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Epidemiological profile, clinical presentation, and mortality risk factors of congenital heart disease in infants under 3 months in Senegal: A retrospective cohort study

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Abstract: *Introduction:* Congenital heart diseases (CHD) represent a major public health challenge in sub-Saharan Africa, where mortality remains high due to delayed diagnosis and limited access to interventional care[1,2]. Recent data from Senegal are scarce. This study aimed to describe the profile and identify mortality risk factors for CHD in infants under 3 months of age in a national reference center.
Methods: A retrospective, descriptive, and analytical study was conducted from January 1, 2023, to December 31, 2024, at the CHNEAR. All newborns and infants under 3 months with an echocardiography-confirmed CHD were included. Data were analyzed using SPSS v.30. Risk factors for death were identified by logistic regression.
Results: Out of 1007 admissions, 73 patients were included (hospital prevalence: 7.2%). Prenatal diagnosis concerned 6.8% of cases. The mean age at admission was 21 days, and 56.2% were malnourished. Atrioventricular septal defect (21.9%) was the most frequent CHD. In-hospital mortality was 43.8%. In multivariate analysis, cyanotic heart disease (OR = 5.2; 95% CI: 1.7-16.0) and severe malnutrition at admission (OR = 3.8; 95% CI: 1.3-11.2) were independent factors associated with death.
Conclusion: This study reveals a very high, largely preventable, in-hospital mortality from CHD. The urgent strengthening of systematic neonatal screening, early nutritional management, and access to pediatric cardiac surgery is imperative to improve survival.

Keywords: Congenital Heart Disease; Newborn; In-hospital Mortality; Risk Factors; Senegal.

Résumé: *Introduction:* Les cardiopathies congénitales (CC) constituent un problème majeur de santé publique en Afrique subsaharienne, où la mortalité demeure élevée en raison d'un diagnostic tardif et d'un accès limité aux soins spécialisés et interventionnels. Les données récentes au Sénégal restent limitées. Cette étude visait à décrire le profil épidémiologique et clinique des cardiopathies congénitales, ainsi qu'à identifier les facteurs de risque de mortalité chez les nourrissons âgés de moins de trois mois dans un centre national de référence.
Méthodes: Il s'agissait d'une étude rétrospective, descriptive et analytique menée du 1er janvier 2023 au 31 décembre 2024 au Centre Hospitalier National d'Enfants Albert Royer (CHNEAR). Ont été inclus tous les nouveau-nés et nourrissons de moins de trois mois présentant une cardiopathie congénitale confirmée à l'échocardiographie. Les données ont été analysées à l'aide du logiciel SPSS version 30. Les facteurs associés au décès ont été identifiés par régression logistique.

Résultats: Parmi 1007 admissions, 73 patients ont été inclus, soit une prévalence hospitalière de 7,2 %. Le diagnostic prénatal ne concernait que 6,8 % des cas. L'âge moyen à l'admission était de 21 jours et 56,2 % des patients présentaient une malnutrition. Le canal atrioventriculaire (21,9 %) constituait la cardiopathie la plus fréquente. La mortalité hospitalière était de 43,8 %. En analyse multivariée, les cardiopathies cyanogènes (OR = 5,2 ; IC 95 % : 1,7–16,0) et la malnutrition sévère à l'admission (OR = 3,8 ; IC 95 % : 1,3–11,2) étaient des facteurs indépendamment associés au décès.
Conclusion: Cette étude met en évidence une mortalité hospitalière très élevée des cardiopathies congénitales, en grande partie évitable. Le renforcement urgent du dépistage néonatal systématique, de la prise en charge nutritionnelle précoce et de l'accès à la chirurgie cardiaque pédiatrique apparaît indispensable pour améliorer la survie.

Mots-clés: Cardiopathie congénitale; Nouveau-né; Mortalité hospitalière; Facteurs de risque; Sénégal.

Introduction

Congenital heart diseases (CHD) are the most common birth defects[3]. In sub-Saharan Africa, their lethality often exceeds 50% in early childhood, unlike in high-income countries where it is below 5%, due to delayed diagnosis and limited access to specialized care[1,2]. In Senegal, recent epidemiological data are sparse. A previous study at CHNEAR (2010-2016) showed a mortality rate of 48.2%[4], highlighting a persistent problem. Updated data are therefore crucial to guide health policies.
The objective of this study was to describe the epidemiological, clinical, and evolutionary characteristics of CHD in infants under 3 months admitted to CHNEAR and to identify independent risk factors associated with in-hospital mortality.

Patients and Methods

2.1. Setting and Design: A retrospective, descriptive, and analytical study was conducted at the Albert Royer National Children's Hospital (CHNEAR), the national pediatric reference center in Senegal, from January 1, 2023, to December 31, 2024.
2.2. Population: All newborns and infants aged 0 to 3 months hospitalized in the neonatology department with a diagnosis of structural CHD confirmed by Doppler echocardiography were included. Incomplete medical records were excluded.
2.3. Data Collection and Analysis: Data were extracted using a predefined standardized form. Statistical analysis was performed with Excel and SPSS version 30. Quantitative variables were expressed as means (standard deviation) or medians (interquartile range), and qualitative variables as counts (percentages). Associations with mortality were first tested using Chi² or Fisher's exact tests. Multivariate logistic regression including variables with $p < 0.10$ in univariate analysis was used to identify independent risk factors. The significance threshold was set at $p < 0.05$.
2.4. Ethical Considerations: The study protocol complied with ethical guidelines. All data were anonymized to ensure patient confidentiality.

Results

3.1. Population Characteristics and Maternal Data

Out of 1007 admissions in the target age group, 73 patients met the inclusion criteria, yielding a hospital prevalence of 7.2%. The sex ratio was 0.97. The mean age at admission was 21 ± 23 days. The mean maternal age was 31.4 ± 6.7 years. A parental consanguinity rate of 17.8% was observed. Prenatal diagnosis of a heart anomaly was made in 6.8% of cases (n=5/73).

3.2. Clinical Presentation and Nutritional Status

The main reasons for admission were respiratory distress (39.7%) and cardiac signs (23.3%). At admission, 75.3% (n=55) presented with respiratory distress and 64.4% (n=47) had a heart murmur. A dysmorphic or syndromic phenotype was suspected in 64.4% (n=47) of infants. Malnutrition concerned 56.2% (n=41) of patients, including a notable proportion with severe malnutrition (weight < 3rd percentile) with intrauterine growth restriction noted in 34.2% of cases.

3.3. Heart Disease Profile and Management

Atrioventricular septal defect (AVSD) was the most frequent heart disease (21.9%, n=16). According to the pathophysiological classification, left-to-right shunts were predominant (49.3%, n=36), followed by right-to-left shunts or cyanotic heart diseases (37%, n=27), while obstructive heart defects accounted for 8.2% of cases and complex heart defects represented 5.5%. Management was predominantly medical and palliative. Interventional treatment (catheterization or surgery) was available to 6.9% (n=5) of the children.

3.4. Outcome and Mortality Risk Factors

The median length of hospitalization was 15 days. The overall in-hospital mortality was 43.8% (n=32/73). In univariate analysis, six factors were significantly associated with death (Table 1). After adjustment in multivariate analysis, only two factors remained significant independent determinants of death: the cyanotic nature of the heart disease (OR = 5.2; 95% CI: 1.7-16.0; p=0.004) and the presence of severe malnutrition (weight < 3rd percentile) at admission (OR = 3.8; 95% CI: 1.3-11.2; p=0.015).

Table 1: Analysis of factors associated with in-hospital mortality (n=73).

Factor	Univariate Analysis (p-value)	Multivariate Analysis
Cyanotic Heart Disease	< 0.001	OR=5.2 ; 95% CI:1.7-16.0 ; p=0.004
Severe Malnutrition (Weight < 3rd pct)	0.005	OR=3.8 ; 95% CI:1.3-11.2 ; p=0.015
Central Cyanosis at Admission	< 0.001	OR=2.9 ; 95% CI:0.9-9.6 ; p=0.08
Prematurity (< 37 WA)	0.03	OR=2.5 ; 95% CI:0.8-8.2 ; p=0.12
Apgar at 5 min ≤ 5	0.04	OR=2.1 ; 95% CI:0.7-6.5 ; p=0.19

Other tested variables (sex, maternal age, consanguinity, etc.) were not significant

Discussion

Our study, one of the first to provide recent analytical data on CHD in Senegal, reveals an alarming situation. The high hospital prevalence (7.2%) and extreme mortality (43.8%) reflect tertiary recruitment of severe cases and a major failure of early screening, as shown by the catastrophically low prenatal diagnosis rate of 6.8%[5,7]. This situation contrasts sharply with high-income countries where systematic screening has significantly improved prognosis[2,8].

The distribution of CHD differs from population-based studies, with an over representation of AVSD (21.9%) and complex cyanotic heart diseases, typical of referral centers receiving the most severe cases[8,9]. The independent and strong link between cyanotic heart disease and mortality (OR=5.2) is well documented in resource-limited settings where access to palliative or curative corrective surgery is almost non-existent[10,11].

The second major risk factor identified, severe malnutrition (OR=3.8), is a critical marker of severity and delay in management. It highlights a vicious cycle where heart failure worsens nutritional status, which in turn decreases resistance to infections and tolerance to any interventional procedure[12,13]. This point is a priority and modifiable target for action.

Our results must be interpreted in light of certain limitations. The retrospective nature of the study introduces a risk of information bias. The modest sample size, although significant for this referral center, limits statistical power for analyzing rare subgroups and widens confidence intervals. Finally, the lack of systematic karyotyping limits the confirmation of suspected syndromes.

Conclusion

This study demonstrates that the high mortality of newborns with congenital heart disease in Senegal is not inevitable, but a consequence of identifiable systemic failures: insufficient prenatal and neonatal screening, inadequate nutritional management, and an almost complete absence of access to corrective surgery.
Urgent and concrete actions are required:

1) Generalization of systematic neonatal screening by pulse oximetry;
2) Strengthening of training in fetal echocardiography;
3) Systematic integration of early and aggressive nutritional support in management; and
4) Development of sustainable national and international partnerships to finance and enable access to pediatric cardiac surgery. Improving the survival of these children imperatively requires the structuring of a complete and accessible care pathway.

Conflicts of Interest: None
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References

1. Kennedy N, Miller P. The need for paediatric cardiac surgery in Sub-Saharan Africa. Cardiol Young. 2013 Dec;23(6):814-25.
2. Mocumbi AOH. The challenges of cardiac surgery for African children. Cardiovascular Journal of Africa. 20 avr 2012;23(3):165-7.
3. Liu Y, Chen S, Zühlke L, Black GC, Choy M kit, Li N, et al. Global birth prevalence of congenital heart defects 1970–2017: updated systematic review and meta-analysis of 260 studies. International Journal of Epidemiology. 1 avr 2019;48(2):455-63.
4. El Moustapha H. Urgences cardiologiques néonatales au Centre Hospitaliers National d'Enfants Albert Royer. 2017.
5. Carvalho JS. Improving the effectiveness of routine prenatal screening for major congenital heart defects. Heart. 1 oct 2002;88(4):387-91.
6. Diop, I. B., Ba, S. A., Diarra, O., & Diagne, I. P. Profil épidémiologique et évolutif des cardiopathies congénitales à Dakar: à propos de 102 cas. Pan African Medical Journal, 36, 387. 2020;

7. Marek J, Tomek V, Skovranek J, Povysilova V, Samanek M. Prenatal ultrasound screening of congenital heart disease in an unselected national population: a 21-year experience. Heart. 15 janv 2011;97 (2):124-30.
8. Donofrio MT, Moon-Grady AJ, Hornberger LK, Copel JA, Sklansky MS, Abuhamad A, et al. Diagnosis and Treatment of Fetal Cardiac Disease: A Scientific Statement From the American Heart Association. Circulation. 27 mai 2014;129 (21):2183-242.
9. Kamdem F, Kedy Koum D, Hamadou B, Yemdji M, Luma H, Doualla MS, et al. Clinical, echocardiographic, and therapeutic aspects of congenital heart diseases of children at Douala General Hospital: A cross-sectional study in sub-Saharan Africa. Congenital Heart Disease. janv 2018;13 (1):113-7.
10. TOURE ML. Cardiopathies congénitales de decouvertes neonatales a l'hôpital pour enfants de diamniadio : aspects epidemiologiques, diagnostiques et pronostics a propos de 187 cas colliges de janvier 2016 a janvier 2022.
11. Jacobs JP, O'Brien SM, Pasquali SK, et al. Variation in Outcomes for Benchmark Operations: An Analysis of the Society of Thoracic Surgeons Congenital Heart Surgery Database. J Thorac Cardiovasc Surg. 2011;142(2):569-579.e3.
12. Murni IK, Patmasari L, Wirawan MT, Arafuri N, Nurani N, Sativa ER, et al. Outcome and factors associated with undernutrition among children with congenital heart disease. Chen RJ, éditeur. PLoS ONE. 23 févr 2023;18(2):e0281753.
13. Zhang M, Wang L, Huang R, Sun C, Bao N, Xu Z. Risk factors of malnutrition in Chinese children with congenital heart defect. BMC Pediatr. déc 2020;20(1):213.

Table 2: Population characteristics and maternal data

Characteristic	
A. Patient data	
Hospital prevalence	7.2% (73/1007)
Sex (Male)	49.3% (n=36)
Age at admission (days)	21 ± 23 (Median : 12 ; Range : 0-85)
Distribution by age at admission	
0 - 7 days	38.4% (n=28)
8 - 15 days	23.2% (n=17)
16 - 22 days	6.9% (n=10)
23 - 28 days	1.4% (n=1)
29 - 60 days	19.1% (n=11)
61 - 90 days	11.0% (n=8)
Diagnosis in neonatal period(≤28 days)	69.9% (n=51)
Gestational age	38.0 ± 2,4 SA
Prematurity (< 37 weeks)	17.8% (n=13)
Term (37 - 42 weeks)	82.2% (n=60)
Adaptation at birth	
Spontaneous cry	87.7% (n=64)
Resuscitation required	12.3% (n=9)
Apgar at 5 min ≤ 5	5.5% (n=4)
Cesarean delivery	31.5% (n=23)
B. Maternal data	
Maternal age (years)	31.4 ± 6,7
< 20	2.7% (n=2)
≥ 35	30.1% (n=22)
Occupation	
Housewife	56.1% (n=41)
Merchant / Saleswoman	16.4% (n=12)
Employee (public/private sector)	8.2% (n=6)
Other	19.3% (n=14)
Residence	
Urban area	83.6% (n=61)
Dakar region	69.9% (n=51)
History / Risk Factors	
Parental consanguinity	17.8% (n=13)
Maternal medical history*	9.6% (n=7)
Multiparity	61.6% (n=45)
History of abortion	31.5% (n=23)
History of fetal/neonatal death	9.6% (n=7)
C. Pregnancy data	
Prenatal follow-up (ANC)	97.3% (n=71)
Mean number of ANC visits	4.7 ± 1,6
≥ 4 ANC visits	85.7% (n=60/71)
Mean number of ultrasounds	1.2 ± 0,8
At least one ultrasound	65.8% (n=48)
Fetal anomaly detected	6.8% (n=5)
Obstetric complications	
Diabetes	11.0% (n=8)
HTN / Pre-eclampsia	9.6% (n=7)
Maternal infection**	6.8% (n=5)
Maternal biological markers	24.7% (n=18)
Anemia (Hb < 11 g/dL)	6.8% (n=5)
Positive Emmel test	97.3% (n=71)
Tetanus vaccination (≥2 doses) Iron/Folic acid supplementation	97.0% (n=71)

*Main maternal medical histories were: sickle cell trait (5.5%, n=4), diabetes (5.5%, n=4), hypertension (2.7%, n=2).
** Documented active maternal infections or recent immunity: rubella (2.7%, n=2), toxoplasmosis (1.4%, n=1), hepatitis B (1.4%, n=1).

Table 3: Clinical and paraclinical, data at admission

Characteristics	Frequency
A. Anthropometric characteristics	
Mean birth weight (g)	2631 ± 670
Mean birth length (cm)	47.4 ± 3,5
Mean head circumference (cm)	32.6 ± 2,1
Intrauterine growth restriction (IUGR)	34.2% (n=25)
Severe IUGR (weight < 3rd percentile)	80% (n=20/25)
Moderate IUGR	20% (n=5/25)
Macrosomie (weight > 97th percentile)	1.4% (n=1)
Weight at admission (g)	2676 ± 787 (Médiane: 2770)
Malnutrition (weight < 10th percentile)	56.2% (n=41)
Severe malnutrition (weight < 3rd percentile)	???
Weight trajectory at admission	
Stable curve	43.8% (n=32)
Curve break (slowing)	50.6% (n=37)
Upward shift	5.5% (n=4)
B. Reasons for admission	
Main reason for hospitalization	
Respiratory distress	39,7% (n=29)
Cardiac signs (murmur, cyanosis, etc.)	23.3% (n=17)
Malformation / Dysmorphic syndrome	17.8% (n=13)
Others (jaundice, fever, prematurity, malnutrition)	19.2% (n=14)
Main reasons for transfer/consultation	
Dyspnea	35.6% (n=26)
Cyanosis	24.7% (n=18)
Isolated heart murmur	15.1% (n=11)
Feeding difficulties / Poor weight gain	19.2% (n=14)
Arrhythmias	5.5% (n=4)
C. Clinical signs and associated syndromes	
Clinical signs at admission	
Respiratory distress	75.3% (n=55)
Mean Silverman score	4.3 ± 1,3
Heart murmur	64.4% (n=47)
Cyanosis (central or differential)	45.2% (n=33)
Global heart failure	26.0% (n=19)
Hepatomegaly	28.8% (n=21)
Abnormal lung auscultation	32.9% (n=24)
Neurological disorders (includinghypotonia)	20.5% (n=15)
Hypothermia (<36.5°C)	16.4% (n=12)
Fever (>38°C)	9.6% (n=7)
Suspected dysmorphic syndrome orphenotype	64.4% (n=47)
Trisomy 21	21.9% (n=16)
Unspecified polymalformation syndrome	16.4% (n=12)
Trisomy 18	6.8% (n=5)
Trisomy 13	6.8% (n=5)
Associated malformations (non-cardiac)	
Craniofacial / ENT dysmorphisms	37.0% (n=27)
Limb / skeletal malformations	13.7% (n=10)
Urogenital malformations	12.3% (n=9)
Central nervous system malformations	6.8% (n=5)
D. Paraclinical data	
Chest radiography (performed in 58.9%, n=43)	
Cardiomegaly	74.4% (n=32/43)
Pulmonary hypervascularity	44.2% (n=19/43)
Infectious signs / bronchiolitis	18.6% (n=8/43)
Situs inversus	4.7% (n=2/43
Biological workup at admission	
Hyperleukocytosis	32.9% (n=24)
Anemia	26.0% (n=19)
Thrombocytosis (>450 000/mm³)	12.3% (n=9)
Thrombocytopenia(<150 000/mm³)	11.0% (n=8)
Positive CRP (>10 mg/L)	20.5% (n=15)

Table 4: Distribution of CHD according to anatomical classification

Heart Disease	Count (n)	Percentage (%)
Atrioventricular septal defect	16	21.9
Partial/Transitional AVSD	*11*	*1.1*
Complete AVSD	*5*	*6.8*
Ventricular septal defect	9	12.3
Perimembranous VSD	*6*	*8.2*
Muscular VSD	*2*	*2.7*
Inlet VSD	*1*	*1.4*
Atrial septal defect	9	12.3
ASD ostium secundum	*8*	*11.0*
ASD ostium primum	*1*	*1.4*
Patent ductus arteriosus	6	8.2
Transposition of the great arteries	6	8.2
Hypoplastic left heart syndrome	5	6.8
Double outlet right ventricle	4	5.5
AVSD type DORV	*2*	*2.7*
Fallot type DORV	*1*	*1.4*
TGA type DORV	1	*1.4*
Single ventricle / Single atrium	4	5.5
Tetralogyof Fallot	3	4.1
Pulmonary atresia type III or IV	3	4.1
Aortic stenosis	2	2.7
Interrupted aortic arch type B	2	2.7
Coarctation of the aorta	1	1.4
Ebstein's anomaly	1	1.4
Hypertrophic cardiomyopathy	1	1.4
Common arterial trunk type II	1	1.4

Fig 1: Kaplan – Meier survival curve according to patient age in days up to 6 months of life

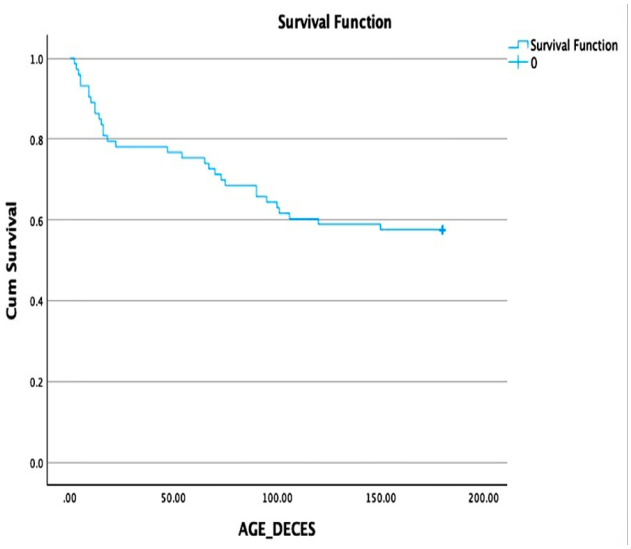

Table 5: Distribution of deaths according to heart disease (n=32)

Main Heart Disease	Count (n)	Percentage (%)
Hypoplastic Left Heart Syndrome	5	15,6
Atrioventricular Septal Defect	5	15.6
Double Outlet Right Ventricle	4	12.5
Transposition of the Great Arteries	3	9.4
Ventricular Septal Defect	3	9.4
Atrial Septal Defect	2	6.3
Patent Ductus Arteriosus	2	6.3
Single Ventricle	2	6.3
Tetralogy of Fallot	1	3.1
Interrupted Aortic Arch	1	3.1
Pulmonary Atresia with Intact Septum	1	3.1
Ebstein's Anomaly	1	3.1
Hypertrophic Cardiomyopathy	1	3.1
Aortic Stenosis	1	3.1

Table 6: Circumstances of Death (n=32)

Cause of Death	Count (n)	Percentage (%)
Cardiogenic shock	8	25.0
Septic shock	6	18.8
Sudden death	4	12.5
Acute pulmonary edema	4	12.5
Pulmonary hemorrhage	3	9.4
Polymalformative cause (T13,T18)	3	9.4
Mixed shock (cardiogenic and septic)	2	6.3
Thrombosis and multiple emboli	1	3.1
Endocarditis	1	3.1