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Original Article

Pattern of Congenital Heart Diseases among Term and Preterm Neonates in a Tertiary Care Hospital of a Developing Country

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ABSTRACT

Objective: To determine the frequency and pattern of various congenital heart diseases in a tertiary care hospital neonatal unit.

Study Design: Prospective longitudinal study.

Place and Duration of Study: Neonatal Unit of Pak Emirates Military Hospital, Rawalpindi Pakistan from Jul 2015 to Jun 2018.

Methodology: All neonates admitted to the Neonatal Unit of Pak Emirates Military Hospital, Rawalpindi Pakistan, suspected of having congenital heart disease were included in the study. Suspicion for CHD was based on the presence of murmur, cyanosis with or without feeding difficulty, signs of congestive heart failure, and variation in pre and post-ductal SpO^2 reading. Echocardiography was performed on all neonates by a Paediatric cardiologist to determine diagnosis and type of lesion.

Results: One hundred and thirty-one neonates were found to have congenital heart disease with male predominance, with 79(60.3%) males and 52(39.7%) females. Ventricular Septal Defect (VSD) was the most common lesion occurring in 44(33.6%) neonates, followed by PDA in 28(21.37%) neonates. CHD occurred more frequently in term neonates (62.0%) than preterm neonates (38.0%).

Conclusion: Congenital heart disease is the most common congenital malformation, with Asia having the highest prevalence worldwide. Lack of specialized antenatal and neonatal health services and paucity of diagnostic facilities lead to delays in diagnosis, increasing morbidity and mortality of CHD cases. Therefore, drastic measures are required to improve neonatal health and transport facilities in our country to mitigate the impact of this disease.

Keywords: Congenital heart disease, Neonates, Pakistan.

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INTRODUCTION

Congenital heart disease (CHD) is a group of malformations leading to structural and functional defects in the heart or great vessels at birth. They are a major health burden worldwide, with an estimated 30% of congenital anomalies involving heart defects.[1–3] CHD has a wide spectrum of clinical presentations, with some remaining asymptomatic, only to be discovered incidentally in late infancy or early childhood. At the same time, other extremes present with cyanosis, heart failure or both in neonatal age.[4,5] Furthermore, CHD in neonates has been linked with poor neurodevelopment outcomes and an increased risk of.[6,7] Therefore, a meticulous physical examination of a newborn and auscultation of the heart with timely Echocardiography are pivotal in prompt diagnosis and treatment measures, thus reducing the morbidity and mortality associated with late diagnosis.[8]

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Literature review reveals a wide variation in the prevalence of CHD worldwide, ranging from 4 to 9 per 1000 live births. However, an estimated 8 per 1000 live births is generally acknowledged.[2,3,9] Asia is considered to have the highest prevalence, 9.3 per 1000 live births worldwide. In Pakistan, different studies have been done at various hospitals, estimating the prevalence of CHD. However, there is no large-scale study available to provide a national estimate of this disease's burden.

This study was conducted in the NICU of a tertiary care hospital to observe the pattern of congenital heart disease in term and preterm neonates.

METHODOLOGY

This prospective longitudinal study was conducted at the NICU of Pak Emirates Military Hospital Rawalpindi from July 2015 to June 2018 after seeking approval from the Hospital Ethical Committee (A/28/EC401/22).

Inclusion Criteria: All neonates in the Neonatal Unit, including in-hospital deliveries and referrals from

other hospitals or home deliveries, confirmed to have congenital heart disease on Echocardiography were included in the study after seeking parental approval.

Exclusion Criteria: Critically ill babies who expired before Echocardiography could be performed were excluded from the data.

Non-probability consecutive sampling technique was employed. A Neonatologist examined all neonates suspected of CHD, and Echocardiography performed by a Pae-diatric Cardiologist confirmed their diagnosis. Suspi-cion for CHD was based on the presence of murmur, cyanosis with or without feeding difficulty, signs of congestive heart failure, and pre and post-ductal SpO^2 gradient of more than >3%. Prematurity, presence of a dysmorphic feature and infants of Diabetic mothers were also screened for CHD.

Patient characteristics, including age, gender, gestational age at birth, weight, mode of delivery, presence of other anomalies and diagnosis, were recorded on designated proformas. Statistical Package for Social Sciences (SPSS) version 20.0 was used for the data analysis. and descriptive statistics, including frequency and percentages, were calculated.

RESULTS

During the study period, a total of 209 neonates were evaluated. There were 131(62.7%) males and 78 (37.3%) female neonates. The mean age at the presentation time was noted to be 5.29±5.85 days, while the mean gestational age was 36.56±2.18 weeks. 84(40.2%) neonates were delivered through spontaneous vaginal delivery (SVD), while 125(59.8%) were born via lower segment caesarean section. Mean birth weight was noted to be 2.57±0.68 kg. In a total of 209 patients, 131 (62.7%) were found to have congenital heart defects (CHD), while the remaining 78(27.3%) had normal findings. In CHD cases (131), there were 79(60.3%) males and 52(39.7%) female babies. Table-I showed the characteristics of neonates with CHD.

Table-I: Characteristics of Neonates having Congenital Heart Disease (n=131).

Characteristics		Frequency (%)
Age (days) (Mean±SD)		4.97+5.38
Birth-weight (kg)(Mean±SD)		2.49+0.72
Gestational Age (weeks)(Mean±SD)		36.35+2.25
Gestational Age	Pre-Term	50 (38.2)
	Term	81 (61.8)
Gender	Male	79 (60.3)
	Female	52 (39.7)
Mode of Delivery	Spontaneous Vaginal Delivery	48 (36.6)
	Lower Segment Cesarean Section	83 (63.4)

Table-II showed the gender-wise distribution of CHD cases and no statistically significant difference (p=0.498). Table-III showed the frequency of CHD among term and preterm Neonates. We found CHD to occur frequently in term babies as compared to preterm. However, no statistically significant difference could be found (p=0.604)

Table-II: Gender wise Distribution of Neonates having Congenital Heart Disease (n=131).

Congenital Heart Disease Types	Male Neonates (n=79) n(%)	Females Neonates (n=52) n(%)	*p*-value
VSD	25(31.6)	19(36.5)	0.498
PDA	20(25.3)	8(15.4)	
ASD	12(15.2)	5(9.6)	
AVSD	2(2.5)	7(13.5)	
Complex CHD	4(5.1)	4(7.7)	
TOF	4(5.1)	2(3.8)	
TGA	2(2.5)	1(1.9)	
Pulm Stenosis	2(2.5)	0	
Dextrocardia	2(2.5)	0	
HLHS	1(1.3)	1(1.9)	
Truncus Aretriosus	1(1.3)	1(1.9)	
Coarctation of Aorta	1(1.3)	1(1.9)	
TAPVR	0	1(1.9)	
Tricuspid Atresia	1(1.3)	0	
Others	2(2.5)	2(3.8)	

Table-III: Gestation wise Distribution of Neonates having Congenital Heart Disease (n=131).

Congenital Heart Disease Types	Preterm Neonates (n =50) n(%)	Term Neonates (n=81) n(%)	*p*-value
VSD	14(28.0)	30(37.0)	0.604
PDA	19(38.0)	9(11.1)	
ASD	7(14.0)	10(12.3)	
AVSD	6(12.0)	3(3.7)	
Complex CHD	1(2.0)	7(8.6)	
TOF	1(2.0)	5(6.2)	
TGA	1(2.0)	2(2.5)	
Dextrocardia	0	2(2.5)	
Pulm Stenosis	0	2(2.5)	
Truncus Aretriosus	0	2(2.5)	
HLHS	0	2(2.5)	
Coarctation of Aorta	0	2(2.5)	
PAPVR	0	1(1.2)	
Tricuspid Atresia	0	1(1.2)	
Others	1(2.0)	3(3.7)	

DISCUSSION

Congenital Heart Disease is the most common congenital anomaly and has significant mortality and morbidity in infancy, especially in developing coun-

tries like Pakistan. Lack of specialized antenatal and neonatal care, diagnostic facilities and out-of-hospital deliveries with poor transport modalities result in delayed diagnosis of many cases.[10] As a result, most cases present to a tertiary care facility when complications have already occurred, leading to an increased mortality rate of CHD. This study was conducted to estimate the prevalence and pattern of congenital heart diseases in a neonatal unit of a tertiary care hospital in a developing country.

A total of 131 patients were enrolled in our study. We found male predominance with a total of 79(60.3%) males and 52(39.7%) females, which is consistent with similar studies in the region.[5,9,11,12] However, there was no statistically significant difference in CHD among males and females. A gender-wise comparison of congenital heart defects revealed that critical CHD(TOF, TGA) were more likely to occur in males. AVSD was the only CHD that occurred more frequently in females compared to males (77.7% vs 22.3%), while all other CHD was found to occur more commonly in males. Bibi *et al.* also found VSD, TGA and TOF more frequent in males, similar to our results, but contrary to our study, they found ASD and PDA prevalent in females.[11] Another study in Taiwan found AVSD prevalent in females in congruence with our results.[13]

VSD was the most common anomaly in 44 patients (33.6%). Multiple studies in Pakistan and the region also found VSD the most frequently found congenital cardiac defect.[9,11,12,14–16] A review article including 114 papers from all over the world found VSD to be the most common defect in the last 50 years.[2] Bibi *et al.* found VSD in 38% of patients.[11] Another study by Hussain *et al.* in CMH Rawalpindi found VSD in 31% of neonates from 2008 to 2011.[17] However, a study in Karachi found TOF to be the most common CHD in contrast to our results.[1]

We found CHD more frequently in Term neonates compared to Preterm babies (62% vs 38%). PDA and AVSD were the only CHD more frequent in preterm neonates, 68% and 66%, respectively. This is in contrast to Hussain et al. who found 63% of cases in preterm neonates. Another study by Fatema *et al.* in Bangladesh showed results similar to ours, with 55.6% of term neonates having CHD.[18] Cyanotic Heart Diseases were also common in Term babies in comparison to preterm neonates TOF (83.3% vs 16.7%), complex CHD (87.5% vs 12.5%), TGA (66.7% vs 33.3%) and HLHS was found in two babies who were both born at term.[19]

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LIMITATION OF STUDY

We only included neonates admitted to NICU, and asymptomatic neonates with CHD could not be screened due to the study design.

CONCLUSION

Congenital Heart disease is a frequently encountered problem in Neonatal Intensive Care units. According to estimates, half of the babies are stillborn in Pakistan hospitals. Moreover, there is a lack of adequate Neonatal facilities with trained healthcare staff and specialized equipment in rural areas. These factors lead to delayed diagnosis and therefore increase mortality in CHD. Therefore, measures should be taken to educate the masses about the importance of an early neonatal check-up in an adequately equipped facility, along with developing Neonatal care units and transport facilities in rural areas to facilitate babies at risk.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

FAS & AWS: Study design, data analysis, critical review, drafting the manuscript, critical review, approval of the final version to be published.

AA & BA: Conception, data acquisition, data interpretation, drafting the manuscript, approval of the final version to be published.

SAHS & AA: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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