

Incidence and pattern of congenital heart disease in a tertiary care hospital

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Abstract

Background: To find the prevalence and pattern of congenital heart diseases (CHD) at a teaching hospital in Warangal, Telangana State, India. **Materials and Methods:** It was a prospective study conducted in the department of pediatrics of MGM Hospital, Warangal, over a period of one and half year. 113 children from birth to 12 years of age who had congenital heart disease confirmed by echo cardiography were included. **Results:** In our study the incidence of congenital heart disease was 9.3 per 1000 live births, as compared to the general incidence of 8 – 10 per 1000 live births. Out of total cases (113) studied, 75 cases (66.37%) were of acyanotic heart diseases, whereas the remaining 38 cases (33.63%) were of cyanotic congenital heart diseases. Major types of CHD were VSD (38.05%), TOF (20.35%), ASD (13.27%), PDA (10.61%), and TGA (8.84%). Male outnumbers female child. Common Symptoms and signs were Breathlessness (62.83%), features of LRTI (46%), FTT (39.82%), features of CHF (34.51%), Cyanosis (30.08%), Cyanotic spells (15.92%) and Clubbing (14.15%). Frequently observed complications were Recurrent LRTI, CHF, FTT, Cyanotic spells, pulmonary arterial hyper tension. **Conclusion:** The prevalence of CHD at a tertiary care teaching hospital (MGM Hospital, Warangal, Telangana state, India), is 9.3 per 1000 live births. VSD, ASD, PDA are the most common acyanotic and TOF, TGA are the common cyanotic congenital heart defects respectively. Non invasive diagnostic technique (2D ECHO) plays major role in the diagnosis of CHD. When clinical evidence leads to suspicion of congenital heart defect, an echocardiography should be performed immediately.

Key Words: Congenital heart disease, prevalence and pattern of CHD.

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Received Date: 17/08/2018 Revised Date: 12/09/2018 Accepted Date: 03/10/2018

DOI: <https://doi.org/10.26611/1014811>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
10 October 2018

INTRODUCTION

Congenital Heart Disease (CHD) comprises one of the major diseases in pediatric age group. Among the all congenital malformations, Congenital Heart Disease is leading cause of morbidity and mortality in children.¹ Congenital heart disease by definition is the structural abnormality of heart or intra-thoracic great vessels present since birth that is actually or potentially of functional significance regardless of the age of detection

(Mitchell et al, IJP, April 2013)¹. The reported incidence of congenital heart disease is 8-10/1000 live births.^{2,3} The frequency of different major forms of CHD also differs greatly in various studies. 80% of congenital heart diseases are Ventricular septal defect (36%), Atrial Septal Defect (5%), Patent Ductus Arteriosus (9%), Atrio Ventricular Septal Defect (4%), Pulmonary Stenosis (9%), Aortic Stenosis (5%), Coarctation of Aorta (5%), Transposition of Great Arteries (4%), Tetralogy of Fallot (4%).⁴ The clinical presentation of congenital heart disease varies according to the type and severity of the defect.⁵ In neonatal period the presenting feature of CHD are cyanosis (with or without respiratory distress), heart failure or a heart murmur. In infancy or childhood the usual presenting features are murmur, cyanosis, heart failure and failure to thrive.⁶ Most cases of congenital heart disease are thought to be multi factorial and result from a combination of genetic predisposition and environmental stimulus.⁷ According to a status report on CHD in India 10% of the present infant mortality may be accounted for by CHD.⁸ As a result of improved medical

and surgical management more children with CHD are surviving into adolescence and adulthood.⁹ This study was undertaken to find out the pattern and clinical profile of congenital heart disease among the admitted children in MGM Hospital, Warangal.

MATERIALS AND METHODS

This prospective observational study was carried out over a period of 18 months, among the admitted children in the department of pediatrics of MGM Hospital, Warangal, age ranging from newborn to 12 years. The cases were included in the study when the diagnosis of CHD was established by Echocardiography. Total 113 cases with congenital heart disease formed the study group. A detailed clinical examination was done for all 113 cases.

The basic investigations were done, Chest x rays were taken for all cases, ECG was taken for all and Echocardiography was carried out for all 113 cases. The study was conducted after taking clearance from ethical committee of Kakatiya Medical College.

RESULTS

Out of the total admissions into the Pediatric Department of MGM Hospital, Warangal, every case of suspected congenital heart disease was recorded for a period of 18 months. 113 cases were studied and formed the study group which included both boys and girls of various age groups ranging from neonates (from birth) to children upto 12 years of age.

Table 1: Showing the incidence of congenital heart disease

| Sr. No | SEX | ADMISSIONS | No. of CHDs | % of Total Admissions |
|--------|--------------|--------------|-------------|-----------------------|
| 1 | Male | 6707 | 62 | 0.51 |
| 2 | Female | 5420 | 51 | 0.42 |
| | Total | 12127 | 113 | 0.93 |

It was found that the incidence of congenital heart disease among the total admissions was 0.93% (9.3 per 1000 live births).

Table 2: Showing the relative incidence of various congenital heart diseases studied.

| Sl. No. | Congenital Heart Disease | No. of Cases of CHD | Percentage of CHD |
|---------|--------------------------|---------------------|-------------------|
| 1 | VSD | 43 | 38.05 |
| 2 | ASD | 15 | 13.27 |
| 3 | PDA | 12 | 10.61 |
| 4 | PS | 3 | 2.65 |
| 5 | PAPVC | 1 | 0.88 |
| 6 | AS | 1 | 0.88 |
| 7 | TOF | 23 | 20.35 |
| 8 | TGA | 10 | 8.84 |
| 9 | TA | 1 | 0.88 |
| 10 | TAPVC | 1 | 0.88 |
| 11 | DORV | 2 | 1.76 |
| 12 | ECD+PS | 1 | 0.88 |
| | Total | 113 | 33.62 |

VSD = Ventricular Spetal Defect, ASD = Atrial Septal Defect, PDA = Patent Ductus Arteriosus, PS = Pulmonary Stenosis, PAPVC = Partial Tetrallogy of Fallot, TGA = Transposition of Great Arteries, TA = Tricuspid Atresia, TAPVC = Total Anamalous Pulmonary Venous Endocardial Cushion Defect + pulmonary stenosis. From above table it shows that out of total 113 cases studied, 75 cases(66.37%) were of acyanotic CHDs, where as the remaining 38 cases(33.63%) were of cyanotic CHDs. It was found that among total cases (113) studied, VSD was found to be the commonest CHD (43 cases with 38.05%). TOF with 23 cases (20.35%) ranked second in order of incidence. ASD with 15 cases(13.27%) placed in third position in order of occurrence, followed by PDA(12 cases with 10.61%) and TGA(10 cases with 8.84%). The other cases which were found to be in single digits are PS (3 cases with 2.65%), DORV(2 cases with 1.76%) and AS, PAPVC, TA, TAPVC, ECD+PS constituted 1 case each.

Table 3: Showing the pattern of Age distribution of various congenital heart diseases

| Sl. No. | CHD | 0 to 1 month | 1 month to 1 year | 1 year to 5 years | 6 years to 10 years | > 10 years | Total no. of Cases |
|---------|--------------|--------------|-------------------|-------------------|---------------------|------------|--------------------|
| 1 | VSD | 8 | 19 | 10 | 4 | 2 | 43 |
| 2 | ASD | 2 | 7 | 5 | 0 | 1 | 15 |
| 3 | PDA | 3 | 4 | 4 | 1 | 0 | 12 |
| 4 | PS | 1 | 0 | 2 | 0 | 0 | 3 |
| 5 | AS | 0 | 0 | 0 | 1 | 0 | 1 |
| 6 | PAPVC | 1 | 0 | 0 | 0 | 0 | 1 |
| 7 | TOF | 1 | 8 | 10 | 4 | 0 | 23 |
| 8 | TGA | 1 | 6 | 3 | 0 | 0 | 10 |
| 9 | TA | 0 | 0 | 0 | 1 | 0 | 1 |
| 10 | TAPVC | 0 | 1 | 0 | 0 | 0 | 1 |
| 11 | DORV | 1 | 0 | 1 | 0 | 0 | 1 |
| 12 | ECD+PS | 0 | 1 | 0 | 0 | 0 | 1 |
| | Total | 18 | 46 | 35 | 11 | 3 | 113 |

The above table shows that majority of children with congenital heart disease presented in the 1 month to 1 year age group (46 cases with 40.7%).

Table 4: Showing the incidence of congenital heart disease in either sex

| Sl. No. | CHD | Male (%) | Female (%) | Total |
|---------|--------------|----------------|----------------|------------|
| 1 | VSD | 22 (51.16) | 21 (48.83) | 43 |
| 2 | ASD | 9 (60) | 6 (40) | 15 |
| 3 | PDA | 5 (41.6) | 7 (58.3) | 12 |
| 4 | PS | 1 (33.33) | 2 (66.66) | 3 |
| 5 | AS | 0 | 1 (100) | 1 |
| 6 | PAPVC | 1 (100) | 0 | 1 |
| 7 | TOF | 14 (60.86) | 9 (39.13) | 23 |
| 8 | TGA | 6 (60) | 4 (40) | 10 |
| 9 | TA | 0 | 1 (100) | 1 |
| 10 | TAPVC | 1 (100) | 0 | 1 |
| 11 | DORV | 1 (50) | 1 (50) | 2 |
| 12 | ECD+PS | 1 (100) | 0 | 1 |
| | Total | 61 (54) | 52 (46) | 113 |

The above table shows that 61 cases (54%) were of male children and remaining 52 cases (46%) were female children. Male to Female ratio is 1.17: 1.

Table 5: Showing Symptoms and signs of congenital heart disease

| Sl. No. | Symptoms and Signs | Presented in no. of Cases | % |
|---------|--------------------|---------------------------|-------|
| 1 | Breathlessness | 71 | 62.83 |
| 2 | LRTI | 52 | 46 |
| 3 | CHF | 39 | 34.51 |
| 4 | FTT | 45 | 39.82 |
| 5 | Cyanosis | 34 | 30.08 |
| 6 | Cyanotic spells | 18 | 15.92 |
| 7 | Clubbing | 16 | 14.15 |
| 8 | Other symptoms | 6 | 5.30 |

Table showing that in 71 cases (62.83%) out of 113 cases, breathlessness was found to be the commonest symptom of CHD. Features of LRTI were found in 52 cases (46%) followed by FTT in 45 cases (39.82%) and 39 cases were presented in CHF (34.51%). Cyanosis was present in 34 cases (30.08%). Cyanotic spells were present in 18 cases (15.92%). Clubbing was found in 16 cases (14.15%).

Table 6: Showing in the Complications of Congenital Heart disease

| Sl. No. | Complication | No. of Cases | % |
|---------|---------------------------------------|--------------|-------|
| 1 | Congestive heart Failure | 39 | 34.51 |
| 2 | Recurrent LRTI | 52 | 46.01 |
| 3 | Cyanotic spells | 18 | 16.0 |
| 4 | Palmonary arterial hypertension (PAH) | 8 | 7.07 |
| 5 | FTT | 45 | 39.82 |
| 6 | Hemiplegia | 2 | 1.76 |

The above table shows that recurrent LRTI was found to be commonest complication of congenital heart disease (found

in 52 cases with 46.01%). The next common complication was FTT observed in 45 cases (39.82%). 39 cases (34.51%), were presented in CHF. Cyanotic spells were observed in 18 cases (16%). PAH was observed in 8 cases (7.07%). Hemiplegia was found in 2 cases of TOF constituting 1.76% of all CHDs.

Table 7: Showing the Chest Xray findings in all congenital heart diseases.

| Sl. No. | CHD | Total No. of Cases | Normal | Cardiomegaly | Boot shaped heart | Egg on side Appearance |
|---------|--------------|--------------------|--------------------|--------------------|--------------------|------------------------|
| 1 | VSD | 43 | 8 (18.60%) | 35 (81.3%) | - | - |
| 2 | ASD | 15 | 3 (20%) | 12 (80%) | - | - |
| 3 | PDA | 12 | 2 (16.6%) | 10 (83.3%) | - | - |
| 4 | PS | 3 | 2 (66.6%) | 1 (33.3%) | - | - |
| 5 | AS | 1 | - | 1 (100%) | - | - |
| 6 | PAPVC | 1 | - | 1 (100%) | - | - |
| 7 | TOF | 23 | 2 (8.7%) | - | 21 (91.3%) | - |
| 8 | TGA | 10 | - | 5 (50%) | - | 5 (50%) |
| 9 | TA | 1 | - | 1 (100%) | - | - |
| 10 | TAPVC | 1 | - | 1 (100%) | - | - |
| 11 | DORV | 2 | - | 2 (100%) | - | - |
| 12 | ECD+PS | - | - | 1 (100%) | - | - |
| | Total | 113 | 17 (15.04%) | 70 (61.94%) | 21 (18.58%) | 5 (4.42%) |

DISCUSSION

A recent systemic review pointed out that highest prevalence of CHD reported from Asia (9.3 per 1000 live birth) and least from Africa (1.9 per 1000 live birth). Available Indian studies had reported a wide variation in prevalence of CHD from 2.25 to 26 per 1000 live birth. Congenital Heart Disease occurs in 8 per 1000 live births and comprises one of the major diseases in the pediatric age group. CHD has become an important cause of morbidity and mortality in infancy and accounts for two - thirds of all major birth defects along with neural tube defects. We carried out this study as there are very few Indian studies which include complete data about the congenital heart disease in our country. Out of the total admissions (12127) in to the pediatric Dept. of MGM Hospital, Warangal (Over a period of 18 months) 113 children ages ranging from birth to 12 years were proven to have congenital heart disease and formed the study group, giving an incidence of 0.93% (9.3 per 1000 live births). The Incidence (0.93%) of CHD, in the present study can be comparable with some Indian studies (Meshram RM et al¹⁰ (1.01%), Ghansham saini¹¹ et al (1.18%), Vashishtha et al¹² (0.52%), Sonalitank et al¹³ reported as 1.65% of Incidence). If we consider relative incidence of various congenital heart diseases, out of 113 cases studied, 75 cases (66.37%) were of acyanotic CHDs, while the rest of 38 cases (33.63%) were cyanotic CHDs. This is in congruence with studies by Meshram RM et al (66.74% and 33.26%), Shah GS et al¹⁴ (69% and 31%), Pate et al¹⁵ (60.6% and 38.6%). Among the total

cases (113) of CHD, VSD was found to be the commonest lesion (38.05%) as was found in other Indian studies. Sonalitank et al reported incidence of VSD as 36.73%, Ghansham saini, Jain et al¹⁶ and Vashishtha et al reported incidence of VSD as 58.35%, 45.4%, 40.9% respectively. TOF with 23 Cases (20.35%) ranked second in order of occurrence, followed by ASD (15 cases with 13.27%), PDA (12 Cases with 10.67%) and TGA (10 cases with 8.84%) in that order. The same sequence i.e., VSD followed by TOF, ASD, and PDA in that order was found in sonalitank et al- and Ghansham saini et al. Regarding Age distribution of CHD, majority of children with congenital Heart disease was presented in the age group of 1 month to 1 year, (46 cases out of 113), as found in, sonali tank et al (58 cases out of 147) and Gunshamsaini et al (31 cases out of 60). If we consider sex distribution of CHD, 61 cases out of total 113, were of male children, showing male preponderance, and 52 cases were of females, giving male to female ratio of 1.17: 1. The diseases which were found to be common in males are VSD, ASD, TOF and TGA, while PDA and PS (Pulmonary stenosis) were found common in females. The male preponderance of VSD was found in studies by chadha et al¹⁷, Bidwai et al¹⁸, and ASD was found Common in males in studies by Jain et al, Vashishtha et al. When the Symptoms and Signs of CHD were taken in to consideration, it was found that breathlessness to be the commonest symptom, seen in 71 cases (62.83%), followed by LRTI in 52 patients (46%) and FTT in 45 cases (39.82% >), (Sonalitank et al reported breathless ness

in 74.83% of cases, LRTI in 44.89% of cases, and FTT in 38.77% cases). 39 Cases (34.51) were presented in CHF in Present study. Sonalitanketal reported CHF in 30.6% of cases, Ghanshamsainietal reported incidence of CHF as 32%. Cyanosis was observed in 34 Cases with 30.08%. (Sonalitanketal reported cyanosis as 37.41%), cyanotic spells were observed in 15.92% of cases (Sonalitanketal reported as 12.92%) and clubbing was present in 16 Cases (14.15%). Regarding the Complications of Congenital heart disease, Recurrent LRTI was found to be the Commonest Complication of congenital heart disease

(Found in 52 Cases (46.01%) out of 113 Cases of CHD). FTT was found as next complication observed in 45 cases (39.82%). 39 Cases were presented in CHF (34.51%), cyanotic spells were observed in 18 cases (16%), and PAH was found in 8 Cases (7.07%). Hemiplegia was found in 2 cases of TOF (1.76%).When considering the Chest X - Ray findings, 70 Cases were associated with cardiomegaly (61.94%). In 17 cases No Cardiomegaly was found. In 21 cases of TOF, Bootshaped heart was observed in Chest X - Ray, while in 5 cases of TGA, there was “Egg on side appearance” in chest X - ray.

Comparison with Other Studies

Table 8: Comparison of Prevalence of CHD observed in the present study with the prevalence reported in other studies

| Author | Age group | Hospital / Community Based | Total Number | No.of CHD / 1000 |
|------------------------------------|------------|----------------------------|--------------|------------------|
| Present Study (n = 113) | 0-12 Years | Hospital | 12127 | 9.3 |
| Meshram RM <i>et al</i> (n= 655) | 0-12 Years | Hospital | 42423 | 10.13 |
| Sonalitank <i>et al</i> (n=147) | 0-12 Years | Hospital | 8893 | 16.5 |
| Ghansham Saini <i>et al</i> (n=60) | 0-12 years | Hospital | 5059 | 11.8 |
| Chadha <i>et al</i> (n=50) | 0-14 years | Community | 11833 | 4.2 |
| Vashistha <i>et al</i> (n=44) | 5-15years | Community | 8449 | 5.2 |

Table 9: Comparison of the profile of congenital Heart Disease in the present study with that of other studies

| Sr. No. | Type of CHD | Present Study n = 113 (%) | Sonalitank <i>et al</i> n=147 (%) | Ghansham Saini <i>et al</i> n=60(%) n=60 (%) | Jaink <i>et al</i> n=55 (%) |
|----------------|-------------|---------------------------|-----------------------------------|--|-----------------------------|
| 1. | VSD | 43 (38.05) | 54 (36.73) | 35 (58.35) | 25 (45.4) |
| 2. | ASD | 15 (13.27) | 18 (12.24) | 6(10) | 2 (3.6) |
| 3. | PDA | 12 (10.61) | 7 (4.76) | 4 (6.66) | 3 (5.4) |
| 4. | PS | 3 (3.65) | 4 (2.72) | 0 | 3 (5.4) |
| 5. | AS | 1 (0.88) | 0 | 1 (1.660) | 0 |
| 6. | PAPVC | 1 (0.88) | 0 | 0 | 0 |
| 7. | TOF | 23 (20.35) | 26 (17.68) | 7(11.6) | 10 (18.6) |
| 8. | TGA | 10 (8.84) | 8 (5.44) | 6(10) | 1 (1-8) |
| 9. | TA | 1 (0.88) | 0 | 1 (1.66) | 0 |
| 10. | TAPVC | 1 (0.88) | 4 (2.72) | 0 | 0 |
| 11. | DORV | 2 (1.76) | 2 (1.36) | 0 | 0 |
| 12. | ECD+PS | 1 (0.88) | 0 | 0 | 0 |
| Miscella neous | | | | 3 (5.4) | |

Table 10: Comparison of Age Distribution of the CHD of Present Study with that of other studies

| Studies | 0-1 month No. of Cases | 1month - 1year No. of Cases | 1 yr - 5 yrs No. of Cases | > 5yrs No. of Cases |
|--------------------------------------|---------------------------|--------------------------------|------------------------------|------------------------|
| Present Study (n=113) | 18 (15.9%) | 46 (40.7%) | 35 (31%) | 14 (12.38%) |
| Sonalitank <i>et al</i> (n=147) | 16 (10.88%) | 58 (39.46%) | 42 (28.57%) | 31 (21.08%) |
| Ghanshamsaini <i>et al</i> (n=60) | 5 (8.33%) | 31 (51.66%) | 14(23.33%) | 10 (16.66%) |

The above table shows that majority of children with congenital heart disease were presented in the age group of 1 month to 1 year, in all studies.

Table 11: Comparison of sex distribution of congenital heart disease in the present study with other studies

| Study (n) | No. of Male Cases | No. of Female cases | Male to Female Ratio |
|--|----------------------|------------------------|-------------------------|
| Present Study (n = 113) | 61 (54%) | 52 (46%) | 1.17:1 |
| Sonalitank <i>et al</i> (n = 147) | 96 (65.31%) | 51 (34.69%) | 1.8:1 |
| Ghanshamsaini <i>et al</i> (n = 60) | 38 (63.33%) | 22 (36.66%) | 1.7:1 |
| Vashistha <i>et al</i> (n = 44) | 24 (54.5%) | 20 (45.5%) | 1.2:1 |
| Chadha <i>et al</i> (n= 50) | 29 (58%) | 21 (42%) | 1.3:1 |

The above table shows that findings of the present study are comparable with those of vashishta *et al* and chada *et al*.

Table 12: Comparison of symptomatology of CHD in the Present Study,with that of Sonalitanketal.

| Symptoms/ Signs | No. of Cases in Present Study | No. of Cases in Sonalitanketal |
|-----------------|----------------------------------|-----------------------------------|
| Breath lessness | 71 (62.83%) | 110(74.83%) |
| LRTI | 52 (46.01%) | 66 (44.89%) |
| FTT | 45 (39.82%) | 57 (38.77%) |
| CHF | 39 (34.51%) | 45 (30.6%) |
| Cyanosis | 34 (30.08%) | 55 (37.41%) |
| Cyanotic Spells | 18 (15.92%) | 19 (12.92%) |

The above table shows that symptoms and signs observed in the present study are in line with those of sonalitanketal.

CONCLUSION

The prevalence of CHD at a tertiary care teaching hospital (MGM Hospital, Warangal, Telangana state, India) is 9.3 per 1000 live births. VSD, ASD, PDA are the most common acyanotic and TOF, TGA are the common cyanotic congenital heart defects respectively. Children with recurrent chest infection, failure to thrive and undue fatigability should give due attention to exclude CHD. Non invasive diagnostic technique (2D ECHO) plays major role in the diagnosis of CHD. When clinical evidence leads to suspicion of congenital heart defect, an echocardiography should be performed immediately.

REFERENCES

- Mitchell SC, koranes SB, Berendes HW. Congenital heart disease in 56109 births. Incidence natural history. *Circulation*1971; 43: 323-32.
- Fyler DC, Buckley LP, Hellenbrand WE, Cohn HE. Report of the New England regional Infant Cardiac Program. *Pediatrics*, 1980; 65(2) Suppl : 375-461.
- Jordan S. C., Scoll O., 3rd ed. *Heart disease in pediatrics*. London: Butterworths, 1989: 38.
- Jackson M, walsh KP, Peart I, Arnold R. Epidemiology of congenital heart disease in Merseyside-1979 to 1988. *Cardiol Young* 196: 6: 272-80
- Kitchiner D J. Cardiovascular disease. In: McIntosh N, Helms PJ, Smyth RL, 6th ed. *ForferandArneil’s Textbook of pediatrics*. Edinberg: Churchill Livingstone, 2003: 815-88.
- Bloomfield P, Bradbury A, Grubb NR, Newby DE. Cardiovascular Disease. In: Boon NA, ColledgeNR, Walker BR, 20th ed. *Davidson’s Principle and Practice of Medicine*. Edinburgh: ChurchillLivingstone, 2006; 519-646.
- Bernstein D. Congenital heart disease. In BehrmanRE, Kligman RM, Jenson HB, 17th ed. *Nelsontextbook of Pediatrics*. Philadelphia: Saunders,2004; 1499-1553.
- Saxena A. Congenital heart disease in India: a statusreport. *Indian J Pediatr*. 2005; 72:595-8.
- Camm AJ, Bunce NH. Cardiovascular Disease. In:Kumar P, Clark M, 6th ed. *Kumar and Clark ClinicalMedicine*. Edinburgh: ElsevierSaunders, 2005; 725-872.
- Meshram RM, Gajimwar VS. Prevalence, profile, and pattern of congenital heart disease in Central India: A prospective,observational study. *Nig J Cardiol* 2018;

- 15:45-9.
11. Ghanshyamsaini, SurajGupte. Congenital heart diseases clinico echo cardiographic profile - Asian Journal of paediatric practice vol.8, No.2.
 12. V.M. Vashishtha, A. Karla, V.K. Jain etal - Prevalence of congenital heart disease in school children Indian pediater. Vol.30 - Nov. 1993.
 13. Sonali Tank, Sushmamalik. Epidemiology of congenital heart disease among hospitalized patients - 2000.
 14. Shah GS, Singh MK, Pandey TR, Kalakheti BK, Bhandari GP.Incidence of congenital heart disease in tertiary care hospital.Kathmandu Univ Med J (KUMJ) 2008; 6:33-6.
 15. Pate N, Jawed S, Nigar N, Junaid F, Wadood AA, Abdullah F, et al.Frequency and pattern of congenital heart defects in a tertiary carecardiac hospital of Karachi. Pak J Med Sci 2016; 32:79-84.
 16. K. K. Jain, ArunaSagar, and SHeshiBeri. Heart disease in children, Indian J Pediatr 1971;38:441 - 48.
 17. S.L. Chadha, Narpal Singh, Epidemiological Study of congenital heart disease. Indian J. Pediatr. Vol 68 - June - 2001, 507-10.
 18. P.S. Bidwai, CM Mahajan, BNS Waliaetal. Congenital heart Disease in child hood - A clinical study - Indian pediater 1971, 8:691-94.

Source of Support: None Declared
Conflict of Interest: None Declared

