

# A study of profile of heart murmurs in correlation with clinical examination and 2D echo

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## Abstract

**Background:** Heart murmurs in children are a source of concern for doctors and parents alike until cardiac diseases are ruled out. While most heart murmurs are innocent, they can also be the first sign of previously asymptomatic structural heart disease. Diagnosis of murmur can be done by investigations like X ray, ECG and 2 D Echo. **Aim and objective:** To study the profile of heart murmurs in correlation with clinical examination and 2D Echo. **Methodology:** In the present study, total of 1900 primary school children between 5 to 10 years studying in different schools near Dr. D. Y. Patil hospital Pimpri, Pune and also healthy children coming to Dr.D.Y.Patil Hospital were auscultated for Heart murmur. Further follow up and diagnostic test were done in those children who had Heart murmur. Diagnostic tests like 2D Echo were performed for further diagnosis of heart condition. Analysis was done in SPSS version 20.0 and Open Epi version 2.3. **Results and discussion:** The prevalence of heart murmur in asymptomatic children between age group 5 to 10 years in pimpri chinchwad locality is 8.6%. Out of 164 children with murmur, 36(21.9%) children had some cardiac anomalies or defects while 128(78.1%) had no cardiac anomaly detected on 2D ECHO. The most common cardiac anomaly found was Bicuspid aortic valve (33.3%), followed by small PFO (19.4%), ASD + TR (11.1%), ASD (8.3%).

**Key Word:** heart murmurs.

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## INTRODUCTION

Modern pediatric cardiology today deals mainly with congenital heart defects (CHD), whose incidence is from 0.8% to 1%.<sup>1</sup> In pediatric cardiology the most common congenital anomalies was CHD (30%) and most common clinical sign was uncharacteristic heart murmur.<sup>2</sup> Heart murmurs are common in healthy infants, children, and

adolescents.<sup>3</sup> Heart murmurs can be the highest percentage of referral to higher centre for cardiac treatment. Evaluation of heart murmur represents the exclusion or the existence of congenital heart anomalies. Normal anatomic and functional findings of heart must be proven by clinical examination, electrocardiography (ECG), X-ray diagnostics, laboratory diagnostics, less often echocardiography, and other non-invasive and invasive methods.<sup>1</sup> Murmurs can be caused by abnormal flow patterns that occur when there are abnormalities of the heart valves, septal defects within the heart, or abnormal communications between blood vessels or between blood vessels and the heart. Heart murmurs can be organic and inorganic. Organic are sign of heart disease, and inorganic murmurs occur on anatomically healthy heart. The organic murmurs occur due to vibration of anatomically damaged valve either in the period of its formation (congenital heart anomalies) or later due to the inflammatory process (acquired heart anomalies). In addition to the

aforementioned cardiac etiology, organic murmurs can be extra-cardiac when they occur as a result of vibrations caused outside of heart. Inorganic murmurs, which are usually called innocent.<sup>4,5</sup> By innocent, we mean that there are no structural (anatomic) or functional (physiological) abnormalities of the heart and that the murmur comes from normal flow within a normal heart. Innocent murmurs may be prevalent mostly in childhood, the presence of murmur does not imply the presence of structural heart disease.<sup>6</sup> The clinical significance of heart murmurs is that unrecognized or misinterpreted murmurs can start unnecessarily complicated and time consuming diagnostic procedure and burden parents and children by fear of heart disease. In most cases, medical history, clinical examination, ECG, laboratory diagnosis and eventual X-ray is sufficient for differentiation of these murmurs. Echocardiography should not be a routine method for every murmur.<sup>1</sup> The present study is designed to determine the Prevalence of heart murmurs in asymptomatic school children in the age group between 5 to 10 years and to study the profile of heart murmurs in correlation with clinical examination and investigative modalities like 2D Echo in Pimpri Chinchwad locality.

**Aim and objective:** To study the profile of heart murmurs in correlation with clinical examination and 2D Echo.

## MATERIAL AND METHODS

Present study was a cross sectional study carried out at a tertiary care centre during July 2014 to July 2016. Study population was 5-10 years old Children in the age group 5 to 10 years, who are not showing any signs and symptoms of heart disease or any acute or chronic illness.

**Inclusion criteria:** 1. Children in the age group 5 to 10 years, who are not showing any signs and symptoms of heart disease or any acute or chronic illness.

**Exclusion Criteria:** 1. Age below 5 years and more than 10 years 2. Children having infection or fever. 3. Previously diagnosed congenital and acquired heart disease 4. Signs of congestive heart failure, cyanosis 5. Anxious children 6. Children previously diagnosed hyperthyroidism or any endocrine disorder. 7. Children previously diagnosed with any chronic disorder. By taking prevalence of 50% with available error of 2.5% on either side of confidence level of 95%, the sample size is 1534. By taking loss of follow up of 20% the sample size increases to 1840; rounded up to 1900.

Study was approved by ethical committee. A valid written consent was taken from guardians of the patient after explaining study to them. School health camps organized by the institution in the surrounding areas of Pimpri-Chinchwad and also Children coming for routine health check up at Dr.Dr.D.Y.Patil Medical College, Hospital and Research Centre, Pune were included in the study. A

detailed history interview and clinical examination of asymptomatic school children between age group 5 to 10 years was taken. 1900 Children were screened for the heart murmur. Out of 1900 children, 164 children had cardiac murmur. 164 children were further investigated for the abnormality of the heart in D. Y. Patil Medical college, Pimpri, Pune. These patients underwent Routine investigations like Hb%, TLC, DLC, Urine routine (sugar, protein, microscopy) and Specific investigations like Chest X-ray, Electrocardiogram and Echocardiography. All the qualitative data will be expressed as percentages and quantitative data by means and standard deviations. Sensitivity, specificity, PPV (Positive Predictive Value) and NPV (Negative Predictive Value) also calculated. All the data will be entered in software Ms Excel spreadsheet and analyzed by software SPSS version 20 and Open Epi version 2.3. Appropriate statistical tests such as X<sup>2</sup> test will be applied to draw a valid conclusion in the study and its significance in the view of medical use.

## RESULTS

In this study total of 1900 cases were included. The minimum age of the children were 5 years and the maximum age of children were 10 years. Mean age of the children was  $7.23 \pm 1.55$ . Majority of children were 7 years (24.4%) old, followed by 8 years (20.8%), 5 years (20.4%), 9 years (15.5%), 6 years (11.1%) and 10 years (7.7%) years old. (Table 1) By gender wise distribution of all Children, we found that Boys (55%) were more in the study compare to Girls (45%) (Table 2) Out of 1900 children who were screened for Heart murmur, 164 children (8.6%) were found to be positive for the Heart murmur. 164 children who had heart murmur were further evaluated for the heart disease. Family history of heart disease was checked in heart murmur detected Children. Total 4 children (3 Boys and 1 Girl) had a family history of heart disease. Chi square test was applied to check the statistical relation between gender and family history of heart disease in Heart murmur detected children. There was a statistically no significant relation seen among Gender and family history of heart disease in Heart murmur detected children ( $p > 0.05$ ). Total 32.3% ( $n=54$ ) children were anaemic. Majority of anemia cases was in 5 years (20.4%) of age, followed by 7 years, 8 years, 9 years and 10 years (16.7%) of age. Chi square test was applied to check the statistical relation between age and anemia in Heart murmur detected children. There was a statistically no significant relation seen among age and anemia in Heart murmur detected children ( $p > 0.05$ ). In present study out of 164 children with murmur 54 (32.9%) had anemia out of these 34(63%) were girls and 20 (37%) were boys, which was statistically significant. Out of 67 girls with murmur, 34(50.7%) girls have anemia and in boys out of 97 with murmur 20(20.7%) have

anemia. There was a statistically significant relation seen among Gender and anemia in Heart murmur detected children ( $p < 0.05$ ). Children were further evaluated for the type of Heart murmur. Systolic E2 murmur (23.3%) was most common among all children and also in both boys (29.9%) and girls (35.8%) by gender wise distribution. Followed by Mid systolic 2 murmur (29.9%), and Systolic E2 murmur (24.4%). Other less common murmurs were Venus hum (4.3%), Systolic E3 (3%), E4 (1.8%), Pan systolic 3 (1.2%) and 4 (1.8%), Early systolic 3 (0.6%) and Mid systolic murmur (0.3%). (Table 3) 2D ECHO done for the final diagnosis of the cardiac etiology in 164 heart murmur detected children out of 1900 screened school children. 128 children (78%) who had heart murmur were had normal condition of the Heart in 2D ECHO. Rest 36 Heart murmur children (22%) had some abnormality in the

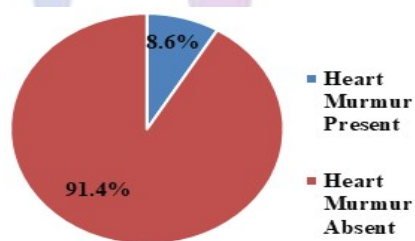
Heart. Gender wise nearly equal distribution of abnormal 2D ECHO findings in Girls (23.9%) and Boys (20.6%) (Table 4) In 2D ECHO findings, the most common cardiac abnormality was Bicuspid aortic valve (33.3%), followed by small PFO (19.4%), ASD + TR (11.1), ASD (8.3). other less common abnormalities were small VSD, VSD+ dilated LA and LV, TR, TR + dilated LA and LV, MR + dilated LA, PDA and Coronary fistula in RVOT + dilated LA and LV. Among boys Bicuspid aortic valve (50%) was most common abnormality than other cardiac abnormality, while in Girls small PFO (25%) was more common cardiac abnormality. Out of 164 children of murmur 36(21.9%) children have aforementioned cardiac anomalies while 128(78.1%) have no cardiac anomaly found on 2D ECHO (Table 5)

**Table 1:** Age wise distribution of all Children

	Mean age: 7.23 ± 1.55	Total Children	Percent
Age (Years)	5	388	20.4
	6	211	11.1
	7	464	24.4
	8	395	20.8
	9	295	15.5
	10	47	7.7
	<b>Total</b>	<b>1900</b>	<b>100.0</b>

**Table 2:** Gender wise distribution of Children

		Total Children	Percent
Gender	Girl	855	45.0
	Boy	1045	55.0
	<b>Total</b>	<b>1900</b>	<b>100.0</b>



**Chart 1:** Distribution of Children based on presence of Heart murmur

**Table 3:** Distribution of children based on Gender and type of Heart murmur

Sr. No	Type of Heart murmur	Gender		
		Girls (%)	Boys (%)	Total (%)
1	Pan systolic 3	2 (2.1)	0	2 (1.2)
2	Pan systolic 4	1 (1.5)	2 (2.1)	3 (1.8)
3	Systolic E1	13 (19.4)	27 (28.3)	40 (24.4)
4	Systolic E2	24 (35.8)	29 (29.9)	53 (32.3)
5	Systolic E3	2 (2.1)	3 (3.1)	5 (3.0)
6	Systolic E4	2 (2.1)	1 (1.0)	3 (1.8)
7	Early systolic 3	0	1 (1.0)	1 (0.6)
8	Venus hum	1 (1.5)	6 (6.2)	7 (4.3)
9	Mid systolic 2	21 (31.3)	28 (28.9)	49 (29.9)
10	Mid systolic 3	1 (1.5)	0	1 (0.6)
	<b>Total</b>	<b>67 (100)</b>	<b>97 (100)</b>	<b>164 (100)</b>

**Table 4:** Distribution of Children based on Gender and 2D ECHO findings of Heart

Sr. No	2D ECHO findings of Heart	Gender		
		Girls (%)	Boys (%)	Total (%)
1	Normal	51 (76.1)	77 (79.4)	128 (78.0)
2	Abnormal	16 (23.9)	20 (20.6)	36 (22.0)
<b>Total</b>		<b>67 (100)</b>	<b>97 (100)</b>	<b>164 (100)</b>

**Table 5:** Gender distribution of type of Heart abnormality in children wise

Sr. No	2D ECHO findings of Heart abnormality	Gender		
		Girls (%)	Boys (%)	Total (%)
1	ASD	2 (12.5)	1 (5)	3 (8.3)
2	ASD + TR	2 (12.5)	2 (10)	4 (11.1)
3	TR	1 (6.3)	0	1 (2.8)
4	TR + dilated LA and LV	1 (6.3)	0	1 (2.8)
5	Small PFO	4 (25)	3 (15)	7 (19.4)
6	mild PS	1 (6.3)	0	1 (2.8)
7	Small VSD	1 (6.3)	1 (5)	2 (5.5)
8	VSD + dilated LA and LV	1 (6.3)	1 (5)	2 (5.5)
9	MR + dilated LA	0	1 (5)	1 (2.8)
10	Coronary fistula in RVOT + dilated LA and LV	1 (6.3)	0	1 (2.8)
11	Bicuspid Aortic valve	2 (10)	10 (50)	12 (33.3)
12	PDA	0	1 (5)	1 (2.8)
<b>Total</b>		<b>16 (100)</b>	<b>20 (100)</b>	<b>36 (100)</b>

## DISCUSSION

In this study total of 1900 cases were included. The minimum age of the children were 5 years and the maximum age of children were 10 years. Mean age of the children was  $7.23 \pm 1.55$ . Majority of children were 7 years (24.4%) old, followed by 8 years (20.8%), 5 years (20.4%), 9 years (15.5%), 6 years (11.1%) and 10 years (7.7%) years old. By gender wise distributing all Children, we found that Boys (55%) were more in the study compare to Girls (45%). One of the study reported average age of the first group was 7.69 (1.01–15.01) years old, and of the second group 3.15 (1.01- 8.06) years old<sup>1</sup>. Kang *et al.* also done a cross-sectional study on 81,213 school children of 5-13 years' old age to determine the prevalence of heart murmur<sup>7</sup>. prevalence of heart murmur in present study was is 8.63%. In a similar study conducted by kang et el diagnosed murmur in 2.7% of school going children of 5-13 years old age group (n=2193) out of 81,213 children which was less than our study<sup>7</sup>. Uner *et al.* also diagnosed heart murmur in 4% of children (n=243) of 6-15 years' old age group out of total 6035 children screened<sup>8</sup>. Present study shows majority of Heart murmur was seen in 5 years (20.1%) and 10 years (20.1%) old children. These were followed by 9 years (17.1%), 6 years (14.6), 8 years (14.6%) and 7 years (13.4%). Though the children were maximum in 7 years of age, prevalence of heart murmur was lowest and age wise distribution of heart murmur was statistically significant. In a study conducted in Turkey by Atiye Fedakar , Türkay Saritaş 1,28,900 patients evaluated between age group 35 days to 15 years 434 patients found to have heart murmur,24.6% children were in age group 5-9 years and

10.4% patients were in age group  $\geq 10$  years<sup>9</sup>. In our study, Boys (59.1%) had higher prevalence of Heart murmur as compared Girls (40.9%) which was statistically not significant. This finding was supported by Zijo *et al* who also found no significant association between gender and heart murmur<sup>1</sup>, but Atiye Fedakar, Türkay Saritaş reported significant association between gender and heart murmur, where they found murmurs in 39.8% females as compared to 60.2% in males in sample of 434 children with heart murmur.<sup>1,9</sup> In our study, we found only 4 children (3 Boys and 1 Girl) had a family history of heart disease. In the Present study 32.3% (n=54) children were found anemic out of 164 children. This was higher than Mesihović-Dinarević *et al.* who found anemia in 25% (n=30) cases out of 120 patients with innocent murmur.<sup>10</sup> In this study, we found heart murmur in 164 patients (8.3% of total 1900 children), but 2D ECHO revealed 36(22%) had abnormal heart while others (78%) had normal heart which was higher than the study of Uner *et al.* which shows out of 6035 children in age group 6 to 15 years,243 (4%) children had murmur and out of which 27(0.4%) had CHD.<sup>8</sup> In our study gender wise nearly equal distribution of abnormal 2D ECHO findings in Girls (23.9%) and Boys (20.6%) . In 2D ECHO findings, the most common cardiac abnormality was Bicuspid aortic valve (33.3%), followed by small PFO (19.4%), ASD + TR (11.1), ASD (8.3). other less common abnormalities were small VSD, VSD+ dilated LA and LV, TR, TR + dilated LA and LV, MR + dilated LA, PDA and Coronary fistula in RVOT + dilated LA and LV. Among boys Bicuspid aortic valve (50%) was most common abnormality, while in Girls small PFO (25%) was more

common cardiac abnormality. In one of the study conducted by Kang G, Xiao J et al who reported the most common cardiac abnormality was ASD followed by mitral valve prolapse.<sup>1</sup> While other study conducted by Julien I.E Hoffman, the incidence of congenital heart disease showed VSD (75/1000 live births) was most commonly reported abnormality followed by bicuspid aortic valve (19/1000 live births). In a study conducted by Uner A, Doğan M in 6035 children between 6-15 age group, 243 children found to have murmur out of which 27 children found to have CHD. These children further evaluated in which mitral valve prolapse and tricuspid valve prolapse were found in 48% and 37% of the cases, respectively.<sup>1,7,8,11</sup>

## CONCLUSION

Prevalence rate of heart murmur was 8.6% among 5-10 years old school going children who were screened for heart murmur. Echocardiography is the gold standard to diagnose congenital cardiac malformations

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