

Ventricular Septal Defects at the Souro Sanou University Hospital Center (CHUSS): Ultrasound, Therapeutic and Evolutionary Aspects of 88 Cases

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How to cite this paper: Tougouma, S.J.-B., Sombie, O., Barro, M., Bama, A., Kinda, G., Sidibé, S. and Nacro, B. (2018) Ventricular Septal Defects at the Souro Sanou University Hospital Center (CHUSS): Ultrasound, Therapeutic and Evolutionary Aspects of 88 Cases. *World Journal of Cardiovascular Diseases*, 8, 403-410. <https://doi.org/10.4236/wjcd.2018.88039>

Received: June 7, 2018

Accepted: August 12, 2018

Published: August 15, 2018

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Abstract

Background: There is a need for data on epidemiological, clinical and therapeutic aspects of ventricular septal defect among children in Sub-Saharan Africa. **Objective:** The aim of this study was to determine the prevalence, epidemiological, echocardiographic, therapeutic and evolutionary aspects of ventricular septal defects (VSD) in the pediatric department of the University Hospital Center (CHUSS) of Bobo-Dioulasso. **Methods:** This study was a descriptive cross-sectional study, conducted from November 2013 to December 2016. All children aged 1 to 179 months seen at the pediatric consultation in CHUSS were included. CIV was confirmed with Doppler echocardiography. **Results:** Out of 36,240 children who received consultation in the pediatric ward of CHUSS during the study period, one hundred (100) cases of them had congenital heart disease representing a hospital prevalence of 2.76%. This was diagnosed with Doppler echocardiography. Of these, 88% were VSD isolated or associated with other cardiac malformations. Isolated form was reported in 54.3% of cases. The average age at diagnosis was 39.6 months. The sex ratio was 1.05. Perimembranous topography and hemodynamic type 2 were the highest, representing 56.8% and 35.2% respectively. The indication for surgical repair was recommended for 81.8% of the cases, but only 9.7% of these cases benefited from cardiac surgery. The rest were

for medicalcare with a high proportion of lost to follow-up (48.9%). **Conclusion:** VSD is the most common congenital heart disease. Its care is mainly surgical. This cardiac surgery is non-existent in Burkina Faso. The design of multidisciplinary strategies associated with an optimization of the means of the countries of Sub-Saharan Africa could improve the management of this cardiopathy.

Keywords

Ventricular Septal Defect, Congenital Heart Disease, Echocardiography, Burkina Faso

1. Introduction

Congenital heart disease is a real public health problem. Indeed their frequency is estimated globally at 5% - 8% of live births [1]; which corresponds to 40% of all fetal malformations. They cause 50% of deaths related to all malformations [2]. Ventricular septal defects (VSD) accounts for 30% of these malformations and is particularly serious because of its anatomical and hemodynamic polymorphism [3]. VSD has been reported to be the most common congenital heart disease in many countries with a frequency of 32.3% and 27.2% in the United States of America and Burkina Faso respectively [4] [5]. This work has been done to better define the anatomical and hemodynamic profile as well as the therapeutic and evolutionary modalities of VSD in the context of our country with limited resources; to optimize its support.

2. Methods

This study was a cross-sectional descriptive study that ran from November 2013 to December 2016 in the pediatric department of the Souro Sanou University Hospital Center (CHUSS) in Bobo-Dioulasso. This period coincided with the installation of Doppler echocardiography in the CHUSS. The study population consisted of all children from 1 to 179 months who were received at the Pediatrics Department of the hospital. Those with suspected congenital heart disease had Doppler echocardiography performed for them by a cardio pediatrician. The examinations were standardized and the reports were written and archived in real time. A 5 MHz cardiac probe on an Aloka Prosound 4000 Plus device with pulsed, continuous and color Doppler was used.

All cases of VSD isolated or in combination with other malformations that have been identified. Isolated VSDs were classified according to the classification of Nadas based on the size of the shunt and on the pulmonary blood flow [6]. Aspects associated with other malformations, as well as sociodemographic, clinical, therapeutic and evolutionary data were extracted from clinical records. The socioeconomic level of the child's family was defined according

to the parents' occupation which is an indicator of their monthly incomes. These socioeconomic level are: High (upper-level management and liberal professions), Middle (middle managers) and Low (farm workers, housewife etc.) [7]. The Epi data 3.4.1 software was used for the statistical analysis of the data.

3. Results

3.1. Prevalence of VSD

Out of 36,240 children seen at the pediatric ward of CHUSS during the study period, one hundred (100) cases of congenital heart disease were diagnosed with a hospital prevalence of 2.76‰. Of these cases, 88% of the congenital heart defects were VSD isolated or associated with other cardiac malformations.

3.2. Sociodemographic Characteristics of Children with VSD

The mean age was 39.6 months. The age group of 1 - 12 months was the highest, representing 44.3% of the cases. The sex ratio m/f was 1.05. The majority of children lived in urban areas (64.7%) and the low socio-economic level of parents was predominant (Table 1).

3.3. Anatomical and Hemodynamic Aspects of VSDs

Isolated VSD was the highest number of cases, representing (54.3%). Of these, type 2 hemodynamic form was the most common, representing 64.5% of cases; and that of type 3 was found in 4 children (4.5% of cases). The VSD was predominantly single (97.7%), perimembranous localization (56.8%). Ten cases of VSD 2a (10.4%) were complicated by aortic insufficiency resulting in Laubry's and Pezzi's syndrome. Table 2(a) and Table 2(b) give us the distribution of VSD according to the anatomical forms.

The form associated with other cardiac malformations was dominated by T4F (26.1% of cases). The other associated malformations are summarized in Table 3.

3.4. Therapeutic and Evolutionary Aspects of VSDs

The indication of surgical repair was asked in 72 patients, 81.8% of the cases. Those who had cardiac surgery were 7 (9.7% of cases). Thirteen (13) children were hospitalized during the study period with a maximum of 3 hospitalizations per child, representing a hospitalization rate of 1.5%. The most common reasons for hospitalization were cardiac decompensation (45.7%) and infectious endocarditis (14.3%). The mean duration of hospitalization was 6.7 days \pm 5.2. Four (4) patients died of respiratory complications, 43 (48.8%) were lost to follow-up and 7 (7%, 9%) were waiting for cardiac surgery (Table 4).

4. Discussion

Only children with suspected congenital heart disease had benefited from

Table 1. Distribution according to socio-demographic and economic characteristics of the 88 children having VSD; CHUSS, Bobo-Dioulasso, November 2013 to December 2016.

Variables	Characteristics	Number of children	Percentage (%)
Sex	M	45	51.1
	F	43	48.9
	Total	88	100.0
Age at echocardiographic diagnosis (in months)	<1	2	2.2
	1 - 12	39	44.3
	13 - 59	26	29.6
	60 - 120	14	15.9
	>120	7	8.0
	Total	88	100.0
Level of schooling	Preschool	39	44.3
	Primary	3	3.4
	Secondary	1	1.1
	No schooling	2	2.3
	Not specified	43	48.9
	Total	88	100.0
Residence	Urban	57	64.7
	Rural	11	12.5
	Semi-urban	10	11.4
	Not specified	10	11.4
	Total	88	100.0
Socio-economic level	Low	48	54.5
	Middle	27	30.7
	High	3	3.4
	Unspecified	10	11.4
	Total	88	100.0

Table 2. (a) Distribution of VSDs according to the anatomical forms (number of VSD) of the 88 children carrying VICs; CHUSS, Bobo-Dioulasso, November 2013 to December 2016; (b) Distribution of VSDs according to the anatomical forms (VSD size) of the 88 children carrying VICs; CHUSS, Bobo-Dioulasso, November 2013 to December 2016.

(a)

Number of VSD	Location				Total (%)
	Perimembranous	Infundibular	Admission	Trabecular	
Unique	50	30	6	0	97.7
Multiple	0	0	0	2	2.3
Total (%)	56.8	34.1	6.8	2.3	100

(b)

VSD Size	Location				Total (%)
	Perimembranous	Infundibular	Admission	Trabecular	
Small	14	00	00	02	18.2
Large	36	30	06	00	81.8
Total (%)	56.8	34.1	6.8	2.3	100

Table 3. Distribution according to hemodynamic forms of isolated VSD and forms associated with other cardiac malformations of 88 children with VSD; CHUSS, Bobo-Dioulasso, November 2013 to December 2016.

Form	Type	Frequency	Percentage (%)	Total (%)
Isolated	1	10	11.4	54.3
	2 _a	16	18.2	
	2 _b	15	17.0	
	3	04	4.5	
	4	03	3.4	
Associated	T4F	23	26.1	45.7
	CAV	11	12.5	
	TAC	04	4.5	
	SP open septum	1	1.1	
	TGV	1	1.1	
Total		88	100	

T4F = Tetralogy of Fallot; CAV = Atrioventricular canal; TAC = Common arterial trunk; SP = Pulmonary stenosis; TGV = Transposition of the great vessels.

Table 4. Distribution of 88 children with VSD according to evolutionary aspects; CHUSS, Bobo-Dioulasso, November 2013 to December 2016.

Evolution	Frequency	Percentage (%)	
Stabilised	26	29.6	
Evacuated	Surgical repair	7	7.9
	No surgical repair	1	1.1
Deceased	4	4.5	
Waiting for evacuation	7	7.9	
Lost to follow-up	43	48.9	
Total	88	100.0	

Doppler echocardiography for confirmation of the VSD. There is a risk of underestimation of VSD prevalence due to this information bias. The study was a cross sectional hospital-based study. The sample of children included may not accurately reflect the general population of children. This selection bias reduces the generalizability of our results. Despite these limitations, our study is the first

to report on hospital prevalence and the echocardiographic, therapeutic and evolutionary aspects of VSDs in a resource-poor country such as Burkina Faso.

Our study reports a low prevalence of 2.76‰ of congenital heart disease in children 1 to 176 months in a hospital. This prevalence is significantly lower than that reported by most of the African authors which varies from 4.8‰ to 9.8‰ [8] [9] [10] [11]. It could be explained by an underestimation of the cases because only those who had a suspicion of heart disease and who had echocardiographic confirmation were taken into account in our study. There is still no data on the overall prevalence of congenital heart disease in hospitals in Burkina Faso. It is therefore necessary to conduct new studies in the general population to better understand the weight of these pathologies in our contexts.

VSD accounted for 88% of congenital heart defects in our series, confirming its high frequency as documented in the literature [1] [12] [13] [14]. Our proportion, higher than the averages of other countries, could be explained by the clinical characteristics of the CIV. Indeed the presence of a heart murmur as the main clinical sign of the VSD motivates more the demand for echo cardiac by pediatricians and or general practitioners for VSD compared to other congenital heart diseases that are clinically less obvious. This result indicates the need for better training of doctors and the institution in our countries of prenatal echocardiographic screening, which is currently non-existent.

The age of discovery of VSD was relatively high in our study with greater than 5 years for 23.8% of patients. This could be explained by the delay in the consultation of multifactorial causes (ignorance, poverty, use of traditional therapy) (**Figure 1**). These late discoveries are of a formidable prognosis when one knows the evolutionary potential of the VSD towards pulmonary obstructive vascular disease. Since March 2016, with a view to reducing maternal and infant mortality in Burkina Faso, the Ministry of Health has set up health insurance to provide free health care for children under 5 years and pregnant women. This measure should eventually improve access to child care to enable early diagnosis of VSDs.

In terms of hemodynamics, type 2a and 2b CIVs were the most recovered with 64.5% as in other African studies [5] [14]. This high frequency could be explained by the noisy symptomatology of VSD at these stages motivating consultation at baseline levels.

The surgical indication was asked in 81.8 of the cases, but only seven (9.7%) received corrective surgery outside the country thanks to the support of sponsoring organizations. This finding of powerlessness is reported by all African studies, which report a proportion of operated cases varying between 0% and 21% [5] [14] [15] [16]. This situation could be explained by the lack of a cardiac surgery center in Burkina Faso and the impossibility for the country to carry out this surgery outside the country at an excessively high cost. This highlights the urgency of setting up pediatric cardiac surgery services in our sub-region to make this vital service more accessible.

We reported a high proportion of lost to follow-up (48.9%) in our study. This situation, with dramatic consequences, could be explained by lack of adequate



Figure 1. Infant of 6 months carrying a VSD IIb Scarifications on the chest and abdomen to get the disease out: multiple amulets to ward off bad luck.

care, the high cost of medical care, and the ignorance of our populations. The lack of a conventional medical response to parents' requests leads them to turn to traditional medicine in our setting (**Figure 1**). Rapid access to cardiac surgery and universal health insurance could reverse this trend.

5. Conclusion

VSD is the most frequently diagnosed cardiac malformation at CHUSS in Bobo-Dioulasso. It is characterized by a late discovery and insufficiency of surgical management rendering uncertainty and the vital prognosis of children having this congenital heart disease. The design of multidisciplinary strategies associated with pooling resources of Sub-Saharan African countries could improve the management of this heart disease.

Conflicts of Interest

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

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