Sohag University Sohag Medical Journal Faculty of Medicine

Original Article

Patterns of Congenital Heart Diseases at Sohag University Hospital

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Abstract

Background: Congenital heart diseases (CHD) are structural or functional heart diseases that present at birth even if it is discovered later in life**. Aim:** to study Patterns of CHD in children at Sohag University Hospital. **Methods:** This was prospective and a cross sectional study done in pediatric department at Sohag University Hospital with all its divisions. **Results:** Total cases of congenital heart diseases were 900 patients, of them 650 (72.2) Acyanotic CHD and 250 (27.8) Cyanotic CHD, regarding acyanotic CHDs the commonest isolated defects were ASD in 181 (20.1) , VSD in 142 (15.78), followed by PDA in 78 (8.67), P.S in 55 (6.11), Then AS in 45 (5). Less common CoA in 20 (2.22), complete AV Canal Defect in 13 (1.44), partial AV Canal Defect in 6 (0.67), combined defects detected in 110 (12.22) . As regard Cyanotic CHDs the commonest were TOF in 97 (10.78) , D-TGA in 57 (6.33) , followed by P.A. in 27 (3) T.A. in 20 (2.22) LHHS in 17 (1.89) , less common were Ebestien anomaly in 12 (1.33) , Single Ventricle in 10 (1.11) other complex cyanotic CHD in 10 (1.11). CHDs were commonest in infants (53.33%) followed by neonates (37.22%) then preschool children (7.222%) then school children (2.22%). **Conclusion**:The most common type observed in this study was ASD followed by VSD, PDA, and TOF . More than half of the patients were diagnosed in infancy age followed by neonatal age which points to a diagnostic improvement along with awareness on the part of the general population. **Keywords:** congenital heart diseases; neonatal; children.

DOI: 10.21608/smj.2024.263429.1448
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Received: 24 January 2024
Revised: 22 February 2024
Accepted: 25 March 2024
Published: 01 May 2024

Introduction

Congenital heart disease is an enormous problem in pediatrics worldwide, it represents the most common birth defect. Researchers aren't sure about the exact cause, but they think genetics, certain medical conditions, some medications and environmental factors may play a role. [(1)]

CHD in many cases may be asymptomatic and discovered accidently during the routine examination or may be presented by some clinical manifestations (e.g. Cyanosis or Murmur) and /or complications (e.g. Heart Failure). [(2)]

As medical care has advanced over time, treatment of many abnormalities is now available and many children with congenital heart defect are living healthier lives. [(3)]

So information about different aspects of CHD is very important for planning health programs for long-term care and maintenance for these cases.

Aim : to study patterns of CHD in children at Sohag University Hospital.

Methodology This was a prospective and cross sectional study done in pediatric department at Sohag University Hospital with all its divisions.

Duration: From start of January 2022 to end of September 2023.

Place: Sohag University Hospital pediatrics department with all its divisions.

Inclusion criteria: All children from date of birth to age of 12 years old including both genders diagnosed to have CHD.

Exclusion criteria: More than 12 years old, acquired heart diseases and children with cardiac functional abnormalities .

Ethical consideration: An approval was obtained from the ethics research committee of Sohag Faculty of Medicine. Informed consent was obtained from parents of patients to be included in the study.

Methods: All patients in this study were being subjected to full history, clinical examination and reporting for investigations & theraputic modalities done.

Statistical analysis: Statistical analysis was done by SPSS version 28 (IBM Co., Armonk, NY, USA). Quantitative data were presented as mean, standard deviation (SD) and range. Qualitative data were presented as frequency and percentage (%).

Results

Table 1: Baseline characteristics of the studied patients

		Total patients (n=900)
Gestational age (weeks)	**Preterm**	85 (9.44%)
	Late preterm	235 (26.11%)
	Term	580 (64.44%)
Gender	**Boys (M)**	455 (50.56%)
	Girls (F)	445 (49.44%)
Degree of consanguinity	**Positive**	370 (41.11%)
	Negative	530 (58.89%)
Family size	**Small**	145 (16.11%)
	Medium	665 (73.89%)
	Large	90 (10%)
Family history of CHD	**Negative**	830 (92.22%)
	Positive	70 (7.78%)
Residence	**Rural**	595 (66.11%)
	Semiurban	160 (17.78%)
	Urban	145 (16.11%)
Mode of delivery	**NVD**	325 (36.11%)
	CS	575 (63.89%)

Data are presented as frequency (%) unless otherwise mentioned, NVD: Normal vaginal delivery.

Our study included 900 children with CHD (455 boys and 445 girls). Out of 900 patients, 9.44% were preterm, Positive consanguinity in 41.11% of our studied population. Most children (73.89%) had medium size family (4-6 members), 7.78% of patients had Positive family history. Regarding residence, 66.11% of children inhabited rural areas. Regar-ding mode of delivery, most children (63.89%) were delivered through CS as shown in **Table 1**

Table 2: Anthropometric measurements of the studied patients

	Total patients (n=900)	
	N	%
Weight (kg)		
Normal	805	89.44
Low (<3rd percentile)	95	10.56
Length (cm)		
Normal	815	90.56
Low (<3rd percentile)	85	9.44
Head circumference (cm)		
Normal	810	90
Low (<3rd percentile)	90	10

Regarding anthropometric measurements of the studied patients, 10.56% of children were below 3rd percentile of weight, 9.44% below 3rd percentile of stature and 10% below 3rd percentile of head circumference. **Table2**

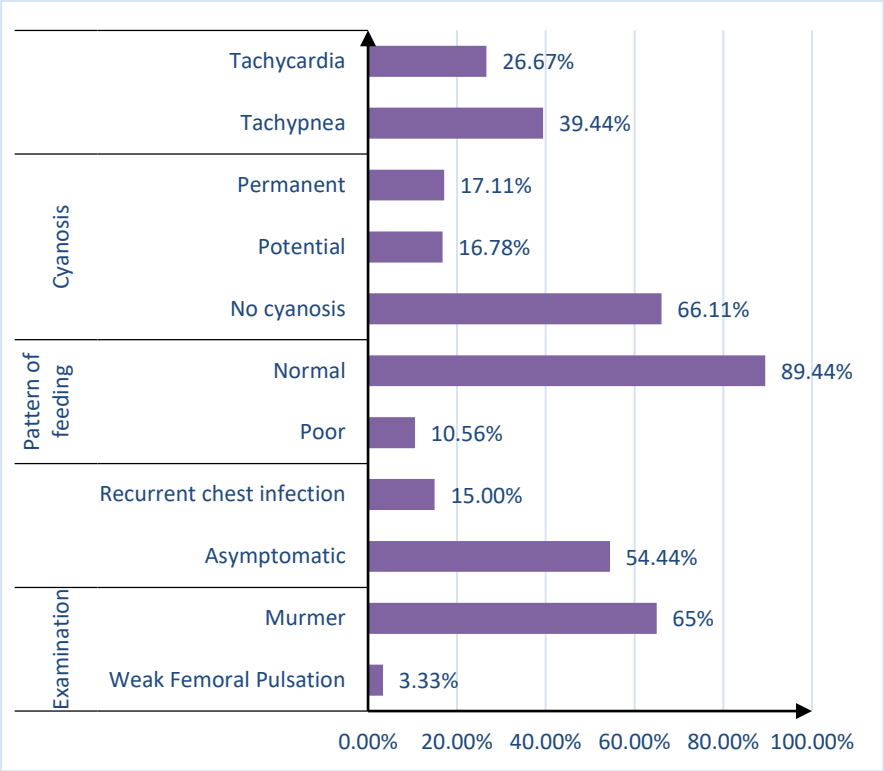

Figure 1: Clinical manifestations of studied patients

As regard clinical manifestations of the cases there were 54.44 % were Asymptomatic while 45.56 % of patients have symptoms and signs as mentioned in **figure 1** .

Table 3: Echocardiography of the studied patients

	Total patients (n=900)	
	N	**%**
Heart Position		
- **Normal**	900	100
Relation of Great Arteries		
- **Discordance**	57	6.33
- **Normal Concordance**	843	93.67
Pulmonary HTN		
- **No**	835	92.78
- **Mild**	5	0.56
- **Moderate**	30	3.33
- **Severe**	30	3.33
Cyanotic or not :		
- **A cyanotic**	650	72.22
- **Cyanotic**	250	27.78

Based on echocardiographic results, all patients had normal heart position, while discordance in 6.33% .
In terms of pulmonary hypertension; 0.56% suffered from mild, 3.33% had moderate and 3.33% had severe HTN. There were 27.78% cyanotic patients as shown in **Table 3**

Table 4: Diagnosis of the studied patients

	Total patients (n=900)	
	N	**%**
Age at diagnosis		
Infant	480	53.33
Neonate	335	37.22
Preschool	65	7.22
School	20	2.22

Table 5 : Distribution of studied Children in different divisions of Pediateric department :

Division	CHD cases	Persent in total cases (900)	Total patients (in duration of the study)	Persent of CHD in total patients in the unit
Pediatric cardiology Clinic	474	52.66%	948	50%
General Pediatric outpatient Clinic	112	12.44%	7920	1.41%
Pediatric Critical Care Unit	72	8%	588	12.24%
Pediatric Wards	67	7.44%	912	7.34%
Pediatric Emergency Room (ER)	58	6.44%	3600	1.6%
Pediatric Intensive Care Unit (PICU)	48	5.33%	348	13.79%
Neonatal Intensive Care Unit (NICU)	40	4.44%	492	8.13%
PICU of New University Hospital (since 4/2022)	22	2.44%	144	15.27%
NICU of New University Hospital (Since 4/2022)	15	1.66%	120	12.5%

Table 5 : As regard number of cases included in the study at different units in Sohag University Pediatric department, Most of the patients were included at the pediatric cardiology clinic 474 Case (52.66%) out of 900 cases of CHDs, which represents the main site of diagnosis and decision making in the department, the number not including those who were diagnosed while admitted in another unit or who were admitted after diagnosis .

Table 6 : Total Pediatric Cardiac Patients in the study

Cardiac Disease	**Number of cases**	**Percent from total patients**
Congenital Heart Disease	900	70.04%
Cardiomyapathy	182	14.16%
Viral Myocarditis	119	9.26%
Rheumatic heart disease	52	4.05%
Others	32	2.49%

Table 6 : as regard total pediatrics cardiac diseases in the department at the time of the study there was 1285 total patients , of which 900 case of CHD (70.04), Cardiomyopathies with its different types in 182 (14.16) , Viral Myocarditis in 119 (9.26) Rheumatic heart disease found in 52 (4.05) and others in 32 (2.49).

Table 7 : Congenital Heart Disease in the study

Acyanotic		Cyanotic	
650	72.22%)	250	27.78 %

Table 7 : as regard types of CHDs in our cases The study shows that among 900 cases of Congenital heart diseases there were 650 with Acyanotic CHD (72.22%) and 250 with Cyanotic CHD (27.78) .

Table 8 : Diagnosis of CHDs in the study :

Acyanotic CHDs :		
ASD	181	20.1
- **Secundum**	158	17.55
- **Primum**	20	2.22
- **Primum and Secundum**	3	0.33
VSD	142	15.78
- **Perimemberanous**	86	9.55
- **Muscular VSD:**	32	3.55
o **Mid Muscular**	18	2
o **Apical muscular**	10	1.11
o **High Muscular**	4	0.44
- **Combined**	24	2.66
Combined defect	110	12.22
PDA	78	8.67
P.S.	**55**	**6.11 :**
- Vavular	- 28	- 50.91
- Spravalvular	- 14	- 25.45
- Subvalvular	- 13	- 23.64
A.S.	**45**	**5 :**
- Valvular	- 23	- 51.11
- Subvalvular	- 12	- 26.67
- Supravalvular	- 10	- 22.22
CoA	20	2.22
Complete AV Canal Defect	13	1.44
Partial AV Canal Defect	6	0.67
Cyanotic CHDs :		
TOF:	97	**10.78 :**
- Classic Fallot	- 59	- 60.82
- Extreme Fallot (pulmonary atresia)	- 19	- 19.59
- Pink Fallot	- 14	- 14.43
- TOF with Absent pulmonary Valve	- 2	- 2.06
- TOF with DORV	- 3	- 3.09
TGA:	57	6.33
- D-TGA	- 56	- 98.25
- L-TGA	- 1	- 1.75
PA	27	3
TA	20	2.22
LHHS	17	1.89
Ebestien Anomaly	12	1.33
Single Ventricle	10	1.11
Other Complex CHD	10	1.11

ASD: Atrial septal defect, VSD: Ventricular septal defect, PDA :Patent ductus arteriosus, PS: Pulmonary valve stenosis, AS: Aortic valve stenosis, CoA : Coarctation of the Aorta, TOF: Tetralogy of Fallot, DORV: Double Outlet Right Ventricle, D-TGA: dextro-Transposition of the Great Arteries, PA : Pulmonary atresia , TA : Tricusped Atresia , LHHS : Left Hypoplastic Heart Syndrome .

Table 8 : approximately half children (53.33%) were diagnosed during infant age, 37.22% during neonatal age, 7.22% in preschool age and 2.22% in school age. The study shows that among 900 cases of Congenital heart diseases there were 650 with Acyanotic CHD (72.22%) and 250 with Cyanotic CHD (27.78) , The most common among Acyanotic CHDs was ASD in 181 (20.1), out of which, the most common type was Secundum ASD in 158 patients, 20 patient had Primum type and another 3 had Primum and Secundum type followed by VSD in 142 (15.78),

of which, Perimemberanous VSD was the commonest in 86, muscular VSD in 32 of which 18 had Mid muscular, 10 patient had Apical Muscular and 4 had high muscular, and combined VSD in 24 . Combined Acyanotic CHD in 110 (12.22) , PDA in 78 (8.67), P.S. in 55 (6.11), AS in 45 (5). CoA in 20 (2.22), Complete AV Canal Defect in 13 (1.44), Partial AV Canal Defect in 6 (0.67), As regard Cyanotic CHDs it was manifested in 250 patints the commonest are TOF in 97 (10.78) D-TGA in 57 (6.33) , P.A. in 27 (3) T.A. in 20 (2.22) LHHS in 17 (1.89) , Ebestien anomaly in 12 (1.33) , Single Ventricle in 10 (1.11) other complex cyanotic CHD in 10 (1.11). Among the studied cases of CHD there were 65 cases (7.22%) complicated by pulmonary hypertension .

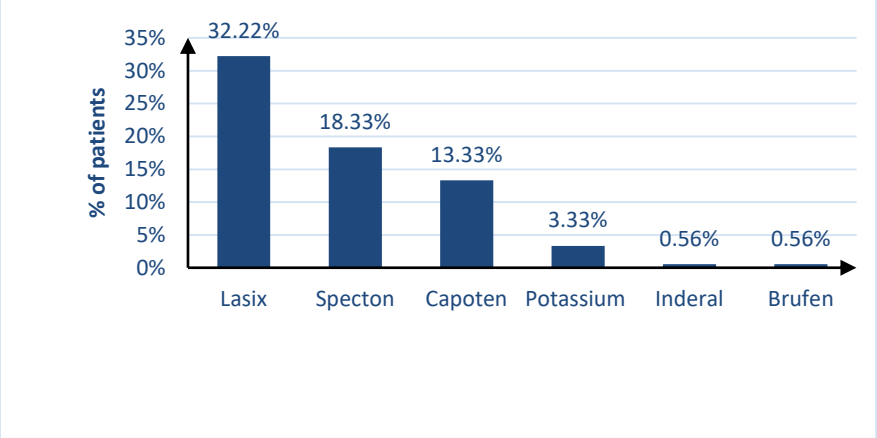

Figure 2: Medications taken by the studied patients

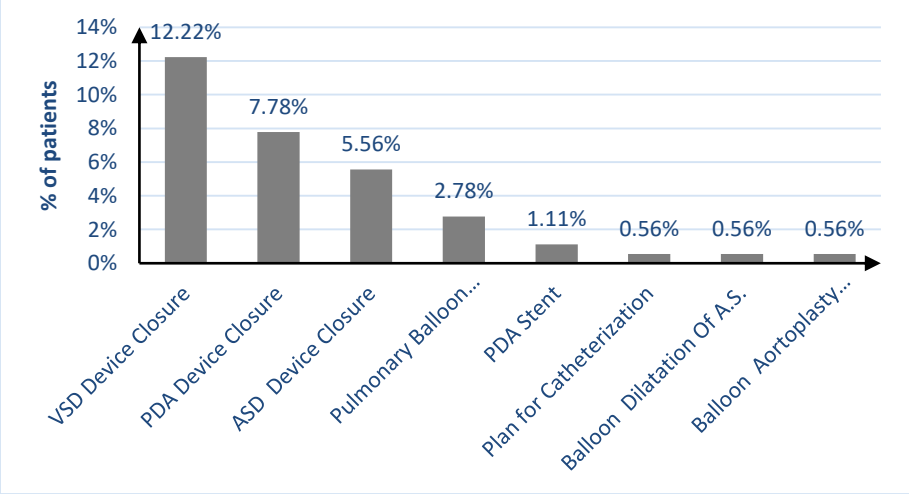

Figure 3: Transcatheter repair of the studied patients

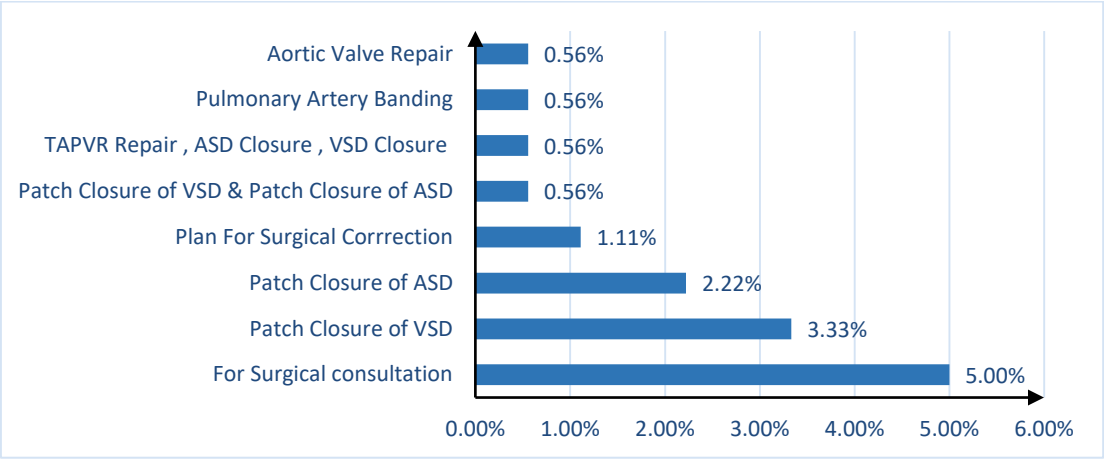

Figure 4: Surgeries performed on the studied patients.

As regard different therapeutic modalities of the studied cases **(figures 2, 3 and 4) ,** there were 335 patients (37.22%) on medical treatment, 270 patients (30%) had transcatheter intervention, and 125 patients (13.88%) had surgical intervention. As regard transcatheter and surgical interventions 220 patients and 40 patients of them respectively (81.48% of transcatheter and 32% of surgical interventions) had been done in Sohag university hospital.

Discussion

Unfortunately, the epidemiology of CHD had not been thoroughly studied among Egyptian children; hence, this study aimed to review the risk factor portfolio, relative frequencies of each type of CHD, demographic characteristics, age, and mode of clinical presentations among Egyptian children with CHD; so that appropriate changes in preventive health policies can be implemented and optimum care for such patients can be provided.

Our study included 900 children with CHD (455 boys and 445 girls) with boys: girls ratio is 1.2: 1.

In a study done by **Zen et al.** [4] found that among the patients with CHD, more than half (52%) were boys. **Meanwhile, Meshram et al.** [5] found that gender distribution was 56.98% of boys with a male: female ratio of 1.3:1.

In this study We detected Positive consanguinity in 41.11% of our studied population.

In a study done previously in Egypt by **Mokhtar et al.** [6], the prevalence of consanguinity is 29%. Similarly, **Haq et al.** [7] detected consanguinity and positive family history in 49% and 14% of their studied population, respectively, also, **Nabulsi et al.** [8] and **AL–Ani, .**[9] detected consanguinity rates of 34.7% and 77.9%, respectively, whereas **Fung et al.** [10] detected them in 3.5% .

In this study we cleared that most children (73.89%) had medium size family.

Similarly, **Meshram et al.** [5] found that most of the patients (70.83%) were from medium sized families, and **Haq et al.** [7] detected that 75% of patients with CHD were from family of medium size, which is near to us .

In this study we found that the vast majority of cases inhabit rural areas (66.11%) followed by semiurban areas (17.78 %) and lower most inhabit urban areas (16.11%).

A study by **Zen et al.** [4] found that among the patients with CHD, Most of them lived in rural areas (84%), and in a study by **Meshram et al.** [5] found that most of (60.93%) the patients were from the rural area .

In this study we found that regarding mode of delivery, most children (63.89%) were delivered through CS .

The same results was found in a study done by **Hoffman et al. 2002**[11], that 66% of neonates with CHD were delivered by CS, While on opposite side in a study done by **Parikh et al. 2017**[12], that 10.76% of neonates with CHD were delivered by CS.

There is no impact for Ceserean section delivery on pattern of CHD in neonates. While fetal CHD may affect the mode of delivery as abnormal heart rate and distress might occur in fetus with CHD and emergency Caesarean section is necessary.

In this study we found that 10.56% of children were below 3rd percentile of weight, 9.44% of children were below 3rd percentile of stature and 10% were below 3rd percentile of Head circumf-erence.

This is in agreement with **Lata et al.** [13] who found that 57% of infants with CHD were underweight, **Harshangi et al.** [14] reported growth retardation in 56%.

In this study we found that as regards cardiac examination, 65% of our patients had murmur .

And in a study done by **Al-Fahham et al.** [15] found that the accidental discovery of a murmur was the most common presenting complaint. Audible murmurs were detected in 748 (74.4%) of patients**, Meshram et al.** [5] found that Pansystolic murmur was auscultated in 223 (51.86%) patients, followed by ejection systolic murmur in 154 (35.81%) and continuous murmur in 43 (10.00%).

In this study we found that approximately half children (53.33%) were diagnosed during infant age, 37.22% during neonatal age, 7.22% in preschool age and 2.22% in school age.

A study by **Al-Fahham et al.** [15], found that most of their patients had been diagnosed within the first year of life (48.9% in the early infancy and 37.8% in the neonatal period), Similarly, **Subramanyan et al.** [16], found that the ages at diagnosis of their CHD cases were in the early infancy and the neonatal periods in 40% and 38% of their studied population respectively, and in a study carried by **Becker et al.** [17], of 249 cases of CHD, 81.5% were diagnosed in neonates.

In this study we found that the most common diagnosis among the studied children as regard acyanotic CHD was ASD in 181 (20.1) , VSD in 142 (15.78) As regard Cyanotic CHDs the commonest are TOF in 97 (10.78) D-TGA in 57 (6.33)

In a study done by **Khoshhal et al.** [18], found that atrioventricular septal defect (AVSD) were the most common acyanotic CHDs and represented 27.9%, 24.8%, 18.9%, 6.4%, and 4.4% of the total cases, respectively. Tetralogy of Fallot (ToF) (8.7%), followed by transposition of the great arteries (TGA) (1.7%) and truncus arteriosus (1.1%), were the most common cyanotic CHDs, a study done by **Haq et al.** [7] found that the most common heart defect in their study population was ventricular septal defect (VSD), followed by patent ductus arteriosus (PDA),

Study limitations

First, as the present work is a hospital-based prospective cross sectional study, the data presented in this report can serve as an estimate of the trends and patterns of CHD and limit the extension of our findings to the general population of the region; hence, no decisive conclusion can be drawn on the incidence and prevalence rates of CHD from our study. Second, being a tertiary care center may have contributed to discrepancies to previous studies noted in this study.

Conclusion

In conclusion, the most common type observed in this study was ASD followed by VSD, PDA, and TOF . More than half of the patients were diagnosed in infancy age followed by neonatal age which points to a diagnostic improvement along with awareness on the part of the general population.

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