Profile of Congenital Heart Disease in Children: A Hospital Based Study

Amit Kumar¹, Rukeya Begum*²,

Junior Resident, From department of Pediatrics, Gauhati Medical College & Hospital, Guwahati, India¹,
Associate Professor From department of Pediatrics, Gauhati Medical College & Hospital, Guwahati, India²,
Correspondence Author*

Accepted 2017-06-15; Published 2017-07-19

Abstract:

Objective: To study the incidence, various patterns, age and sex distribution, various presentation and complications of CHD among admitted children of age 1 month to 12 years

Design: Hospital Based observational Study

Setting: Department of Pediatrics, GMCH, Guwahati.

Study Population: All children with CHD of age 1 month to 12 years admitted and first time diagnosed with CHD during above mentioned period.

Method: Thorough history and clinical examination was carried out on 4569 admitted patients and clinical diagnosis was made. Final diagnosis was established by 2 D-Echocardiography and analyzed to know profile of CHD.

Results: 112 patients were identified as having CHD, the incidence of CHD was 24.5 per 1000 admitted patient. VSD (43.8%), TOF (14.2%), ASD (13.4%), PDA (8%), TGA (4.5%), DORV (3.6%), AVSD (3.5%) were the common CHD. Most common age of presentation was between 1-12 months (70.5%). Males were predominant in VSD, TOF, TGA, DORV and female were predominant in ASD, and PDA. Major clinical presentations were breathing difficulties (66%), poor weight gain (61%), easy fatigue (58%), cough (51.7%), feeding problem (50%), recurrent chest infection (40.2%), fever (33.9%), cyanotic spell & palpitation (11.6%) and convulsion (1.8%). Also, the major physical findings was tachypnoea (64.3%), tachycardia (56.3%), crepitation (49.1%), cyanosis (27.7%), wheeze (24.1%), enlarged tender liver (22.3%), and clubbing (14.3%). Most common complication was found to be growth failure, followed by recurrent chest infection and heart failure.

Conclusion: VSD, ASD, PDA are the most common acyanotic and TOF was the commonest cyanotic congenital heart defects respectively. CHD needs regular monitoring so as to permit optimal growth and
development and early diagnosis and timely intervention will reduce the morbidity and mortality to a large extent. This study shows the burden of CHD in North-East so it may help in policy making.

**Keywords:** Congenital heart diseases, Incidence and profile of CHD

**Introduction:**
Congenital heart disease (CHD) is the commonest of all congenital lesions and is the most common type of heart disease among children\(^{(1)}\). Congenital heart disease, in a definition proposed by Mitchell et al is “a gross structural abnormality of the heart or intra-thoracic great vessels that is actually or potentially of functional significance regardless of the age of detection”\(^{(2)}\).

The burden of congenital heart diseases (CHD) in India is likely to be enormous with high morbidity and mortality, due to a high birth rate\(^{(2)}\). The prevalence of CHD is not uniform in our country as various studies have reported it ranging from 1.3 to 50.89 per 1000 live births \(^{(3-4)}\). Also several studies from abroad report a changing pattern and incidence of CHD in various geographical locations \(^{(5-6)}\). Early recognition of such diseases has great implications. Despite advanced diagnostic facilities and improved medical care, CHD is considered one of the leading causes of infant mortality\(^{(7)}\). According to a status report on CHD in India, 10% of the present infant mortality may be accounted by CHD\(^{(8)}\). CHD may present at different ages from birth to adolescence\(^{(7)}\). Many cases are asymptomatic and discovered incidentally during routine health check-up\(^{(9)}\). Other presentations can range from cyanosis, clubbing of fingers, fatigue to full blown congestive cardiac failure\(^{(7,9)}\). CHD has not been studied thoroughly in India, as in western countries.

The profile of Congenital Heart Disease varies with the age group studied. Simple and potentially correctable heart defects like Ventricular Septal defect (VSD), Atrial Septal Defect (ASD) and patent ductus arteriosus (PDA) are common at all the ages. The varied structural abnormalities in congenital heart diseases fall primarily into three major categories:

- **Left to Right Shunts:** The most commonly encountered left to right shunts include;
  - Atrial septal defect.
  - Ventricular septal defect.
  - Patent ductus arteriosus.
  - Atrophicventricular septal defect.

- **Right to Left Shunts:** These are the cyanotic group of diseases. Here are the commonly Encountered right to left shunts.
  - Tetralogy of Fallot.
  - Transposition of great arteries.
  - Persistent truncus arteriosus.
  - Tricuspid atresia.

- **Obstructive Congenital Abnormalities:**
  Congenital abnormalities to blood flow may occur at the level of heart valves or within a great vessel. The common examples are;
  - Coarctation of aorta.
  - Pulmonary stenosis and atresia.
  - Aortic stenosis and atresia.

There are few studied on clinical profile of Congenital Heart disease in children in Assam. With this picture in background this study was carried out at a tertiary care hospital, Guwahati.

**Aims and Objectives:**
1) To study the incidence of congenital heart disease among admitted children of age 1 month to 12 years.
2) To study various pattern of congenital heart disease in hospitalized children.
3) To study the age and sex distribution of congenital heart diseases.
4) To know the various presentation of congenital heart disease.
5) To know the complication of Congenital Heart disease.

Materials and Method:

Study design: This study was a Hospital based study conducted at department of Pediatrics, Gauhati Medical College & Hospital, Guwahati for a period of 1 year between July 2015 to June 2016.

Participants: All children with Congenital Heart Disease of age 1 month to 12 years admitted and first time diagnosed with Congenital Heart Disease in Pediatric Department, GMCH, during above mentioned period were included in the study and children of age less than 1 month, old cases already evaluated by echo-cardiography and came for follow up, children with Acquired heart disease, unstable patients who died before the confirmation of diagnosis were excluded from the study.

Sample size: 112 children of congenital heart disease.

Method: The study was conducted after taking clearance from ethical committee of Srimanta Sankaradeva University of Health Sciences, Guwahati. Informed consent was taken from parents or caregivers & a thorough history and clinical examination was carried out and congenital heart disease was suspected in patient having cardiac murmur, presence of Cyanosis, breathing difficulties, cyanosis associated with feeding difficulties, clubbing, features of congestive cardiac failure, or failure to thrive. Study group was first assessed clinically according to a preformed proforma including sex and age of presentation. Then clinical diagnosis was made on clinical finding and children were divided into acyanotic congenital heart disease and cyanotic congenital heart disease. Then children were subjected to routine investigations like chest x-ray, ECG and Electrocardiography. Final diagnosis was confirmed by Echocardiography and analyzed to know profile of congenital heart disease.

Results:

Total admission in Pediatrics ward during the study period was 4,569. Out of which male were 2,653 and female were 1,916. Total number of children admitted with congenital heart disease were 127, out of which 15 are excluded in accordance to excluding criteria and study was done with 112 patients with confirmed case of CHD. Out of 112 CHD patients, 69 (61.6%) were males and 43 (38.3%) were females. So, the present study showed that there was male predominance over female with male to female ratio of 1.6:1.

Table 1: Age Distribution at the time of Diagnosis of CHD (N=112)

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of Patient</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12 months</td>
<td>79</td>
<td>70.5</td>
</tr>
<tr>
<td>1-5 years</td>
<td>26</td>
<td>23.2</td>
</tr>
<tr>
<td>5-12 years</td>
<td>7</td>
<td>6.3</td>
</tr>
</tbody>
</table>

This study showed that congenital heart disease was presented more commonly during infancy. Most of the patients (70.5%) were suffering from Acyanotic heart disease and the rest (29.5%) were suffering from cyanotic heart diseases.

VSD (62%) was the most common ACHD followed by ASD (19%), PDA (11.3%), AVSD (3.6%), and PS (0.9%) & AS (0.9%).

Table 2: Distribution of Acyanotic Heart disease among its various types

<table>
<thead>
<tr>
<th>ACHD</th>
<th>No</th>
<th>% of ACHD (N=79)</th>
<th>% of all CHD (N=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSD</td>
<td>49</td>
<td>62.0%</td>
<td>43.8%</td>
</tr>
<tr>
<td>ASD</td>
<td>15</td>
<td>19%</td>
<td>13.4%</td>
</tr>
<tr>
<td>PDA</td>
<td>9</td>
<td>11.3%</td>
<td>8%</td>
</tr>
<tr>
<td>AVSD</td>
<td>4</td>
<td>5.1%</td>
<td>3.5%</td>
</tr>
<tr>
<td>PS</td>
<td>1</td>
<td>1.3%</td>
<td>0.9%</td>
</tr>
<tr>
<td>AS</td>
<td>1</td>
<td>1.3%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Table 3: Distribution of Cyanotic Heart disease among its various type (N=33)

<table>
<thead>
<tr>
<th>CCHD</th>
<th>No</th>
<th>% of all CCHD (N=33)</th>
<th>% of all CHD (N=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOF</td>
<td>16</td>
<td>48.5%</td>
<td>14.2%</td>
</tr>
</tbody>
</table>

doi: http://dx.doi.org/10.15520/ijcrr/2017/8/07/69
TOF (48.5%) was the most common CCHD followed by TGA (15.2%), DORV (12.1%), and TAPVC (3%), TA (3%), Ebstein Anomaly (3%). There was male preponderance noted among various types of CHD like VSD, TOF, TGA, DORV and female preponderance was noted for ASD, PDA and in AVSD both males and females were equally distributed. Majority of mothers of patients belonged to 20-30 years of age group i.e. 63.4%.

Table 4: Distribution of Various Extracardiac Congenital anomalies (N=8)

<table>
<thead>
<tr>
<th>Extracardiac congenital anomalies</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down syndrome</td>
<td>5</td>
<td>4.5%</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>1</td>
<td>0.9%</td>
</tr>
<tr>
<td>Anorectal malformation</td>
<td>1</td>
<td>0.9%</td>
</tr>
<tr>
<td>Achondroplasia</td>
<td>1</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

8 (7.1%) patients were associated with extracardiac congenital anomalies. Out of which 5 patients (62.5%) had Down syndrome.

Table 5: Symptomatology of CHD

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No. of Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing difficulties</td>
<td>74</td>
<td>66</td>
</tr>
<tr>
<td>Poor Weight gain</td>
<td>69</td>
<td>61</td>
</tr>
</tbody>
</table>

Major clinical presentations of patient with CHD were breathing difficulties in 66%, followed by poor weight gain in 61%, easy fatigue in 58%, cough in 51.7%, feeding problem in 50%, recurrent chest infection in 40.2%, fever in 33.9%, cyanotic spell & palpitation in 11.6% and convulsion in 1.8% and 91 patients (81.2%) were presented with murmur.

Table 6: Important physical finding in CHD (N=112):

<table>
<thead>
<tr>
<th>Physical finding</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tachypnoea</td>
<td>72</td>
<td>64.3%</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>63</td>
<td>56.3%</td>
</tr>
<tr>
<td>Crepitation</td>
<td>55</td>
<td>49.1%</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>31</td>
<td>27.7%</td>
</tr>
<tr>
<td>Wheeze</td>
<td>27</td>
<td>24.1%</td>
</tr>
<tr>
<td>Enlarged tender liver</td>
<td>25</td>
<td>22.3%</td>
</tr>
<tr>
<td>Clubbing</td>
<td>16</td>
<td>14.3%</td>
</tr>
</tbody>
</table>

Major physical finding of patients with CHD was tachypnoea in 64.3%, tachycardia in 56.3%, crepitation in 49.1%, cyanosis in 27.7%, wheeze in 24.1%, enlarged tender liver was seen in 22.3%, and clubbing in 14.3%.

Most common complication of CHD was growth failure. It was observed in 62 patients (55.4%). Out of which 33 (29.5%) patients were of VSD, 12 (10.7%) patients were of ASD, 4 (3.6%) patients were of TOF, 6 (5.4%) were of PDA and 3 (2.7%) were of DORV. Similarly, 18 (16.1%) patients of VSD, 1 (0.9%) patient of ASD, 2
(1.8%) patients of TOF and 1 (0.9%) patient of DORV had developed heart failure.

**Discussion:**

Congenital heart disease is an important group of diseases that causes great morbidity & mortality in children (2). The present study i.e., “Profile of Congenital Heart Disease in children” in GMCH, Guwahati was undertaken to evaluate various congenital heart diseases for their incidence, pattern, and clinical presentation, associated anomalies, and complications.

In this study, a total of 112 patients who were admitted in pediatric ward and diagnosed with CHD for the first time were taken and sample size was in accordance with the study population of above mentioned various studies except the studies conducted by Borzouee M et al (17) and Khursid Wanni et al (20). This discrepancy could be attributed to the fact that in the study by Borzouee M et al (17) all the study population was taken from the department of Cardiology and the study period by Khursid Wanni et al was 3 years and 9 months. The present study did not give the true incidence of CHD in total population since it was a hospital based study and confined to children admitted in pediatric ward at Gauhati Medical College & Hospital, Guwahati only. However, the incidence of CHD among children admitted in pediatric ward over a period of one year could be estimated by this study and the incidence of congenital heart disease was 24.5 per 1000 admitted pediatrics patients.

Also, the incidence of CHD among children was not comparable with the other studies from India because they were mostly community based or had taken patients from birth to a particular age who had visited to hospital during the study period. However, our study was in accordance with the study by Rashmi et al, 2008 (16), which was a hospital based study. And, it is generally accepted that the improvement of diagnosis, attention or awareness among general pediatrician and early referral to tertiary care hospital has resulted in an increase of reported incidence and prevalence of CHD.

In the present study, it was observed that the majority of patients belonged to less than 1 year of age group. Other study showed nearly similar results as of the present study i.e. the most common age group at the time of diagnosis was less than 1 year of age and it was due to the fact that during the period of 1 month to 1 year the hemodynamic changes due to structural defect becomes established resulting in symptoms. In a 5 year study (1979-1984) conducted by Udani et al (28), the maximum number of cases were seen between 5-12 years and least in the age group of below 1 year. This might be due to the fact that increased awareness and better facilities are freely available now and hence, more children are being diagnosed at an earlier age than when the study was conducted by Udani et al around 30 years ago (28).

The study showed that acyanotic congenital heart disease was more common than the cyanotic congenital heart disease and the finding was almost consistent with the findings of the other studies.

In this study, the commonest type of CHD was VSD (43.8%) followed by ASD (13.4%) and then PDA (8%), (Table 2) which is similar to the other studies.

In the present study, it was found that TOF was the most common cyanotic heart disease (14.2%) followed by TGA (4.5%), DORV (3.6%) (Table 3) which is also similar to the other studies. In the

**Table 7:** Comparison of total number of study population among previous studies

<table>
<thead>
<tr>
<th>Author/Year/Reference no.</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kasturi L et al,1999 (25)</td>
<td>108</td>
</tr>
<tr>
<td>Sonali Tank et al,2004 (25)</td>
<td>147</td>
</tr>
<tr>
<td>Mohammed S et al,2006 (14)</td>
<td>89</td>
</tr>
<tr>
<td>Memon Y et al 2007 (26)</td>
<td>80</td>
</tr>
<tr>
<td>Borzouee M et al,2008 (17)</td>
<td>1380</td>
</tr>
<tr>
<td>Shah et al, 2008 (18)</td>
<td>84</td>
</tr>
<tr>
<td>Rajendra Kumar Jatav et al, 2014 (21)</td>
<td>116</td>
</tr>
<tr>
<td>Hajela S et al, 2014 (27)</td>
<td>100</td>
</tr>
<tr>
<td>Khursid Wanni et al,2014 (20)</td>
<td>866</td>
</tr>
<tr>
<td>B Deeva Kumar et al, 2015 (22)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Present Study,2016</strong></td>
<td><strong>112</strong></td>
</tr>
</tbody>
</table>
present study, the complex cardiac lesion was seen in 4.5% of cases while it was reported as 2.5% in the study by Memon et al (26), 6.9% in the study by Borzouee M et al (17), 5% in the study by Hajela S et al (27) and 8% in the study by Kumar B et al (22) which were comparable to the present study. There were gender differences in the occurrence of specific heart lesion. In the present study, it was noticed that VSD, TGA, DORV were more common in boys which was similar to the various studies by Chandha et al (24), Bidwai et al (29), Salah A Ibrahim et al (19) whereas ASD, PDA were more common in girls as was seen in the studies by Mausa MJ et al (13), S Mohammed et al (14), Khaled Amro et al (34), Salah A Ibrahim et al (14).

In the study, it was observed that 16.1% of mothers belonged to < 20 yrs. of age whereas 63.4% were between 20 -30 yrs. of age and 20.5% were above 30 yrs. which is similar to the finding of B Deeva Kumar et al, 2015 (22).

Many extracardiac anomalies are associated with congenital heart diseases. In the present study, 7.1% cases were associated with extracardiac anomalies. Out of these 8 cases, 5 (62.5%) were associated with Down syndrome and 1 case each was associated with hypothyroidism, anorectal malformation and Achondroplasia (Table 4). In a study conducted by Kasturi et.al (23), 20% of cases with congenital heart disease had extracardiac anomalies. In the study conducted by Sonali Tank et.al (25), 10% cases of congenital heart disease had syndromes and other associated somatic anomalies, among which Down syndrome was the commonest and also in study by A. Khalil et al (12) Down syndrome was the most common anomaly.

Also in the present study, Down syndrome was found to be the most common extracardiac anomaly.

Children with CHDs are brought to the hospital with a variety of symptoms which may or may not be related to the cardiovascular problem. The symptoms of significance are features of congestive cardiac failure, respiratory difficulties, feeding difficulties, breathing difficulties, chest infection, cough, fever, cyanosis, cyanotic spell and associated syndrome.

In the present study, out of the different clinical features, breathing difficulty, poor weight gain, feeding problems, fatigue, cough, cyanotic spell, palpitation were the major presenting symptoms (table 5) and the observations correlated well with the results of Vashishta VM et al, 1993 (10), Khalil A et al, 1994 (11), L Shamima et al, 2008 (15) and also with the studies of other countries like Hag AL et al, 1994 (30).

In the present study, the most common physical finding was murmur but it was not present in all cases of CHD, 81.2 % of cases presented with murmur. This finding was similar to the findings of B Deeva Kumar et al, 2015 (22). Pansystolic murmur was found in 98% of VSD. This finding was similar to that of Keith et al (31). Ejection systolic murmur was present in 97 % cases of TOF and it was absent in 3% cases of TOF which were infants of age between 2 to 5 months. In the study by Naik et al (32) and L Shamima et al (15) all 100 % cases of TOF had ejection systolic murmur. This discrepancy might be due to the fact that murmur may not be so prominent during early age of life in case of TOF. Also 86.2% cases of ASD was associated with murmur which was consistent with the findings of Siddique et al (33).

Other important findings were tachypnoea (64.3%), tachycardia (56.3%), crepitation (49.1%), cyanosis (27.7%), enlarged tender liver (22.3%), clubbing (14.3%) (Table 18). These findings were similar to the findings of study done by L Shamima Sharmin et al (15).

The present study also showed that the most common presentations in acyanotic heart disease for which the patients were seeking medical care were recurrent chest infection (51.9%) and heart failure in (27.8%) of all acyanotic cases. Similarly, in cyanotic heart disease, cyanotic spell or cyanosis was most common presentation. Failure to thrive was the most common complication of congenital heart disease, the reason being low energy intake, low resting energy expenditure, inadequate food intake and feeding difficulty. Also out of the 25 cases of
congestive cardiac failure, 72% was due to VSD, 8% due to ASD & PDA each, 4% due to DORV and rest due to others. There were no cases of TOF as it is a well-known fact. These findings were similar to the findings of the other studies by Vashishta VM et al (18) & L Shamima et al (15).

**Limitation of the study:** There were some limitations of this study like as the study was hospital based study so it does not reflect true community incidence of CHD and being a Government tertiary care centre, upper class got excluded from study. Also, children below 1 month was not included in the study so prevalence among live birth could not be estimated.

**Conclusion:**

This is a hospital based observational study with 112 children of age group 1 month to 12 years diagnosed with congenital heart disease for the first time. Congenital malformations and in particular CHD are important contributors to infant morbidity & mortality. Hence, this study was undertaken as it is important to determine the exact profile and case burden of CHD so that appropriate changes in health policies can be recommended.

Among the cases taken for the study, simple acyanotic congenital heart disease like VSD, ASD, & PDA were the commonest and these are correctable lesion if diagnosed earlier.

Also, Children with congenital heart disease have unique presentation and carry poor outcome if diagnosis is late. Hence, early diagnosis and treatment appears to be the best approach to minimize the morbidity and mortality attributed to CHD.

Pediatric cardiac care in India is still in infancy. Government of India is doing their best through programs like NRHM (National Rural Health Mission) to increase the awareness of the among the pediatricians. The government of Assam in collaboration to NRHM is helping the people by running the programme for free operation of Congenital Heart Disease in children upto age 14 years.

In the light of analysis and interpretation of the present study findings, following recommendations can be made:

1. Children with undue fatigability, recurrent chest infection, failure to thrive should be given due attention to exclude CHD.
2. Heart failure in infancy and childhood should be evaluated cautiously for presence of CHD.
3. Local pediatricians should be trained about specialized cardiac care and specialized cardiac centres should be established locally so that patients can be managed effectively without delay.
4. It is recommended that all murmur should be screened by 2-D- Echocardiography sunless thought to be physiological.
5. CHD needs regular monitoring so as to permit optimal growth and development and early diagnosis and timely intervention will reduce the morbidity and mortality to a large extent.

**Bibliography:**

7. Wren C, Richmond S, Donaldson L. Presentation of congenital heart disease in infancy:
implication for routine examination Arch Dis Child Fetal neonatal Ed. 1999;80:49-52.