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## CHILDHOOD CONGENITAL HEART DISEASE

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#### ABSTRACT

Background: Congenital heart disease (CHD) is among the most prevalent congenital conditions that affect neonates and infants. CHD have a major effect on morbidity, mortality, and medical expenses. There is variation in the pattern of CHDs in different geographical areas, and there have been reports of varying global CHD prevalence. Objectives: Is to identify the occurrence of specific types of CHD among hospitalized infants and to estimate the CHD effect on the infants' growth. Methods: This is descriptive, retrospective, cross-sectional study included 113 infants with congenital heart disease attending the department of pediatric medicine at Ibin Al Atheer Teaching Hospital, from January 2024 to the end of December 2024. For each patient, the following data had been collected: age, sex, cause of admission, and the growth parameters. The diagnosis of CHD was made by electrocardiography, chest x-ray and by M mode two-dimensional echocardiography examinations. Results: Out of 3951 patients, 113 (2.8%) had congenital heart disease were admitted to Ibin Al Atheer Teaching hospital in Mosul. The most common congenital heart disease (CHD) were ventricular septal defect (54.8%), tetralogy of Fallot (17.6%), Patent ductus arteriosus (12.3%), Transposition of great arteries (6.1%), Pulmonary stenosis (5.3%), and Atrial septal defect (ASD) (3.5%). The most common mode of presentation was respiratory tract infection and heart failure in a cyanotic patients and cyanosis in cyanotic groups. The study found only Patent ductus arteriosus and Atrial septal defect were more common in female while all other lesions were equal male to female ratio or slightly more common in male. Conclusion: Ventricular septal defect is the most common type of congenital heart disease and the most common cause of morbidity, while ASD and PS is the least cause of morbidity in patients with congenital heart disease. Growth failure is common in patients with left to right shunts while it is uncommon in cyanotic patients.

**KEYWORDS:** Ventricular septal defect, Cyanotic, A cyanotic, Mosul, Iraq.

## 1- INTRODUCTION

Congenital heart disease (CHD) is among the most prevalent congenital conditions that affect neonates and infants.<sup>[1]</sup> In both children and adults, CHD have a major effect on morbidity, mortality, and medical expenses.<sup>[2]</sup> As a matter of fact, CHD is present in roughly 15-25 % of newborn deaths.<sup>[3]</sup> There is variation in the pattern of CHDs in different geographical areas, and there have been reports of varying global CHD prevalence.<sup>[4-5]</sup> The prevalence of congenital heart disease (CHD) in infants varies between around 3.7 and 17.5 per 1,000 births worldwide, making up 30 to 45% of all congenital abnormalities. It has been found that birth prevalence varies continentally, ranging from 6.9 per 1,000 births in Europe to 9.3 per 1,000 in Asia.<sup>[6]</sup>

The etiology of congenital heart disease is complex, with a wide range of genetic and environmental factors contributing to its pathogenesis. CHD is frequently divided into two categories: Cyanotic (blue skin color caused by a lack of oxygen), such as Ebstein's anomaly, hypoplastic left heart syndrome (HLHS), pulmonary atresia, tetralogy of Fallot (TOF), total anomalous pulmonary venous return (TAPVR), transposition of the great vessels (TGA), tricuspid atresia, truncus arteriosus, double outlet right ventricle (DORV), and non-cyanotic, such as aortic stenosis (AS), bicuspid aortic valve (BAV), atrial septal defect (ASD), atrioventricular canal (endocardial cushion defect), coarctation of the aorta (COA), patent ductus arteriosus (PDA), pulmonic stenosis, and ventricular septal defect (VSD).<sup>[7-9]</sup> Ventricular septal defect has been the most prevalent

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type of congenital heart disease (CHD), with atrial septal defect, patent ductus arteriosus, tetralogy of Fallot, single ventricular, atrio-ventricular, and double outlet right ventricular defects following.<sup>[10]</sup>

A heart murmur or irregular heart sound, cyanosis (bluish tint to the skin, fingernails, and/or lips), rapid breathing, anorexia, poor weight gain, difficulty exercising, and excessive perspiration are all warning signs of congenital heart disease in infants and children.<sup>[11]</sup>

Congenital cardiac defects have a wide spectrum of severity in infants. About 30-40% of patients with Congenital cardiac defects will be symptomatic in first year of life, while the diagnosis was established in 60% of patient by the first month of age.<sup>[12]</sup>

The aim of study is to identify the occurrence of specific types of CHD among hospitalized infants. And to study the demographic distribution of CHD and the most common pattern of presentation. Lastly; to estimate the CHD effect on the growth of infants.

## 2- PATIENTS AND METHODS

This is descriptive, retrospective, cross-sectional study included 113 infants with congenital heart disease attending the department of pediatric medicine at Ibin Al Atheer Teaching Hospital, from January 2024 to the end of December 2024.

For each patient, the following data had been collected: age, sex, cause of admission, and the growth parameters.

The diagnosis of CHD was made by electrocardiography, chest x-ray and by M mode two-dimensional echocardiography examinations.

The echocardiography's were performed with a mechanical sector scanner at 3 and 5 MHz, patients were studied in supine or left lateral 30-degree decubitus position to obtain different views. Neither catheterization nor surgical interventions were done to any patients.

## 3. RESULTS

Among the 113 patients, there were 62 of them had VSD (54.8%) and 20 (17.6%) were diagnosed as tetralogy of Fallot and (14) patients showed to have patent ductus arteriosus (12.3%). From the other hand; 7 patients were diagnosed as transposition of great arteries (6.1%), while 6 patients (5.3%) had pulmonary stenosis. Moreover; the

least common congenital heart disease was Atrial septal defect which was diagnosed in 4 patients (3.5%) only. As shown in tables 3.1 and 3.2 in addition to figure 3.1.

Table 3.1:	Various	types	of	CHD,	a (	cyanotic	group.

Diagnosis	Total No.	%
VSD	62	54.8%
PDA	14	12.3%
ASD	4	3.5%
PS	6	5.3%

Table 3.2: `	Various typ	pes of CHD,	cyanotic g	group.





In this study it was found that only patent ductus arteriosus and atrial septal defect were more common in female while other lesions of congenital heart disease were equal in male or female or slightly more in male, as shown in table 3.3.

Table 3.3: Various types of CHD with	i sex distr	ibution.
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Diagnosis	<b>M: F</b>	Μ	F	Total
VSD	1.1:1	33	29	62
PDA	0.5:1	5	9	14
ASD	0.3:1	1	3	4
TOF	1.5:1	12	8	20
TGA	1.3:1	4	3	7
PS	1:1	3	3	6
Total	1.05:1	58	55	113

The mode of occurrence of congenital heart disease mostly in first 6 months of life about (61.9%) except tetralogy of Fallot mostly appear in second 6 months of life and very rare finding after first year of life about (3.5%). As shown in table 3.4 and figure 3.2.

 Table 3.4: Age distribution at diagnosis in different types of CHD.

Diagnosis	0-6 M	%	7-12M	%	>12M	%	Total
VSD	42	67.6	18	29	2	3.2	62
PDA	12	85.7	2	14.2	-	-	14
ASD	-	-	2	50	2	50	4
TOF	5	25	15	75	-	-	20
TGA	7	100	-	-	-	-	7
PS	5	83.3	1	16.6	_	-	6
Total	71	62.8	38	33.6	4	3.6	113



The most common presentation was chest infection in a cyanotic CHD which present among 60 patients (69.8%),

while heart failure is presenting feature in 19 patients (22%). As shown in table 3.5.

Table 3.5: Comm	on presentation of	f various types o	of CHD in A cy	anotic group.

Diagnosis	Chest infection	%	Cyanosis	%	HF	%	Total
VSD	44	67.7	4	6.4	14	22.5	62
PDA	9	64.2	-	-	5	35.7	14
ASD	4	100	-	-	-	-	4
PS	3	50	3	50	-	-	6
Total	60	69.8	7	8.1	19	22.1	86

Cyanosis was the presenting feature of cyanotic CHD among 24 patients (88.8%) while chest infection presented among 3 patients (11.1%). As shown in table 3.6.

Table 3.6: Common presentation of various types of CHD in Cyanotic group.

Diagnosis	Chest infection	%	Cyanosis	%	HF	%	Total
TOF	3	15	17	85	-	-	20
TGA	-	-	7	100	-	-	7
Total	3	11.2	24	88.8	-	-	27

The study found the effect of different types of congenital heart disease on the pattern of growth (weight) and it found a cyanotic type (ASD, PDA ASD, PS) of congenital heart disease had more deleterious effect on the weight of the patients than cyanotic heart disease. As shown in table 3.7 and 3.8.

Table 3.7: The growth pattern and how it is affected by CHD in a cyanotic group.

A cyanotic CHD	Wt < 3 <sup>rd</sup> centile	%	Wt > 3 <sup>rd</sup> centile	%	Total
VSD	44	70.9	18	29.0	62
PDA	8	57.1	6	36	14
ASD	4	100	0	0	4
PS	3	50	3	50	6
Total	59	68.6	27	31.4	86

#### Table 3.8: The growth pattern and how it is affected by CHD in cyanotic group.

cyanotic CHD	Wt < 3 <sup>rd</sup> centile	%	Wt > $3^{rd}$ centile	%	Total
TOF	4	20	16	80	20
TGA	4	57.1	3	42.8	7
Total	8	29.7	19	70.3	27

### 4. DISCUSSION

Heart malformations are the most common type of congenital anomaly. Despite recent advancements in surgical techniques and interventional approaches. The

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incidence of congenital heart disease cannot be determined in this study because it is a hospital based rather than community-based study, but the incidence of CHD among the admitted patients in this study (2.8%) is less than which is found in previous Iraqi studies.<sup>[13,14]</sup>

The relative incidence of the various abnormalities in this study is compared with our studies. As shown in figure 4.1.

Lesions	VSD %	TOF%	PDA%	TGA%	ASD%	PS%
Samira Telfah Abdilghani Alaani et al 2023. <sup>[15]</sup>	25 %	4 %	21%	0.3%	68%	1%
Ziad A Rasheed et al, 2024. <sup>[16]</sup>	24 %	28 %	2 %		20 %	1 %
Ali R Jassim et al 2016. <sup>[17]</sup>	20%	6 %	8 %	3 %	31 %	24 %
The current study results	54.8	17.6	12.3	6.1	3.5	5.3

Table 4.1: Multiple studies with various types of CHD.

As the study findings were hospital based, ventricular septal defect (VSD) is the commonest congenital heart disease, in contrast to other recorded results by other studies. Tetralogy of Fallot (TOF) was the second most congenital lesions (17.6%) in this study and this relatively less than that recorded by Ziad A Rasheed et al.<sup>[16]</sup>

Patent ductus arteriosus showed to be the third most common congenital lesions and the second most common a cyanotic lesion, and this is compatible with Samira Telfah Abdilghani Alaani et al.<sup>[15]</sup>

The incidence of transposition of great arteries in this study is 6.1% which is more than that of Ali R Jassim et al.<sup>[17]</sup> From the other hand; the study revealed that there was lower incidence of ASD in comparison with Samira Telfah Abdilghani Alaani et al., Ziad A Rasheed et al and Ali R Jassim et al.<sup>[15-17]</sup>

The distribution of incidence of congenital heart disease between male and female confirm there is slight male predominance which is runs with Neeraj Kumar Jat et al study results.<sup>[18]</sup>

Regarding the age at which the diagnosis had been done the study indicate that the patients with left to right shunts (VSD & PDA) mostly presented during the first 6 months of life (71%) while the patients with TOF mostly presents in second 6 months of their age (75%) and only severe cases can present during the 1<sup>st</sup> 6 months. All patient with diagnostic TGA present within the first few months of life and this compatible with the natural history of this disease.<sup>[19]</sup>

In this study, the main cause of presentation of patients with left to right lesions (VSD, PDA, ASD) were chest infection (67.3%) and heart failure (22%) and this explained by excessive pulmonary blood flow which results in heart failure and recurrent pulmonary infection while few patients (8.1%) can presents with cyanosis result from high pulmonary vascular resistant with bidirectional or right to left shunt and this caused by long standing left to right shunt or in some infants with large VSD or PDA pulmonary arteriolar medial thickness never decrease. From the other hand; cyanosis was the

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main presenting cause of patients with right to left shunt (88.8 %) and this explained on the pathophysiological mechanism of right to left shunt or caused by hyper cyanotic spells which is the most common complications of patients with TOF, few patients (11.1%) presents with respiratory infection, and this can result from increase pulmonary blood flow resulted from mild right ventricular outflow tract obstruction. Heart failure which is the most common presenting feature of patients with left to right is rare (if ever) in the patients with right to left shunt. These finding were consistent with Xiao Meng et al literature review.<sup>[20]</sup>

The evaluation of growth of the study patients revealed that the majority of patients (68.6%) with left to right shunts had poor growth state while most (70.3%) with cyanotic congenital heart had weight >  $3^{rd}$  centile and only minority (29.7%) had poor weight gain and this compatible with Luma Ibrahim Khalel Al-Allaf et al study findings.<sup>[21]</sup>

A major limitation of this study is the lack of a healthy control group, which could have led to bias in the data. Another limitation is the relatively small sample size. A larger sample size could have resulted in more accurate reporting of frequencies. The study only included hospitalized children during the study period, this may have resulted in important cases being missed.

## 5. CONCLUSION

Ventricular septal defect is the most common type of congenital heart disease and the most common cause of morbidity, while ASD and PS is the least cause of morbidity in patients with congenital heart disease. The most common mode of presentation of patients with CHD are respiratory infection, heart failure in a cyanotic CHD while cyanosis is the most common presentation in cyanotic group. PDA and ASD are more common in female patients while all other lesions a slight male predominance is present. Growth failure is common in patients with left to right shunts while it is uncommon in cyanotic patients.

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## **Conflict of intertest**

About this study, the authors disclose no conflicts of interest.

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