	3	5.17%
T4F	2	3	5	8.62%
Transposition of the great vessels	1	0	1	1.72%
Double outlet right ventricle	0	2	2	3.44%
Single ventricle	0	1	1	1.72%
Total	36	22	58	100%

Indications	Findings conclusive of heart disease
Heart murmur	Congenital heart disease (17.24%) p-value = 0.27 Rheumatic valve disease (6.9%) p-value = 0.95
Cyanosis	Tetralogy of fallop (83.33%) p-value = 0.00001
Polymalformative syndrome	ASD (26.67%) p-value = 0.07 VID (13.33%) p-value = 0.48

Continued

	PAD (38.46%) p-value = 0.009
Heart failure	Cardiomyopathy (100%) p-value = 0.000000001
Tachycardia	Cardiomyopathy (40%) p-value = 0.0005
Acute articular rheumatism	Heart valve disease (4.35%) p-value = 0.37

(15.51%) including 7 cases in girls, tetralogy of Fallot (T4F) with 5 cases (8.62%) and complete atrioventricular canal (AVC) in 5 cases (8.62%). The nosological distribution of cases of rheumatic valvulopathies according to sex showed that mitral insufficiency (MI) was the most represented with 9 cases (50%) including 7 cases in girls, followed by aortic insufficiency (IAo) with 5 cases (27.77%) including 4 cases in girls, aortic stenosis and tricuspid insufficiency (TI) each represented 2 cases (11.11%). We did not find a statistically significant association between heart murmur and congenital heart disease or rheumatic valve disease. Cyanosis and tetralogy of fallot are closely related with a p-value = 0.00001. As for polymalformative syndrome, it is significantly associated with PAD but not with other heart diseases. A very significant link with a p-value = 0.000000001 was found between heart failure and cardiomyopathy. The latter was also associated with tachycardia.

4. Discussion

The average age in our study was 35.96 months. Infants represented 49.29% of this number and newborns 20%. These results are comparable with many studies carried out in Senegal and in Africa in general. Sow [3], the majority of these patients were less than one year old (44.6%), Abena [4] and Cloarec [5] 70% of cases were between 0 and 2 years old.

The majority of the TOURE series in Mali consisted of children under one year old and estimated at 39.83% [6]. The average age was relatively homogeneous in all the African series, whereas it is lower in certain developed countries [7]. This is explained by the fact that in our countries the diagnosis is made when complications appear, in particular pulmonary complications, which lead the parents to a pediatric consultation.

The sex ratio of 0.72 showed a female predominance compared to the analysis of DIOP [8] which noted a sex ratio of 1.11 and BAH [9] 1.07 in favor of boys. Leye [10], Mbodj [11] and Diakhate [12] showed a female predominance. In all these series, we did not find a direct relationship between sex and heart disease.

The heart murmur posed the indication of 29 echocardiographies or 20.71% of cases. It was the reason for 32.14% of echocardiograms performed by the Togouma team in Burkina Faso [2]. The murmur is also at the forefront of indications in Kinda's study, these results could be explained by the fact that the murmur is an almost constant sign in congenital heart disease in children [13].

One out of ten echocardiograms was prescribed for suspected congenital heart

disease and mainly in the 0 - 30 month age group. She was guided by functional signs dominated by dyspnea and physical signs: heart murmur and cyanosis. In Nigeria, out of 65 echocardiograms performed [14], the suspicion of congenital heart disease was the most frequent (61.5%), representing almost 10 times what was found in our series with, however, a much smaller population. In 42 children, *i.e.* 56% of normal ultrasounds, the request was systematic, that is to say in front of a clinical anomaly. These systematic indications were mainly seen in the age group [0 - 30 months]. These results can be superimposed on those of Mor [15] as well as in the study by Kinda in 2016 [13]. The non-systematic indications on the other hand were found almost in the age groups and the result was normal in 71% of the cases. This could be explained by the difficulty of the clinical examination of the child in particular cardiac auscultation, and also reflects the exaggerated requests for echocardiography sometimes without taking into account the clinical state. Indeed we identified during our study, 8 requests for echocardiography without any clinical orientation also the echocardiographies are requested with very little information, as an indication take the example of the breaths, none of them was characterized and yet this is the most common indication. All this suggests that there would be a lack of control of the situations indicating echocardiography. However, the difficulty, especially in young children, particularly in the 0 - 5 year age group, of differentiating between the signs pointing to cardiac damage and those of respiratory damage should be taken into consideration. To this end, other clinical elements must be able to be incorporated, such as pulse oximetry. All these arguments must be based on a good clinical semiology. At the Abidjan Cardiological Institute, 95.3% of requests were deemed appropriate, inappropriate in 3.2% and uncertain in 1.6%. In the group of inappropriate indications, the patients were significantly younger, the examinations were more often normal [16]. Nearly Seventy-two percent of non-routine requests were normal. This confirms the fact that the request for an echocardiographic examination must be guided by a clinical orientation. Study echocardiograms were performed by a pediatrician with training in pediatric and congenital cardiology and extensive experience in the diagnosis of pediatric heart disease. This makes the observed results reliable.

The difficulties encountered were poorly informed ultrasound reports, which really prevented us from highlighting certain epidemiological aspects.

5. Conclusion

Our study has confirmed the essential role of echocardiography in the diagnosis of heart disease in children, while also identifying the relationship between the main indications and the existence of heart disease.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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