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# Congenital Heart Disease in Rural Senegal: A Retrospective Study of 79 Patients

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## Abstract

**Introduction:** Congenital heart disease (CHD) is a malformation of the heart present at birth and resulting from a developmental defect during embryonic life. The aim was to assess CHD in rural areas. **Methodology:** This is a retrospective study conducted over a period of 2 years in rural Senegal. **Results:** During the study period, we collected 79 patients with CHD, representing a hospital prevalence of 2.6%. The mean age at diagnosis was 17.05 months and the sex ratio was 1.19. The mean birth weight was 2826 g. The main comorbidities were anaemia (54.43%) and respiratory infections 38 cases (48.10%). Respiratory distress was the most common sign with 98.73%. Radiological cardiomegaly was noted in 86.7%. The most frequent CHD were interventricular septal defect (IVD) 21.51% and atrial septal defect (ASD) 8.86%. No patient was able to receive surgical treatment. Seven children died (8.86%) and 21 children were lost to follow-up (26.58%). On Doppler echocardiography, 16.45% of the patients had pulmonary arterial hypertension (PAH). **Conclusion:** In light of this work, emphasis should be placed on the quality of antenatal consultations, the quality of management and the regular availability of echocardiography and a cardio-paediatrician in order to reduce morbidity and mortality.

## Keywords

Heart, Disease, Congenital, Children, Senegal

## 1. Introduction

Congenital heart disease (CHD) is the most common congenital malformation in children (20.7% of all malformations in children) and is the leading

cause of malformational mortality in children [1] [2]. For a long time, CHD has been under-diagnosed in Africa due to the weakness of the technical platform. In Senegal, most of the data come from studies carried out in reference centres. A study conducted in 2019 showed a hospital prevalence of 2.6% [3]. There is no data in rural areas, which is a limitation for assessing prevalence at national level. Thus, the overall objective of this study was to assess CHD in rural areas.

## 2. Methodology

This study was conducted in the city of Touba, which is located in the western third of Senegal, 193 km from the capital. It is the second largest city in Senegal in terms of population and demographic boom. The setting was the level 1 public facility (EPS1) of Ndamatou. It polarises 2 health districts, 3 health centres and 45 health posts. The paediatrics and neonatology department attached to the maternity ward receives all newborns born in the facility or coming from peripheral centres. The care of newborns and children is provided by a team consisting of a paediatrician and general practitioners. This is a retrospective study including all children aged 0 - 15 years with CHD diagnosed on cardiac ultrasound and hospitalised during a two-year period (from 1er February 2018 to 28 November 2021). Sociodemographic, clinical, paraclinical, therapeutic and evolutionary data were collected on the basis of a survey form from the hospitalization records of the paediatric department. After the data collection, we proceeded to the coding of the information and then, an entry was made on the Microsoft Excel 2010 software. To determine the general characteristics of our population, we proceeded with a descriptive analysis of our variables by determining their frequency and their average.

## 3. Results

### 3.1. Socio-Demographic Data

During our study period, 4880 children were hospitalised, of whom 79 had CHD, giving a hospital prevalence of 2.6%. The mean age was 17.05 months [extremes 0 and 120 months]. Seven patients or 34.17% were under 6 months of age. Of the 79 children, 43 were boys (54.4%) and 36 were girls (45.5%), giving a sex ratio of 1.19. The socio-economic level of the families was considered low in 68%, medium in 29% and high in 3% of cases.

### 3.2. Medical History

The average age of the mothers was 19.7 years [extremes 18 and 44 years]. Only 6.32% of the women had made 4 antenatal visits (ANC) during the pregnancy. No cases of antenatal diagnosis were recorded. The average birth weight was 2826 g [extremes 1175 g and 4400 g]. Two cases (2) of congenital heart disease were diagnosed in the siblings. Parental consanguinity was present in 67.6% of the cases, 17.39% in the first degree and 65.21% in the second degree.

### 3.3. Clinical Data

The main circumstances of discovery were feeding difficulties during feeds in 62 cases (78.48%) and poor weight gain in 55 cases (69.62%). Severe acute malnutrition was found in 21.51% and moderate in 16.83%. Seventy five percent (60.75%) of the patients were underweight and only one case was obese. Twenty-four children (31%) had severe hypoxia on admission with oxygen saturation (SpO2) of 80% or less. Respiratory signs were dominated by respiratory distress (98.73%), crepitus (63.29%), and ronchi (45.56%). Trisomy 21 was found in 15 cases (18.98%). Among the patients, three (3) had a digestive malformation and ten (10) had a thoracic deformity, including one case of pectus excavatum and nine cases of non-typical thoracic deformation. The main comorbidities were anaemia in 43 cases (54.43%), respiratory infections in 38 cases (48.10%) and 5 cases of cerebral palsy (6.32%).

### 3.4. Radiological and Ultrasound Data

Chest X-rays were taken in 76 children (96.20% of cases). Cardiomegaly was found in 68 children (86.07%). Ultrasonographically, non-cyanogenic CCs were most frequent in 50 patients (63.29%). Ventricular septal defect (VSD) was found in 17 patients (21.51%), atrial septal defect (ASD) in 7 patients (8.86%), patent ductus arteriosus (DA) in 4 patients (5.06%), pulmonary stenosis in 13 patients (16.45%) and pulmonary atresia in 2.53% of cases. Concerning cyanotic CC, 15.18% of patients had transposition of vessels, 10.12% had single ventricle and 6.32% had tetralogy of Fallot. The different types of CHD are shown in **Table 1**.

### 3.5. Therapeutic and Evolutionary Data

The main drug treatments for heart failure during hospitalisation were diuretics in 89.87%, oxygen therapy in 87.34% and ACE inhibitors in 24.05% of cases (**Table 2**). The main complications observed were: PAH in 13 patients (16.45%), heart failure in 46 patients (58.22%), cardiogenic shock in 5 patients (6.32%). During hospitalisation, 13 cases of nosocomial infection (16.45%) and 7 deaths (8.86%) were reported. Forty-six (58.22%) of the patients were in cardiac decompensation, 36.70% (30 cases) in acute malnutrition and 24.05% (19 cases) in severe anemia.

## 4. Discussion

In our study, the hospital prevalence of CHD was 2.6%. The Kinda study [4] in Niger reported a hospital prevalence of 0.98%. In Europe, the overall prevalence was 8 per 1000 births between 2000 and 2005 [5]. The prevalence of CHD seems to be increasing over the years due in part to better identification, with the contribution of new exploration techniques, in particular Doppler echocardiography. This is amply demonstrated by the study of Diop [6] who found in 2007 a prevalence of 3.6 per 1000 children hospitalised at the Hôpital Principale de Dakar

**Table 1.** Distribution of patients by type of congenital heart disease CC.

| Type of CC | Workforce | % |
|---|---|---|
| Isolated ventricular septal defect (VSD) | 17 | 21.51 |
| Isolated inter-atrial communication (IAC) | 07 | 8.86 |
| Isolated patent ductus arteriosus (PCA) | 04 | 5.06 |
| Atrioventricular canal (AVC) | 06 | 7.59 |
| CIV + CIA | 08 | 10.12 |
| VIC + PCA | 04 | 5.06 |
| CIV + CIA + PCA | 04 | 5.06 |
| Lung stenosis | 13 | 16.45 |
| Pulmonary atresia | 02 | 2.53 |
| Hypoplastic left heart | 01 | 1.26 |
| Tricuspid atresia | 01 | 1.26 |
| Tetralogy of Fallot | 05 | 6.32 |
| Single Ventricle | 08 | 10.12 |
| Transposition of large vessels | 12 | 15.18 |
| Dextrocardia | 07 | 8.86 |
| Other | 04 | 5.06 |

**Table 2.** Distribution of patients by treatment modality.

| Treatment | Workforce | % |
|---|---|---|
| Diuretic | 71 | 89.87 |
| Oxygen therapy | 69 | 87.34 |
| Enzyme conversion inhibitor IEC | 19 | 24.05 |
| Digitalique | 03 | 3.79 |
| Beta-blocker | 06 | 7.59 |
| Sildenafil | 01 | 1.26 |
| Dobutamine | 01 | 1.26 |
| Adrenalin | 05 | 6.32 |
| Surgery | 00 | 00 |

and the study of Bodian *et al.* [7] in 2015 with a prevalence of 8.9 per 1000 children in a school setting in Dakar. Nevertheless, in Africa, the limitation of both material and human resources means that congenital heart disease is under-diagnosed and drowned in rheumatic heart disease. In our series, the average age at diagnosis was 17.05 months. A study carried out in 2003 by Ndiaye found an average age of 16 months [8]. On the other hand, DIOP, in 2007, reported an average age at diagnosis of 8.8 months [6]. This difference in age could

be related to a delay in diagnosis. In our series, there was a male predominance with a sex ratio of 1.19. This overall male predominance has been found in most series in the literature [3] [9]. Socio-cultural realities are often different between urban, semi-urban and rural settings. In our study, the socio-economic level of the families was considered low in 68% of cases. This low socio-economic level is one of the factors that hinder the diagnosis and management of CHD. Dupuis *et al.* reported a high frequency of CHD in communities with a higher rate of parental consanguinity [10]. In our regions, consanguineous marriages are frequent. According to the Ministry of Health of Senegal, consanguinity in Senegal concerns 43.02% of households [11]. Parental consanguinity was associated with a two- to three-fold increase in the risk of congenital heart disease in several studies [3]. In our study, parental consanguinity was found in 67.6% of cases. Keyndou [12] identified parental consanguinity in 54.2% of patients. It was less frequent in the study by Touré [13] with 25.6% of cases and by Diop [6] with 42.5% of cases. Concerning antenatal diagnosis, no cases were revealed as well as in Hamdy's study [14]. This could be explained by the low rate of obstetrical ultrasound. Indeed, obstetrical ultrasound remains the only way to detect CHD in the antenatal period and is therefore the reference examination [15]. In our study 86.07% of the patients had cardiomegaly on chest radiography. These results are different from those of Daou where cardiomegaly represented 31.37% of cases [16]. IVC, IAC and PCA are the most frequent CHD in our series. These results are much lower than those of Nyobé Abe'e [17], with 31.9% of perimembranous VIC, DA with 29.8%, CIA with 23.4%. However, the study by Clorec *et al.* [18] found in their series a VIC in 64.8% of cases, a DA in 4.2% of cases and a tetralogy of Fallot in 3.9% of cases. Among the other CHD, tetralogy of Fallot was found in 6.32% of cases in our series. This compares with the study by Ngom [3] where two patients or 2.1% had tetralogy of Fallot. In our series no patient had undergone surgical cure. In our regions the number of patients benefiting from surgery remains very low. The number of patients having benefited from surgery remains very low compared to western countries where more than 80% are operated [19]. Indeed, authors in underdeveloped countries report a surgical cure of 11% to 26% [20]. These difficulties are linked to a very high cost for middle and low income families, especially when it comes to transferring children to Europe to undergo the cure.

## 5. Conclusion

In light of this work, emphasis should be placed on the quality of antenatal consultations, the quality of management and the regular availability of echocardiography and a cardio-paediatrician in order to reduce morbidity and mortality.

## Conflicts of Interest

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

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