Original Article

Assessing Congenital Heart Disease Subtypes Prevalence in Neonates: A Retrospective Study

CHD Subtypes Through Echocardiographic Findings

Zaland Ahmed[1],Ijaz Hussain[4], Saadia Ilyas[2], Alia Abdul Haq[3], Faiza Fayyaz[3] and Ghazala[3]

ABSTRACT

Objective: Determine the prevalence of CHD subtypes through echocardiographic findings.
Study Design: A retrospective study.
Place and Duration of Study: This study was conducted at a tertiary care hospital Peshawar from July to December 2023.
Methods: A six-month retrospective study was conducted at a tertiary care facility from July to December 2023. From the nursery department, 945 newborns were referred. Thorough examination of the echocardiography data, neonatal screening results, and departmental records were done for data retrieval. Approval from the institutional review board was obtained, data anonymization, and observance of patient privacy was insured.
Results: A total of 945 newborns with a mean age of 7 days were referred from the neonatal unit. Among the clinical manifestations were poor eating (17.8%), tachypnea (26.1%), and cyanosis (40%). Clinical suspicion of CHD (62.8%) and abnormal results from neonatal screening tests (276.6%) were the reasons for referral. Various congenital heart diseases were detected by echocardiographic findings: 314 neonates (33.2%) had ventricular septal defect, 209 had atrial septal defects, 168 had patent ductus arteriosus (17.7%), 63 had transposition of the great arteries (6.7%), and 127 had tetralogy of Fallot (13.4%). Tetralogy of Fallot and transposition of the greater arteries were associated with cyanosis ($p < 0.05$). Isolated ventricular septal anomalies were linked to poor feeding and underdevelopment ($p < 0.05$).
Conclusion: Our study highlights the frequency of complicated congenital cardiac abnormalities, patent ductus arteriosus, and ventricular and atrial septal defects. Relationships between certain anomalies and clinical manifestations highlight how complex newborn cardiac disease is. Optimizing outcomes requires the coordinated efforts of healthcare specialists. Our findings, while admitting research limitations, are consistent with the necessity for cooperative methods and early therapies in newborns with congenital heart problems. To improve generalizability and evaluate the effects of long-term interventions on newborn outcomes, prospective, multicenter studies are necessary.
Key Words: Neonatal cardiology, Congenital heart disease, Echocardiography, Referral patterns

Citation of article: Ahmed Z, Hussain I, Ilyas S, 4. Abdul Haq A, Fayyaz F, Ghazala. Assessing Congenital Heart Disease Subtypes Prevalence in Neonates: A Retrospective Study. Med Forum 2024;35(3):47-51. doi:10.60110/medforum.350311.

INTRODUCTION

Nearly eight out of every one thousand live newborns around the world are affected by congenital heart disease (CHD), which continues to be one of the top causes of morbidity and mortality among neonates[1].

[1.] Medical Officer Lady Reading Hospital Peshawar.
[2.] Department of Pediatric Cardiology / Trainee Pediatrics[3], Lady Reading Hospital- Peshawar.
[4.] Department of Pediatric Cardiology Peshawar Institute of Cardiology, Peshawar

Correspondence: Saadia Ilyas, Head of Department Depart of Pediatric Cardiology Lady Reading Hospital- Peshawar.
Contact No: 0333 9112912
Email: saadia76@gmail.com

Received: January, 2024
Accepted: February, 2024
Printed: March, 2024

In neonates, coronary cardiac disease (CHD) encompasses a wide range of anatomical abnormalities and physiological changes, each of which presents its own set of obstacles when it comes to managing and diagnosing the condition[2].

Early identification is essential for achieving the best possible outcomes[3]. Although some cases of coronary cardiac disease (CHD) are characterized by cyanosis, others may appear with less obvious signs or even stay asymptomatic. A susceptible demographic that requires careful monitoring and prompt management in situations of suspected cardiac pathology is the neonate population, particularly those who have been admitted to the nursery department[4].

Whether cardiac abnormalities are suspected or verified, pediatric cardiology consultations are an essential component in the process of evaluating and treating infants who have these conditions. Within the context of these consultations, detailed

echocardiographic evaluations are frequently performed in order to outline the anatomy and function of the cardiac[5]. The results of an echocardiogram provide vital information about the kind and severity of cardiac abnormalities, which helps to direct therapeutic decision-making and encourages the implementation of suitable therapies.

The literature is limited in that it concentrates only on referrals from the nursery department and the echo findings that are related with them. This is despite the fact that it is essential to comprehend the patterns and consequences of neonatal cardiology consultations. As a result, the purpose of this study is to address this deficiency by conducting a retrospective analysis of neonatal cardiology consultations that arise from the nursery department of our tertiary care facility. We hope to improve our understanding of the cardiac difficulties that are experienced by this population and to improve the quality of care that is provided by analyzing the findings of the echo and the situations that led to these consultations.

METHODS

From July 2023 to December 2023, a six-month retrospective study was carried out at Lady Reading Hospital, Peshawar, a tertiary care center in Pakistan. The hospital is a renowned referral source for pediatric cardiology.

Study Population: Newborns who were referred to the pediatric cardiology department for additional assessment of possible cardiac pathology were from the nursery department. For inclusion in the study, all newborns admitted to the nursery section during that time had to pass screening.

Inclusion Criteria: Newborns admitted to the nursery during with suspected cardiac disease based on clinical signs and symptoms during the duration of the study.

Infants with suspected cardiac pathology sent to the pediatric cardiology department for additional assessment.

Patients having complete availability of medical records, including echocardiograms reports.

Exclusion Criteria: Newborns whose medical records were not complete.

Ethical Considerations: This study was approved by the Institutional Review Board of Lady Reading Hospital in Peshawar. The data were anonymized prior to analysis, and the study respected patient confidentiality.

Data collection: For this retrospective analysis, information was collected over a six-month period, from July to December 2023, from the Hospital Management Information System (HMIS) at Lady Reading Hospital in Peshawar. Relevant data, including patient demographics, echocardiographic results, and referral reasons was retrieved for neonates that were referred to the pediatric cardiology department. These details, including patient information, echocardiography results, and referral indications, were assembled into an Excel file. After checking for accuracy, the data was exported to IBM SPSS 22 for statistical analysis.

Statistical Analysis: The statistical analysis was carried out using IBM SPSS 22. The chi-square test or Fisher's exact test were used to compare categorical variables, and the Mann-Whitney U test or Student's t-test were used to compare continuous variables. P-values less than 0.05 were deemed statistically significant.

RESULTS

Table No. 1: Demographic data

Parameter	Value
Total Neonates	945
Mean Age (days)	7 ± 3
Gender (Male)	546 (57.8%)
Gender (Female)	399 (42.2%)

Among the most common departmental signs cyanosis occurred in 478 instances (40%), tachypnea in 247 cases (26.7%), and poor eating in 168 cases (17.8%). Lethargy, inability to thrive, and murmur on auscultation were other less common signs. (Table 2, Figure 1)

Table No. 2: Percent distribution of departmental presentation

Departmental Presentation	Number of Cases (%)
Cyanosis	478 (40.0%)
Tachypnea	247 (26.1%)
Poor Feeding	168 (17.8%)
Lethargy	22 (2.3%)
Failure to Thrive	20 (2.1%)
Murmur on Auscultation	10 (1%)

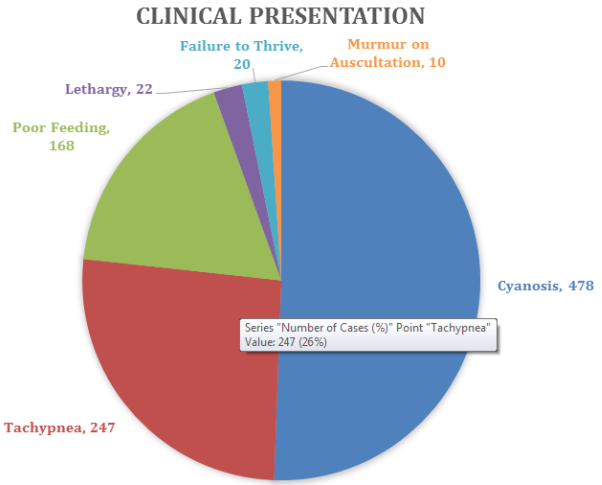

Figure No. 1: Pie-chart of departmental presentation among the individuals

Throughout the January 2023–December 2023 study duration. A total of 945 neonates were referred to the pediatric cardiology department for further testing of

suspected cardiac pathology. The neonates had a mean age of 7 days and a standard variation of 3 days at the time of referral. Males accounted for 546 (57.8%) of the neonates referred. (Table 1) Primary reasons for referral to the pediatric cardiology department were abnormal results on neonatal screening tests in 261 neonates (27.6%) and suspicion of congenital heart disease based on clinical evaluation in 594 neonates (62.8%). Furthermore, out of the newborns that received proper medical therapy, 103 babies (10.89%) were referred for additional examination due to ongoing respiratory distress. (Table 3, figure 2)

Table No. 3: Percent distribution of indications for referral

Indications for Referral	Number of Neonates (%)
Suspected CHD based on examination	594 (62.8%)
Abnormal neonatal screening tests	261 (27.6%)
Persistent respiratory distress	103 (10.9%)

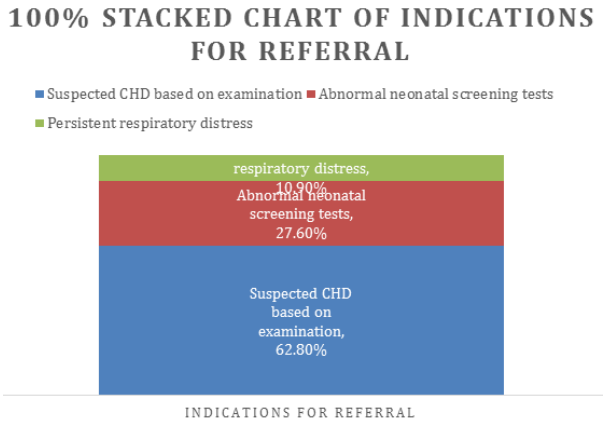

Figure No. 2: 100% stacked chart distribution of indications for referral

Table No. 4: Dichotomous percent distribution of congenital heart diseases with significant values

	Congenital Heart Diseases	Number of Cases	%	P Value
Acyanotic Heart Diseases	VSD	314	33.2%	<0.05
	ASD	209	22.1%	
	PDA	168	17.7%	
	Complex CHD	3	0.32%	
	Total	691	73.0%	
Cyanotic Heart Diseases	TOF	127	13.4%	<0.05
	TGA	63	6.7%	
	Complex CHD	10	1%	
	Total	254	26.9%	

The study cohort exhibited a wide range of heart abnormalities as determined by echocardiographic assessment. The most frequent anomalies found were patent ductus arteriosus in 168 neonates (17.7%), ventricular septal defects in 314 neonates (33.2%), and atrial septal defects in 209 neonates (22.1%). In addition, cyanotic congenital cardiac disorders were common; 63 neonates (6.7%) had Transposition of the Great Arteries, and 127 neonates (13.4%) had Tetralogy of Fallot. These results demonstrate the complexity of congenital cardiac disorders in neonates by highlighting the occurrence of both cyanotic and acyanotic lesions in the study population. Complex CHDs were another rare finding that were seen in a smaller percentage of instances. (Table 4, Figure 3)

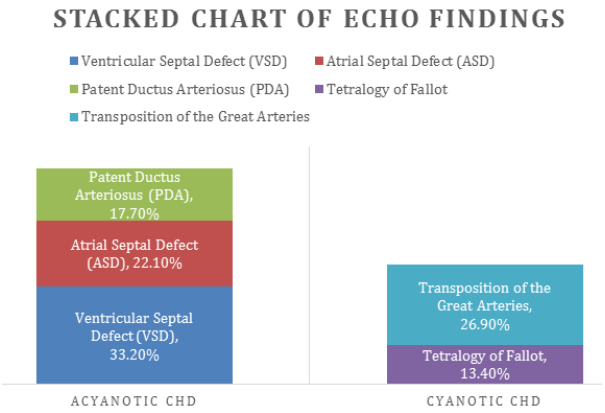

Figure No. 3: Percent stacked chart of echo findings between cyanotic and acyanotic heart diseases

By running Chi-square test a significant correlation was seen between certain heart abnormalities and specific clinical presentations. Cyanosis was significantly linked to transposition of the great arteries and tetralogy of Fallot ($p < 0.05$). (Table 4) On the other hand, newborns who presented with poor eating and failure to develop were more likely to have isolated ventricular septal abnormalities ($p < 0.05$).

DISCUSSION

The results of this study shed important light on the range of cardiac abnormalities seen in newborns sent from the nursery section to the pediatric cardiology department at Lady Reading Hospital in Peshawar. The findings of our study align with other research indicating that the most prevalent congenital heart defects in newborns are patent ductus arteriosus, ventricular septal defects, and atrial septal defects[6]. The prevalence of these lesions emphasizes how crucial it is to identify them early and take prompt action to reduce the risk of complications and enhance long-term outcomes.

Our study's observations regarding the correlation between departmental presentation and echocardiographic findings align with previous research. For example, cyanosis has been strongly linked to complex congenital heart disorders such

transposition of the great arteries and tetralogy of Fallot[7,8]. Additionally, isolated ventricular septal abnormalities were more frequently seen in newborns who did not flourish and did not eat well, supporting findings from earlier research[9,10].

Our research contributes significantly to the expanding body of evidence that underlines the fundamental role of consulting pediatric cardiologists in managing newborns suspected of having cardiac issues. It underscores the benefits of early referrals and thorough echocardiographic evaluations, enabling accurate diagnoses and prompt initiation of suitable treatments, ultimately leading to enhanced departmental outcomes[11,12]. These conclusions underscore the critical need for a collaborative approach involving neonatologists, pediatric cardiologists, and cardiac surgeons in the holistic care of neonates diagnosed with congenital heart conditions. This comprehensive and coordinated effort among medical specialists is essential for optimizing the medical management and long-term outcomes of infants with cardiac defects.

Although our study has some advantages, such as a sizable sample size and thorough echocardiographic evaluations, there are a few drawbacks that should be taken into account. The study was conducted at a single center, which limited the generalizability of the results to other settings, and the retrospective methodology may have introduced selection bias. Furthermore, departmental information may not have been documented accurately or completely as a result of the data extraction process's reliance on medical records[13,14].

To confirm our results and clarify the epidemiology and departmental features of congenital heart disease in newborns, future investigations should concentrate on prospective, multicenter studies. To evaluate the effect of early intervention on long-term outcomes, such as morbidity and mortality rates, longitudinal follow-up studies are also required. The treatment and prognosis of newborns with congenital heart disease can be further enhanced by filling in these information gaps.

CONCLUSION

Our study highlights the frequency of complicated congenital cardiac abnormalities, patent ductus arteriosus, and ventricular and atrial septal defects. Relationships between certain anomalies and clinical manifestations highlight how complex newborn cardiac disease is. Optimizing outcomes requires the coordinated efforts of healthcare specialists. Our findings, while admitting research limitations, are consistent with the necessity for cooperative methods and early therapies in newborns with congenital heart problems. To improve generalizability and evaluate the effects of long-term interventions on newborn outcomes, prospective, multicenter studies are necessary.

Author's Contribution:

Concept & Design of Study:	Zaland Ahmed
Drafting:	Ijaz Hussain, Saadia Ilyas
Data Analysis:	Alia Abdul Haq, Faiza Fayyaz, Ghazala
Revisiting Critically:	Zaland Ahmed, Ijaz Hussain
Final Approval of version:	Zaland Ahmed

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.ERB-1180/07/2020 Dated 15.07.2022

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