

Frequency and Pattern of Congenital Heart Disease Among Neonates

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Abstract

Background: Congenital heart disease (CHD) is among the most common congenital anomalies and a major contributor to neonatal morbidity and mortality worldwide. Epidemiological data regarding the distribution of CHD among Iraqi neonates remain limited.

Objective: To determine the frequency and pattern of CHD among neonates referred for echocardiography in Al-Diwaniyah, Iraq.

Methods: A hospital-based cross-sectional observational study was conducted from February to December 2024. A total of 934 neonates suspected of having CHD underwent echocardiographic examination. Diagnoses were classified into cyanotic and acyanotic CHD. Data were analysed using SPSS. Categorical variables were compared using Chi-square tests.

Results: Of 934 neonates, 600 (64.2%) were males and 334 (35.8%) were females. The most common lesions were ASD, VSD, and PDA. Cyanotic CHD such as TOF and TGA were less frequent. Monthly Chi-square analysis revealed no statistically significant association between sex and diagnosis distribution ($p > 0.05$).

Conclusion: ASD, VSD, and PDA were the most frequent echocardiographic diagnoses. Although male predominance was observed, the distribution of CHD types did not significantly differ

by sex. Early echocardiographic screening remains essential for timely detection and management.

Introduction

The concept of congenital heart disease (CHD) is used to describe any structural or functional defect of the heart or great vessels that develops in fetal life and is observable at birth, although it can be identified at an older age [1]. The CHD is the most prevalent congenital anomaly worldwide and it leads to a significant morbidity and mortality among the new-born [2]. CHD is not just a burden during infancy since individuals who are already patients need lifelong follow-up, and they are likely to develop complications during adulthood [3].

The prevalence of CHD in different parts of the world is estimated to be 4-10 per 1,000 live births, but its distribution varies according to geographic areas due to genetic, environmental, socioeconomic, and diagnostic factors [2,4]. Better availability of diagnostics especially echocardiography has increased the rate of detection especially of mild and moderate lesions including ASD and VSD [5].

Although CHD has clinical significance, epidemiological data about the prevalence and distribution of neonatal CHD in Iraq is scanty. Most neonates do not present with early clinical manifestations and hence result in late diagnosis and avoidable complications. Thus, there is a need to use local hospital-related data to inform screening strategy and resource planning.

This study had the following objectives:

1. To find out the prevalence of the echocardiographic results in neonates who are referred to the hospital due to suspected CHI in Al-Diwaniyah, Iraq.
2. To determine the prevalent types of congenital heart defects that were identified using echocardiography.
3. To estimate sex-specific variations in the distribution of CHD.

Research Questions

1. How commonly does CHD occur with neonates who were referred to echocardiography in Al-Diwaniyah?
2. What are the most prevalent types of CHD found?
3. Do sex and distribution of echocardiographic diagnoses have a statistically significant association?

Literature Review

A number of studies conducted in the international arena have confirmed that CHD is a major cause of morbidity in neonatal stage. According to Van der Linde et al., the prevalence of CHD in the world differed significantly, due to the disparity in the access to healthcare services and the ability to diagnose the disease [2]. Rahim et al. reported CHD prevalence in Iran like that in the rest of the world [6]. In China, Pan et al. found that socioeconomic and geographic variables have a significant impact on the rate of CHD detection, and ASD is one of the most prevalent lesions [7].

Septal defects (ASD and VSD) and PDA have been documented as the most common acyanotic CHD defects in all parts of the world, with cyanotic lesions including TOF and TGA being less common, but having higher mortality without intervention [8].

This paper is informed by an epidemiological paradigm focusing on the distribution of the disease in individuals (sex), place (Al-Diwaniyah), and time (monthly changes). Diagnosis using echocardiography is regarded as a gold standard test in making a solid classification of CHD lesions, which enhances the detection of the major and minor defects [5].

Even though CHD is a well-investigated disease worldwide, little has been published regarding the neonatal CHD distribution in Iraq. Majority of the data available come as a result of other countries in the Middle East or Asia. Also, there is a dearth of research in Iraq with patterns of monthly distribution or assessing sex-specific differences in diagnoses. This research paper will fill these gaps.

Methodology

The study was a cross-sectional observational study, which was carried out at the Al-Diwaniyah Maternity and Children Teaching Hospital in Iraq, a period of 11 months, February to December 2024.

The target group was the neonates who refer to the suspected congenital heart disease and whose age was at 0-28 days. The sample size was 934 (including 600 males (64.2), and 334 females (35.8)).

Inclusion Criteria

- Neonates (≤ 28 days old).
- Clinically suspected CHD (murmur, cyanosis, respiratory distress, abnormal pulse oximetry, or failure to thrive).
- Echocardiography performed during the study period.

Exclusion Criteria

- Incomplete echocardiographic records.
- Repeat echocardiography of the same neonate (only first evaluation included).

Echocardiographic assessment of all the neonates was done by trained pediatric cardiologists with standard echocardiographic guidelines. Diagnoses were documented and were as follows:

ASD, VSD, PDA, ASD+VSD, pulmonary stenosis (PS), coarctation of aorta (COA).

- Cyanotic CHD: tetralogy of Fallot (TOF), great arterial transposition (TGA).

The additional observations included LVH and DCM.

The SPSS software was used to analyze the data.

- Descriptive statistics were in form of frequency and percentage.

Type of association Chi-square was employed to test the relationship between sex and echocardiographic diagnoses.

A p-value that was below 0.05 was taken to be statistically significant.

Ethics and Compliance

The research was done in compliance with the Declaration of Helsinki. The Ethics Committee of Al-Diwaniyah Maternity and Children Teaching hospital gave ethical consent.

Conflict of Interest

No conflict of interests with regard to this study is mentioned by the authors.

Informed Consent

All neonates had informed consent taken before echocardiographic examination by the parents or legal guardians.

Table 1: Monthly Distribution of Echocardiographic Findings Among Neonates Referred for Suspected Congenital Heart Disease (February–December 2024)

Month	Sex	ASD	VSD	PDA	ASD+VSD	TOF	PS	LVH	DCM	COA	TGA	p-value
Feb	Male	18	6	6	0	1	1	0	0	0	0	0.66
	Female	12	1	3	0	0	1	0	0	0	0	
Mar	Male	14	10	4	0	1	0	0	0	0	0	0.22
	Female	10	13	9	0	1	0	0	0	0	0	
Apr	Male	3	20	7	0	0	0	3	2	0	0	0.93
	Female	1	12	5	0	0	0	1	2	0	0	
May	Male	0	0	0	7	0	0	0	0	0	0	0.26
	Female	0	0	0	8	3	0	1	0	0	0	
Jun	Male	0	0	3	10	0	0	2	0	0	0	0.14
	Female	0	0	1	13	0	0	7	0	0	0	
Jul	Male	0	0	9	15	0	0	0	0	0	0	1
	Female	0	0	2	7	0	0	0	0	1	0	
Aug	Male	0	0	3	6	0	0	2	0	0	0	0.5
	Female	0	0	0	8	0	0	1	0	0	0	
Sep	Male	2	5	3	0	0	2	0	0	0	0	0.31
	Female	5	5	1	0	0	0	0	0	0	0	
Oct	Male	25	10	7	0	2	2	1	0	0	2	0.15
	Female	7	6	0	0	0	0	1	1	0	0	
Nov	Male	14	7	10	0	0	1	3	1	0	0	0.45
	Female	10	5	1	0	0	1	1	1	0	0	
Dec	Male	9	7	7	0	0	0	1	1	1	0	0.46
	Female	0	7	3	0	0	0	0	0	1	0	

ASD = Atrial Septal Defect; VSD = Ventricular Septal Defect; PDA = Patent Ductus Arteriosus; ASD+VSD = Atrial Septal Defect with Ventricular Septal Defect; TOF = Tetralogy of Fallot; PS = Pulmonary Stenosis; LVH = Left Ventricular Hypertrophy; DCM = Dilated Cardiomyopathy; COA = Coarctation of the Aorta; TGA = Transposition of the Great Arteries.

Results

Echocardiography was done on 934 neonates. The number of referrals that happened monthly was uneven with highest referrals of February and October. During the study period, male neonates were a larger percentage of referrals.

Out of the entire sample, 600 (64.2) were males and 334 (35.8) were females. A significant percentage of the neonates had normal echocardiographic images, and the rest had congenital cardiac lesions.

The commonly identified abnormalities were ASD, VSD, PDA, and ASD+ VSD. TOF and TGA were rare cyanotic lesions.

The relationships between sex and echocardiographic diagnosis were tested by monthly Chi-square tests. The findings established that the relationship between sex and type of diagnosis was not statistically significant ($p < 0.05$) in all months. This suggests that, as much as males were referred more often, the trend of diagnoses was not different between male and female neonates.

Discussion

This paper explored the prevalence and spread of echocardiographic diagnosis of neonates who were suspected of having CHD in Al-Diwaniyah. The results established that the most frequent abnormalities were acyanotic lesions, especially ASD, VSD and PDA, and cyanotic lesions like TOF and TGA were less prevalent. Such results are in line with the known epidemiological trends of CHD.

The referral population was found to be male dominated. Nevertheless, Chi-square test failed to show statistically significant sex differences in the distribution of the diagnosis, indicating that sex is not a strong factor in the type of CHD diagnosed in the population.

The results are consistent with the world evidence that septal defect and PDA are the most frequent congenital lesions of the heart among the infants [2,8]. The same findings have been established in Iran, the prevalence of CHD and their patterns of distributions are similar to the current study [6,9]. ASD has been cited as one of the most prevalent lesions in China that are identified following neonatal screening programs [7].

A decreasing rate of cyanotic lesions in this research is also in line with the reports of other countries where cyanotic CHD is usually a minor percentage of the total CHD cases but is clinically more severe [8].

The research results give valuable local epidemiological data that can be used to enhance neonatal screening interventions in Iraq. Echocardiography screening at an early stage can enable CHD to be detected promptly especially in newborns who do not exhibit any noticeable pathological symptoms. Health policy makers can also use these findings in making plans in providing pediatric cardiology services and allocating resources towards neonatal cardiac care.

Limitations

This was a study that was conducted in a hospital and this can be limiting in generalizing it to the overall neonatal population. The study was conducted in neonates who were thus referred because of suspected CHD but not a population-based screening sample.

The male dominance may have been caused by referral bias. Also, the mild cases might have been overrepresented because of the enhanced echocardiographic recognition.

The future research must incorporate a population-based design, maternal risk factors, and long-term outcomes of the diagnosed neonates. More studies should also be done to find out the actual CHD per 1000 live births in Iraq.

Conclusion

In this paper, the authors evaluated echocardiographic result of 934 children who were referred with suspected congenital heart disease in Al-Diwaniyah, Iraq. The most abnormalities that were detected

were acyanotic lesions, especially ASD, VSD, and PDA. Less common was cyanotic CHD like TOF and TGA. Male neonates had a larger percentage of referrals, though there was no significant difference in distribution of the diagnoses in males and females.

Recommendations

- Routine neonatal echocardiographic screening should be strengthened, especially for high-risk neonates.
- Pediatric cardiology services should be expanded to support early detection and management.
- Future epidemiological studies should include population-level screening and risk factor assessment.

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