

Congenital Heart Disease Among Neonates in a Neonatal Unit of a Tertiary Care Hospital

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ABSTRACT

Objective: To determine the pattern of Congenital Heart Disease among neonates in a neonatal unit of a tertiary care hospital.

Study Design: Cross-sectional study.

Place and Duration of Study: The study was conducted at Neonatal Intensive Care Unit of Pak Emirates Military Hospital, Rawalpindi Pakistan, from Aug 2020 to Jan 2021.

Methodology: A total of 287 participants were enrolled in the study using non-probability consecutive sampling. Echocardiogram was used as a tool to diagnose congenital heart disease.

Results: Among 287 neonates, the mean weight was 2.36 ± 0.73 kg with 49.5% being males and 50.5% females. Most of the neonates were delivered by Lower Segment Cesarean Section (227, 79.1%), while rest (60, 20.9%) were by spontaneous vaginal delivery. Neonates were mostly born at full term (159, 55.4%), followed by preterm (99, 34.5%), and early term (29, 10.1%). Only 34(11.8%) of the neonates showed any Congenital Heart Disease. Ventricular Septal Defect was the most common Congenital Heart Disease defect (15, 44.1%), followed by Patent Ductus Arteriosus (10, 29.4%) and Teratology of Fallot (4, 11.8%), while least common was Pulmonary Atresia (1, 2.9%). The relationship of Congenital Heart Disease with gender, mode of delivery, gestational age, and outcome of the neonate was found to be not significant.

Conclusion: A small proportion of the neonates had Congenital Heart Disease with no significant relationship with gender, delivery mode, gestational age, and outcome of the neonate.

Keywords: Congenital Health Disease (CHD); Prevalence; Neonatal Intensive Care Unit (NICU); Outcome; Ventricular Septal Defect (VSD).

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INTRODUCTION

Congenital heart disease (CHD) is the most common congenital birth defect in newborns varying incidence among different ethnicities and geographical regions.¹ CHD is defined as a major structural malformation of the heart and its vessels, which mostly presents soon after birth.² It constitutes the majority of various cardiac disorders encountered amongst pediatric population with an incidence of up to 7-10 per 1000 live births.³ A high index of suspicion must be kept for CHD in Neonatal Intensive Care Units (NICU) as it frequently mimics conditions such as sepsis, metabolic disorders or pulmonary hypertension. Clinical presentation of CHD in neonates varies from asymptomatic cardiac murmurs to severe clinical cyanosis and cardiogenic shock.⁴ In Pakistan, only a few studies have been conducted to know the scale of CHD, with most of the studies being from hospitals, due to which the actual scope of the problem might not be appreciated. Indeed, the reported prevalence in

Pakistan from literature varies from 16.76-60%.^{5,6} It is considered that 80-90% of the cases might be due to abnormality in genetic makeup, wherein Classic Mendelian single gene defects accounts for about 3.5% of the total abnormality, but statistics among siblings reveals that among firstborn twins, 1.85% show CHD, followed by 1.16% among full siblings, and finally 1.01% among half siblings.^{7,8} Additionally, environmental factors are also implicated in causing CHD, such as exposure to Thalidomide and rubella virus during pregnancy.^{1,8} There is significant morbidity and mortality associated with CHD in infancy accounting for up to 3% of mortality.⁹ Similarly, the association with gestation age and CHD is yet to be clarified. In defects caused by CHD, ventricular septal defect (VSD) has been noted as the most common lesion followed by patent ductus arteriosus (PDA).⁸ Thus, timely detection of neonatal CHD in antenatal stage through fetal echocardiography can prove to be lifesaving.¹⁰ Our study aimed to determine the frequency of CHD in neonates admitted in NICU of a large tertiary care hospital. The rationale behind our study was to determine the relationship of CHD with gender,

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gestational age, mode of delivery and outcome as this would help to prioritize patients for treatment, leading to better prognosis.

METHODOLOGY

The cross-sectional study was conducted at Neonatal Intensive Care Unit (NICU) of Pak Emirates Military Hospital (PEMH), Rawalpindi, Pakistan, after taking Ethics permission from Ethics Review Board of Pak Emirates Military Hospital, Rawalpindi, as per letter vide No: A/28/EC/208/2020, dated 8th September 2020. The study duration was six months, conducted from August 2020 to January 2021. Sample size was calculated as per WHO calculator, keeping the prevalence of congenital heart disease as 4.9%.⁶ The participants were enrolled in the study using non-probability consecutive sampling.

Inclusion Criteria: All newborns, regardless of weight or gender, admitted to the NICU were included.

Exclusion Criteria: Neonates not eligible for pre-requisite investigations were excluded.

All the neonates were examined clinically. Neonates with suspicious murmurs were evaluated using echocardiography.¹¹ The gestation age of the neonate was categorized as preterm (born before 37 weeks), early term (born between 37 week and 0 days to 38 weeks and 6 days), full term (born between 39 weeks and 0 days to 40 weeks and 6 days), late term (born between 41 weeks and 0 days to 41 weeks and 6 days), and post term (born after 42 weeks).

A pre-designed data collection tool was used to record all variable, which were later analyzed using Statistical Package for the Social Sciences (SPSS) v.25.0. Descriptives, like mean with standard deviation, and frequencies with percentages, were calculated for the numerical and categorical variables, respectively. Inferential and advanced statistics like chi-square test were applied to see the relationship between different categorical variables (gender, gestational mode etc.) with congenital heart disease.

RESULTS

In a total of 287 participants, 142(49.5%) were males and 145(50.5%) were females with a mean weight of 2.36±0.73 kg. Maximum neonates were delivered by Lower Segment Cesarean Section (LSCS) (227, 79.1%), while remaining (60, 20.9%) were delivered by Spontaneous Vaginal Delivery (SVD). Majority of the patients were full term (159, 55.4%), followed by pre-term (99, 34.5%), and early term neonates (29, 10.1%). Most of the neonates were

discharged (222, 77.4%), while 65 (22.6%) died in NICU. Only 34(11.8%) of the neonates had congenital heart disease. Details regarding type of congenital heart disease is given in Table-I. Association between different variables and congenital heart diseases was measured and no significant correlation of CHD with gender (*p*-value=0.948), mode of delivery (*p*-value=0.40), gestational age (*p*-value=0.97), and outcome of the neonate (*p*-value=0.15), as shown in Table-II.

Table-I: Defect of Congenital Heart Disease Among Neonates, (n=34)

Congenital Anomaly	n (%)
Ventricular Septal Defect	15(44.1%)
Patent Ductus Arteriosus	10(29.4%)
Teratology of Fallot	4(11.8%)
Atrial Septal Defect	2(5.9%)
Tricuspid Atresia	2(5.9%)
Pulmonary Atresia	1(2.9%)

Table-II: Relationship of Different Categorical Variables with Congenital Heart Disease (n=287)

Variable		Congenital Heart Disease n (%)		p-value
		Yes	No	
Gender	Male (n=142)	17(11.97)	125 (88.03)	0.948
	Female (n=145)	17(11.72)	128 (88.28)	
Mode of Delivery	LSCS (n=227)	25(11.01%)	202 (88.99)	0.40
	SVD (n=60)	9(15)	51 (85)	
Gestational Age	Preterm (n=99)	12(12.12)	87 (87.88)	0.97
	Early term (n=29)	3(10.34)	26 (89.66)	
	Full term (n=159)	19(11.95)	140 (88.05)	
Outcome	Discharged (n=222)	23(10.36)	199 (89.64)	0.15
	Died (n=65)	11(16.92)	54 (83.08)	

* LSCS: Lower Section Cesarean Section, SVD: Spontaneous Vaginal Delivery

DISCUSSION

This study revealed frequency of 11.8% neonates suffering from CHD, of which 44.1% had VSD. The study also noted that no significant statistical relationship existed between CHD and gender, mode of delivery, gestational age, or neonatal outcome. In our study, almost equal number of males and females were examined for CHD, and results showed same

numbers (17 each) of CHD cases in both genders. While a study from Finland showed a female predominance,⁸ another study from Pakistan, revealed male predominance.¹² Another study from Pakistan reported almost same number of male and female for diagnosed cases of CHD,¹³ showing similar results with our study. A systematic review that analyzed 5217 neonates showed more higher frequency of CHD cases among of babies delivered via SVD (55.6%) as compared to LSCS (44.4%).¹⁴ Our study recorded a mean weight of 2.36 ± 0.73 kg for all neonates, in similarity with a study conducted at Rawalpindi, which showed majority of the neonates were below 2.5 kg.¹¹ This study shows that maximum of the neonates born were full term 55.4% with an insignificant relationship with CHD (p -value: 0.97), which is in contradiction with the number reported from another study showing 63.21% of the neonates were preterm,¹² with 11.8% of neonates having CHD, which is much higher than other studies showing incidence between 1.5-2.5%.^{6,12} In another study from a tertiary care hospital, about 33% of the enrolled patients had VSD among diagnosed cases,¹³ similar to a meta-analysis of 260 studies which also showed that most CHD cases were VSD.¹⁵ While Patent Ductus Arteriosus (PDA), was the second most common disease encountered in the CHD, this is in contrast to literature which mostly shows that Atrial Septal Defect (ASD) is the second most common CHD recorded.^{12,16} While our study revealed that 77.4% of the patients were discharged, this finding was in contrast with other studies.^{17,18}

CONCLUSION

A small proportion of neonates were recorded to have CHD in the NICU of a tertiary care hospital. Furthermore, CHD was found to have no statistically significant relationship with gender, mode of delivery, gestational age, or outcome of the neonate.

Conflict of Interest: None.

Authors Contribution

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

AJ & FI: Conception, study design, drafting the manuscript, approval of the final version to be published.

RN & MH: Data acquisition, critical review, approval of the final version to be published.

SN & SA: Data acquisition, data analysis, data interpretation, critical review, 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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