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Original Research Article

# CLINICAL PROFILE AND SHORT –TERM OUTCOME OF CONGENITAL HEART DISEASES IN NEONATES

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ABSTRACT

**Background:** Congenital heart diseases (CHD), even though present at birth, may get picked up only much later in life as its characteristic effects manifest. They still remain the most common birth defects with an incidence of 8-12 per 1000 live births and thus are a major cause of infant and childhood morbidity and mortality, making early diagnosis crucial. To ensure prompt management, the clinical profile of CHD is highly essential. The analysis of the short-term outcome will possibly throw some light on the efficacy of the interventions being performed and the need for alternate options.

**Materials and Methods**: A descriptive study conducted in a government tertiary teaching hospital in south India during a period of twelve months after the institutional review board approval. The various demographic features, antenatal factors, clinical profile, management given and immediate outcome were analyzed. All the neonates in our study population who were discharged were further followed after a period of 6 weeks for weight gain, recurrent infections and need for new interventions**.**

**Results**: The neonates presented at a mean age of 2.78 days and diagnosis was made at a mean age of 4.78 days. Most critical defects presented within 1 week. The main presenting symptom was breathing difficulty (71%) and 23 % were asymptomatic. On follow up at 6-weeks, 4 more cases expired, leading to a total mortality of 13 %. Among the 87 survivors, 36.8% were not thriving well, 29.9 % had recurrent illnesses and 37.9% needed some new intervention.

**Conclusion**: Meticulous clinical examination and pulse oximetry screening are needed for early identification of most of the congenital heart diseases. The number of neonates undergoing surgery and also the total survivability was found to be much higher, probably owing to schemes like ‘Hridyam’.

**Key words:** congenital heart disease, cyanosis, heart failure, pulse oximetry

## INTRODUCTION

The incidence of moderate to severe structural congenital heart disease in live born infants is 8 to 12 per 1000 live births.[1-5] More recent higher incidence figures appear to be due to the inclusion of more trivial forms of congenital heart disease, such as tiny ventricular septal defects that are detected more frequently by highly sensitive echocardiography.[3] Congenital heart defects vary widely in presentation in infants. Only about.[2-3]
in 1000 newborn infants will be symptomatic in the 1st year of life. Diagnosis is established by 1 week of age in 40-50% of patients and by 1 month of age in 50-60% of patients with congenital heart diseases. 6 Because of the parallel nature of the fetal circulation, even severe congenital defects can be well compensated by it. It is only after birth when the fetal pathways are closed that the full hemodynamic impact of an anatomic abnormality becomes apparent.[3,6]

Despite the various types of cardiac defects, their clinical presentations share a lot of similarities. Cyanosis, erratic pulses and blood pressures, congestive heart failure, and cardiogenic shock are all warning signs of severe heart disease in newborns.

Today, because of the availability of modern treatment methods, over 75% of infants born with

critical heart disease can survive beyond the first year of life and many can lead a near normal life thereafter.[2] Thus, early diagnosis is now more crucial than ever before in order to drastically reduce morbidity and mortality (associated with CHD). To ensure prompt detection and diagnosis and to provide the appropriate management at the proper time, the clinical profile of CHD needs to be thoroughly explored and analyzed. The analysis of the short-term outcome will possibly throw some light on the efficacy of the interventions being performed and the need for alternative options.

## MATERIALS AND METHODS

This is a descriptive study conducted in a government tertiary teaching hospital in south India during a period of twelve months after the institutional review board approval. The objective was to study clinical profile of neonates admitted with congenital heart disease in the Neonatology Unit during the study period and to analyze the short-term outcome by following up the study subjects for 6 weeks.

Sample size was calculated with the formula, 4pq/d2, where, p= prevalence, q= 100-p and d= 20% of p. P= 24, Q = 76, D =5 %, substituting values, Sample size obtained was 280.On considering the availability of cases and birth prevalence of congenital heart disease, multiple similar studies done elsewhere were considered, all of which studied less than 100 infants in a 1-year period.[9-14] After Discussion with the institutional ethic committee , it was decided that all the cases meeting inclusion criteria would be included in the study. By following this method, a total of 100 neonates were studied over the study period.

All consecutive neonates satisfying the inclusion criteria, who attended and were admitted in the Neonatology Unit, Department of Pediatrics, during the study period were included. Those babies who are <34 weeks with patent ductus arteriosus and babies with patent foramen Ovale of < 2 mm were excluded from the study.

Necessary data regarding history was collected using the proforma. Hospital course and evaluation details including echocardiography were obtained from the case record and concerned treating doctors. The cases were followed up after discharge/referral, for 6 weeks and assessments were made regarding weight gain, new or recurrent symptoms, new medications or surgery and mortality. The data thus collected was first coded and then transferred to a master chart on Microsoft Excel, from which distribution tables were prepared and analyzed using SPSS.

Descriptive analysis was performed for all variables. Categorical variables were described as percentage. The information collected regarding all the selected cases were recorded in a Master Chart in MS Excel format. Using 'IBM SPSS' software version 25, the range, frequencies, percentages, mean, standard deviation, chi square and p values were calculated. Pearson chi square test was used to test the significance between two qualitative variables. Mann Whitney U test was used to find the association between quantitative variables and qualitative variables. A p value less than 0.05 were taken to denote significant relationship.

## RESULTS

A total of 100 babies were included in the study, 44 were inborn and 56 outborns, birth prevalence of CHD being 10.2 per 1000 live births among the inborn babies. The overall sex ratio was 1.27:1, with critical lesions affecting males more than females. Various antenatal factors were assessed, but no statistical association could be made. 9 babies had antenatal diagnosis. The mean birth weight was 2.58 kg, with 39% having low birth weight. The neonates presented at a mean age of 2.78 days and diagnosis was made at a mean age of 4.78 days. Distribution of primary cardiac diseases among the study population is given in Figure 1. Most critical defects presented within 1 week. The main presenting symptom was breathing difficulty (71%) and 23 % were asymptomatic. On analyzing associated symptoms, feeding difficulty was the most common, and had a significant association with disease outcome. Association between type of CHD and presenting clinical signs are given in Table 1. Down syndrome was the most common extra cardiac anomaly (31%) associated and Perinatal asphyxia (10%) was the most common co-morbidity. Both of these parameters showed significant association with the CHD outcome. 74% cases were medically managed and 23 % taken up for surgery. 91 % of all the cases survived the immediate neonatal period and were discharged. On follow up at 6-weeks, 4 more cases expired, leading to a total mortality of 13 %. Among the 87 survivors, 36.8% were not thriving well, 29.9 % had recurrent illnesses and 37.9% needed some new intervention (Table 2). The follow up parameters were significantly associated with the type of CHD.

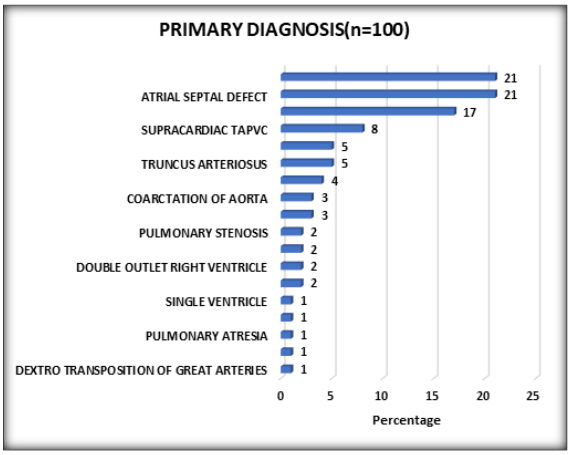


**Figure 1: Primary diagnosis**

**Table 1: Association between type of CHD and presenting clinical signs**

| Presenting symptoms | Type of disease (n=100) | | Chi square | P value |
|---|---|---|---|---|
| | ACHD | CCHD | | |
| Murmur | 33 | 8 | 4.260 | 0.513 |
| Cyanosis | 0 | 5 | | |
| Tachycardia | 3 | 0 | | |
| Tachypnea | 25 | 2 | | |
| Heart failure | 5 | 1 | | |
| Failed Pulse oximetry | 0 | 18 | | |

**Table 2: Association between 6 week survival and management**

| Management | 6 week survival | | Chi square | P value |
|---|---|---|---|---|
| | Expired | Surviving | | |
| Medical | 9 (12.2%) | 65 (87.8%) | 21.645 | <0.001 |
| Surgical | 1 (4.3%) | 22(95.7%) | | |
| Palliative | 3 (100%) | 0(0%) | | |

## DISCUSSION

The birth prevalence of CHD among the inborn neonates was 10.2 per 1000 live births. The birth prevalence from a large North Indian study by Saxena et.al published in 2016 was 8.07 per 1000 live births.[15] In another study by Kapoor et.al in 2008, the value was 10.47 per 1000 live births.[16] In an international literature review by Bernier et.al to estimate true Burden of congenital heart disease there was found to be wide regional variation with higher values (maximum 17 per 1000 in Iceland, to minimum of 1.2 per 1000).[17] The overall sex ratio was 1.27:1, with critical lesions affecting males more than females. This was similar to previous studies like those by Shah et.al in Nepal (1.5:1), Humayun et.al (1.7:1) in Pakistan, Sharmin et.al (1.3:1) in Bangladesh and Hajela et.al (1.43:1) in Madhya Pradesh.[18-20] VSD, ASD were more in females while all critical defects affected predominantly males. Various antenatal factors were assessed, but no statistical association could be made. 9 neonates were picked up to have CHD in the fetal life itself. The mean birth weight was 2.58 kg, with 39% having low birth weight. The neonates presented at a mean age of 2.78 days and diagnosis was made at a mean age of 4.78 days. Most critical defects presented within 1 week.. Majority of neonates presented within the 1st week (93%) and majority (89%) had an anatomical diagnosis made in the 1st week itself. Most critical defects were picked up before 10 days of life.

In a study by Molaei et.al in Iran, the mean age at diagnosis was 8.54 days.[13] According to Flanagan et.al, most of the severe forms of congenital heart disease manifest in first week of life, while trivial or mild form of congenital heart diseases manifest in the 3rd and 4th week, which is consistent with our findings.[21]

The main presenting symptom was breathing difficulty (71%) and 23 % were asymptomatic. On analysing associated symptoms, feeding difficulty was the most common, and had a significant association with disease outcome. Cardiac murmur was the most frequent clinical sign (41%) followed by tachypnea (26%) Table 1. In a study by Rein et.al, 86 % of neonates who were screened by echocardiography on detecting a cardiac murmur with no other symptoms had significant heart disease.[22] Vaidyanathan B et.al reported cardiac murmur was most significant finding in screening evaluation for CHD (53%).[23] Pulse oximetry picked 18 neonates of which 50 % had no other symptoms or signs. In a systematic review by Thangaratinam et.al, the overall sensitivity of pulse oximetry for detection of critical congenital heart defects was 76·5% and the specificity was 99·9%, thus meeting the criteria for being a tool for universal screening.[24] In a study by Vaidyanathan B et.al, the sensitivity of clinical evaluation and pulse oximetry combined was 19% for all CHDs and 20% for major CHD; specificity was 88%.[23]

There were 66 ACHD and 34 CCHD among which, the most common CHD overall was VSD and ASD (21% each) followed by PDA (17%). The most common CCHD was Supracardiac TAPVC (8%) followed by Tetralogy of Fallot (5%). In a study by Hossain et.al, VSD were the maximum, 31.3 %, followed by ASD, 22.9 %, Patent ductus Arteriosus, 14.94%25 Mir et.al and Islam et.al also reported the most common CHD as VSD followed by ASD and PDA,[13-14] while, Khalil et al. noted VSD and PDA were the most common lesions found in 34.8% and 18.6%, respectively.[26]

Down syndrome was the most common extracardiac anomaly (31%) and Perinatal asphyxia (10%) was the most common co-morbidity. Both of these parameters showed significant association with the CHD outcome. 74% cases were medically managed and 23 % taken up for surgery. 91 % of all the cases survived the immediate neonatal period and were discharged. On follow up at 6-weeks, 4 more cases expired, leading to a total mortality of 13 %. Among the 87 survivors, 36.8% were not thriving well, 29.9 % had recurrent illnesses and 37.9% needed some new intervention (Table 2). The follow up parameters were significantly associated with the type of CHD.

## CONCLUSION

- The birth prevalence of CHD among the inborn neonates was 10.2 per 1000 live births. The overall sex ratio was 1.27:1, with critical lesions affecting males more than females. Various antenatal factors were assessed, but no statistical association could be made.
- The mean birth weight was 2.58 kg, with 39% having low birth weight. The neonates presented at a mean age of 2.78 days and diagnosis was made at a mean age of 4.78 days. Most critical defects presented within 1 week
- The main presenting symptom was breathing difficulty (71%) and 23 % were asymptomatic. On analysing associated symptoms, feeding difficulty was the most common, and had a significant association with disease outcome
- Cardiac murmur was the most frequent clinical sign (41%) followed by tachypnea (26%). Pulse oximetry picked 18 neonates of which 50 % had no other symptoms or signs.
- There were 66 ACHD and 34 CCHD among which, the most common CHD overall was VSD and ASD (21% each) followed by PDA (17%). The most common CCHD was Supracardiac TAPVC (8%) followed by Tetralogy of Fallot (5%).
- Down syndrome was the most common extracardiac anomaly (31%) and Perinatal asphyxia (10%) was the most common co-morbidity. Both of these parameters showed significant association with the CHD outcome.
- 74% cases were medically managed and 23 % taken up for surgery. 91 % of all the cases survived the immediate neonatal period and were discharged.
- On follow up at 6-weeks, total mortality was 13 %. Among the 87 survivors, 36.8% were not thriving well, 29.9 % had recurrent illnesses and 37.9% needed some new intervention (Table 2).
- The clinical profile of congenital heart disease in our demography was made out and was found to be consistent with most other studies, with few disparities of significance.
- The number of neonates undergoing surgery and also the total survivability was found to be much higher, probably owing to schemes like 'Hridyam.

  Significant associations were identified between presence of multiple symptoms, the various co-morbidities, associated extra cardiac anomalies, management, outcome and follow up parameters, which may each be subjected to specific studies for better delineation of clinical significance.

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