

Frequency and types of congenital heart disease in neonates: A cross-sectional study from large public sector hospital of Karachi, Pakistan

Misbah Majeed¹, Muhammad Ashfaq², Bader-U-Nisa², Aijaz Ahmed³, Jai Parkash⁴

¹Women Medical Officer, ²Assistant Professor, ³Senior Registrar, ⁴Professor, National Institute of Child Health, Rafique Shaheed Road Karachi, *Correspondence to:* Dr Muhammad Ashfaq, Email: drishi_sindhu@yahoo.com

ABSTRACT

Background: Congenital heart disease (CHD) is one of the frequent congenital health issues in neonates. Early diagnosis is a key factor to combat this problem. This study aims to assess the frequency and common types of CHD among neonates presenting to a tertiary care hospital, Karachi.

Patients and methods: This descriptive cross-sectional study was conducted in a Neonatal Intensive Care Unit (NICU) of National Institute of Child Health (NICH), Karachi from March to September 2017. All neonates of gestational age ≥ 37 weeks with suspected CHD (presence of blue-tinged skin, i.e. cyanosis on routine clinical examination) were included. Information regarding presence of CHD and its types were collected along with the demographic characteristics and history of the patients.

Results: Among total 134, CHD was observed in 126 (94%) patients. Out of these 126 CHD patients, ventricular septal defect (VSD) was observed in 49 (38.9%), patent ductal arteriosus (PDA) in 29 (23%), atrial septal defect (ASD) was observed in 19 (15.1%), transposition of great arteries (TGA) in 18 (14.3%), and tetralogy of Fallot (TOF) in 14 (11.1%) patients. A significant association of VSD was observed with neonatal age ($p < 0.001$), ASD with neonatal age ($p = 0.037$) and maternal age ($p = 0.025$), while TGA was found significantly associated with neonatal age ($p < 0.001$).

Conclusion: CHD was observed in majority of the suspected patients with VSD as commonest type of congenital heart diseases among neonates.

Keywords:

Congenital heart diseases; Neonates; NICU

INTRODUCTION

Congenital heart diseases (CHD) are at the 3rd place amongst death causes in children following nervous system and musculoskeletal diseases and remains the most common congenital fetal malformations responsible for a high rate of child mortality and morbidity.^{1,2} Postnatal incidence is almost 0.3 to 1.2% of all live births whereas prenatal incidence of CHD varies from 2.4 to 52%.³ The frequency of CHD is observed mainly in the neonatal intensive care unit (NICU) as compared to live born neonates in population and the reported incidence is around 4.5% of neonates admitted to the NICU.⁴⁻⁶ The birth of approximately 40,000 children is reported with a CHD defect annually in the context of Pakistan, for instance, 5239 (82.9%) patients out of 6320 patients were detected with CHDs from Children Hospital Lahore.⁷ CHD has a multifactorial etiology and important role is

played by genetic and environmental factors in its development. This study aims to determine common types and frequency of CHDs among neonates at tertiary care hospital, Karachi.

PATIENTS AND METHODS

A descriptive cross-sectional design was conducted at the Neonatal Intensive Care Unit (NICU) of National Institute of Child Health, Karachi for six months, from March till September 2017, using non-probability consecutive sampling technique. Sample size of 134 was calculated based on World Health Organization (WHO) parameters of a confidence level of 95%, precision of 3.8%, prevalence of transposition of great arteries (TGA) of 5.3% for neonates suspected to have CHD.

The inclusion of patients was based on neonates with gestational age ≥ 37 weeks confirmed on medical records admitted to NICU of the NICH with suspected CHD. Suspected CHD was defined on the basis of presence of blue-tinged skin, i.e. cyanosis on routine clinical examination. Bicuspid aortic valve with no stenosis or regurgitation cardiac malposition unaccompanied by structural heart disease were

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considered as exclusion criteria. Neonates with neural tube defects like meningocele, spina bifida were also excluded. Detailed history and physical examination with emphasis on cardiovascular system were conducted. Relevant investigations included chest X-ray, echocardiography and arterial blood gases. All information, including demographic characteristics like gestational age, gender, and age were recorded. Statistical software, SPSS version 27, was used to enter and analyze the data. The age of the neonates and gestational age was calculated through Mean \pm SD. Gender, history of unexplained sibling death, history of abortion, history of unexplained sibling death, presence of CHD and its types were presented through frequency and percentages. Effect modifiers like age of the neonates, maternal age, gestational age, gender, history of CHD, history of unexplained sibling death, history of abortion were stratified to evaluate their effect on frequency and types of CHD. Post stratification Chi-square test was applied, a p-value ≤ 0.05 was considered as significant.

RESULTS

Out of total 134 suspected CHD patients, mean age of neonates was 11.06 ± 7.82 days and mean gestational age was 38.58 ± 0.85 weeks. Mean maternal age was 26.58 ± 4.82 years. There were 65 (48.5%) patients with ≤ 10 days of age while 69 (51.5%) were 10 days of age or more. Slight female preponderance was found; 70 (52.2%) females and 64 (47.8%) male. There were 63 (47%) patients with >38 weeks of gestational age while 71 (53%) patients were presented with ≤ 38 weeks. There were 74 (55.2%) patients with >25 years of maternal age. History of abortion was available in 75 (56%) patients, CHD in siblings in 33 (24.6%), unexplained sibling death in 21 (15.7%) and history of TORCH infections was found in 4 (3%).

Frequency of CHD was observed in 126 (94%) patients. Ventricular septal defect (VSD) was observed in 49 (38.9%), patent ductal arteriosus (PDA) in 29 (23%), atrial septal defect (ASD) in 19 (15.1%), transposition of great arteries (TGA) in 18 (14.3%), and tetralogy of Fallot (TOF) in another 14 (11.1%) neonates. In terms of CHD, the findings have not shown any significant difference with any baseline characteristics of the patients. However, a significant association of VSD was observed with neonatal age ($p < 0.001$), ASD with neonatal age ($p = 0.037$) and maternal age ($p = 0.025$), while TGA was found significantly associated with neonatal age ($p < 0.001$).

DISCUSSION

This study determined the frequency and common types of congenital heart diseases among neonatal population represented at NICU of a pediatric tertiary care centre at Karachi, Pakistan. The study enrolled 1-28 days of neonates with either gender having gestational age of ≥ 37 weeks and suspected to have CHD. The findings confirm CHD among majority of the patients out of these suspected cases. This finding is similar to various previous studies as well.⁷⁻¹¹ VSD was found predominantly higher, followed by PDA, TGA, ASD and TOF among types of CHD in this study. These findings are similar to those of Rashid and coauthors.⁷ On the contrary, this study presented evidence regarding neonates and TGA where TOF was highly reported in majority of the patients with cyanotic heart defects in previous studies.⁸⁻¹⁵ ASD was found significantly related with maternal age and neonatal age among different types of CHD with baseline characteristics in this study, whereas VSD was reported with neonatal age only. In addition, neonatal age was significantly associated with TGA whereas other types of CHD were insignificantly associated with neonatal age. Similar findings have been reported by other authors from this part of world and other regions.¹⁶⁻²² A total of 1003 cases of congenital heart defects were suspected out of 1100 cases in a recent study from Karachi in which 64.9% patients comprised of septal defects while 11% comprised obstructive lesions. Most commonly reported CHD in that study was TOF whereas 24.4% out of the total 1003 cases were accounted for cyanotic lesions, followed by VSD (21.5%), ASD (9.3%), and PDA (8.6%). On the other hand, the most common obstructive lesion making was pulmonary stenosis reported among 3.1% of the CHD. Combination of simple defects was reported among 147 (14.5%) cases while the combination of ASD and VSD was reported among 34 cases.² Present study has not observed the temporal association as it was a descriptive cross-sectional study and, therefore, the findings of this study can be observed in the light of limitation. However the findings reflect that further large scale multicenter studies are needed in order to collect prospective data on the analyzed important factors. Mostly patients did not follow-up once they leave the hospital and this becomes one of the strongest reasons for failure of follow-up for this study. Authors recommend educating and empowering these patients for seeking continual medical attention for what they and their families observe as a cured condition.

CONCLUSION

CHD was found as a common congenital disorder of the neonatal population with VSD as the most common disease. For optimal consequence of this issue, timely management and early diagnosis remain the essential factors. High index of suspicion, detailed and careful clinical examination in neonates suspected to have CHD, confirmation by echocardiography and pulse oximetry and early expert consultation are important in management.

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