

Clinical Profile of Cardiac Arrhythmias in Children Attending the Out Patient Department of a Tertiary Paediatric Care Centre in Chennai

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ABSTRACT

Introduction: The presentation of symptoms of paediatric arrhythmias vary depending on the age and underlying heart disease. Physical examination of children with important arrhythmias may be entirely normal.

Aim: Aim is to study the characteristics of cardiac arrhythmias in paediatric patients in a tertiary paediatric care centre in Chennai, India.

Materials and Methods: The participants (n=60) were from birth to 12 years of age. Patients with sinus arrhythmias, sinus tachycardia and sinus bradycardia were excluded. Proportions of various parameters of interest like clinical features, age and sex distribution and underlying heart disease of children presenting with cardiac arrhythmias were arrived. Statistical analysis was performed using SPSS version 16.0.

Results: Ventricular ectopics were the most common type of arrhythmias observed in the present study followed by Sinus Node Dysfunction (SND). The most common type of SND was sino atrial arrest. Supra ventricular tachycardia was the most frequently sustained tachyarrhythmia in the present study. An increased association of WPW (Wolf Parkinson White Syndrome) with specific congenital cardiac defects was noted.

Conclusion: Cardiac arrhythmias in children can present at anytime from fetal life to adolescence and their recognition requires high index of suspicion. While majority of children with arrhythmias have structurally normal heart, they are frequently encountered in children with underlying heart disease. Treatment of paediatric arrhythmias should be guided by the severity of the patient, the structure and function of the heart.

Keywords: Bradyarrhythmia, Paediatric arrhythmias, Sinus arrhythmia, Supraventricular tachycardia, Tachyarrhythmia

INTRODUCTION

Paediatric primary care practitioners are truly on the frontline in the diagnosis and treatment of many childhood arrhythmias. Presentation of symptoms of paediatric arrhythmias vary depending on the age. Further, a variable pattern of association of arrhythmias with underlying heart disease has been reported by various studies across the globe. Interestingly, the physical examination of children with important arrhythmias may be entirely normal. Patients with disturbances in cardiac rhythm can have various complaints, but symptoms such as palpitations, syncope, presyncope or dyspnea commonly cause them to seek a physician's help [1].

Tachyarrhythmias typically refer to non sustained and sustained forms of tachycardia originating from myocardial foci or reentrant circuits [2]. SVT (Supraventricular Tachycardia) is the most commonly sustained tachyarrhythmia in children. The true incidence of SVT in children is unknown, but has been estimated from 1 per 25,000 to as high as 1 per 250 children. It has been reported that 25% of the children presenting with SVT have WPW (Wolf Parkinson White Syndrome) syndrome on ECG [3]. The incidence of sudden cardiac death in WPW syndrome during childhood has been estimated to be as high as 0.5% [4]. For this reason, any child with WPW and a syncopal tachycardia episode should be considered for a catheter ablation procedure. Premature Ventricular Complexes (PVCs) have been evident on routine ECGs in 0.8 - 2.2% of children with no known heart disease and in 18% and 50% of newborns and adolescents, respectively during 24 hours ambulatory ECG monitoring [5].

Bradyarrhythmias include disorders of sinus node function and AV conduction disturbances. Sinus Node Dysfunction (SND) is relatively uncommon in children. Most children with SND are asymptomatic.

The incidence of congenital complete AV block has generally been reported to be between 1/15,000 and 1/25,000 live births [6]. A family history of rhythm disturbances was often present in those with long QT syndrome. A careful drug and dietary history should also be sought. Some nasal decongestants can provoke tachycardia episodes [1].

The increased vigilance combined with the advances in recent technological advances has resulted in an increase in the number of infants and children being diagnosed with cardiac rhythm disturbances. The objective of the present study was to identify the characteristics of cardiac arrhythmias in paediatric patients in a tertiary paediatric care centre in Chennai, Tamil Nadu, India.

MATERIALS AND METHODS

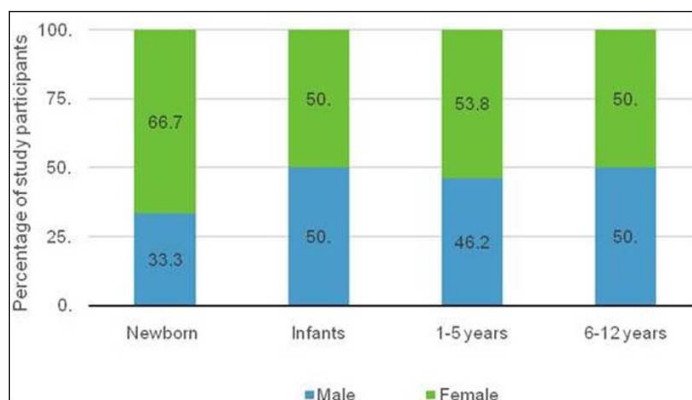
The present study was a descriptive study done in the Institute of Child Health and Hospital for Children, Chennai, in the period of June 2001 to October 2002. The total number of children reported were 7,32,535 of the study from birth to 12 years of age, attending the paediatric, medical and cardiology out-patient departments. Children who were diagnosed with rhythm disturbances, based on clinical features and a confirmatory ECG were included in the study. Routine clinical examination was performed by the primary investigator and the diagnosis of all the study participants was confirmed by the Paediatric cardiologist. The total number of participants included in the study was 60 by convenient sampling method. All consecutive cases with rhythm disturbance were included in the study. Patients with sinus arrhythmias, sinus tachycardia and bradycardia were excluded. Statistical analysis was performed using SPSS Version 16.0. Proportions of various parameters of interest like clinical

features, age and sex distribution and underlying heart disease of children presenting with cardiac arrhythmias were arrived.

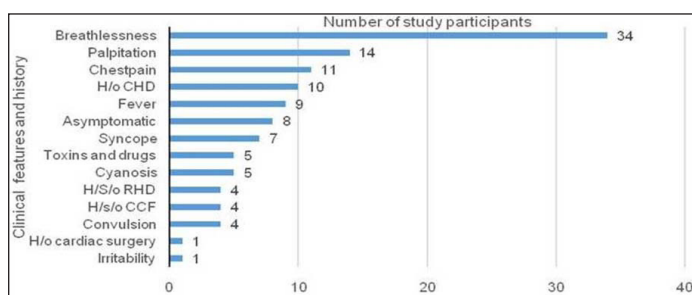
RESULTS

The total number of children who participated in the study was 60. [Table/Fig-1] shows the age and sex wise distribution of the study participants. [Table/Fig-2] shows the clinical features of presentation of children with rhythm disturbances at the Out- patient department. Chest X-ray was found to be normal in 48.33% of the study participants while 40% of the children showed cardiomegaly [Table/Fig-3]. Similarly, echocardiography reports were normal in 41.67% of the subjects, while 55% of the reports revealed abnormalities [Table/Fig-4].

Ventricular ectopics were the most common type of arrhythmia observed in the present study, accounting for 30% of children. Presenting symptoms were breathlessness (55%) palpitation and chest pain (27.7% each). SND was the second most common type of arrhythmia observed in the present study. The most common type of SND was sinoatrial arrest. SVT was the most frequently sustained tachyarrhythmia in the present study. Infants were most commonly affected (71.4%). Of the children who presented with SVT in the present study, the most common presenting symptom was breathlessness, while 28.57% presented with convulsions. Sympathomimetics were identified as the precipitating factor in 2 out of 7 of patients with SVT. One patient developed SVT following Adrenalin



[Table/Fig-1]: Age and sex distribution of children presenting with cardiac arrhythmias.



[Table/Fig-2]: Clinical features at presentation to the OPD among children with cardiac arrhythmias.

* CXR Finding	Numbr	Percentage
Normal	29	48.33
Cardiomegaly	24	40
BHV	1	1.67
Consolidation	1	1.67

[Table/Fig-3]: CXR findings among children presenting with cardiac arrhythmias (n =55). * CXR was not taken n 5 children.

ECHO Finding	Numbr	Percentage
Abnormal	33	55
Normal	25	41.67

[Table/Fig-4]: ECHO findings among children presenting with cardiac arrhythmias (n=58). ECHO was not done in 2 patients.

infusion and the rhythm was reverted back to Normal Sinus Rhythm by administration of an intravenous bolus of adenosine. About, 85.7% of the children who participated in the study required IMCU admission while 57%, 5% and 42.8% developed shock, convulsions and cardiomegaly, respectively. Normal ECHO finding was reported in 71.4% of the children. In the present study, 1 out of 7 cases of SVT showed WPW syndrome on the surface ECG. The total number of cases of WPW syndrome studied was 4. An increased association of WPW with specific congenital cardiac defects, notably Ebstein's anomaly and HOCM was noted. A total of 11 cases of Complete Heart Block (CHB) were studied. There was female preponderance and most of them were asymptomatic.

DISCUSSION

Ventricular ectopics were the most common type of arrhythmia observed in the present study, accounting for 30% of children. Benign ectopics needed only reassurance. Ventricular tachycardia was observed in a child with hyperkalemia due to congenital adrenal hyperplasia. One child with Rheumatic Heart Disease (RHD) developed atrial fibrillation. In a Holter survey of 624 healthy children, Martin et al., found 12 children with ECG evidence of SND. The most common abnormality noticed was sinus arrest [7]. The most common type of SND in our study was sinoatrial arrest. This finding was similar to studies done by Martin et al., in which 10 out of 12 children with SND showed sinoatrial arrest.

According to the study done by Venugopalan P et al., the authors have reported three cases of SVT in children and elaborated on their diagnosis and management. They have observed that clinical features along with ECG are major sources of help in the diagnosis of these common paediatric arrhythmias. SVT was the most frequently sustained tachyarrhythmia in the present study. Infants were most commonly affected (71.4%) and this was in concurrence with the observations of Venugopalan et al., [8]. In the study done by Robert T Gerhardt et al., who also described the use of adenosine for the treatment of SVT, occurring after successful initial resuscitation from ventricular fibrillation, where high dose epinephrine protocol was used [9]. Intravenous bolus of adenosine is the treatment of choice to terminate an acute episode that does not respond to vagal stimulation. Infants and children need long term drug therapy, while older children with single episode of SVT and absence of WPW syndrome may be followed up without medication. In a randomized double cross over trial to assess the safety and efficacy of verapamil and adenosine 22% with narrow complex tachycardia experienced conversion to sinus rhythm with carotid sinus massage. The incidence of conversion of arrhythmia was similar in both treatment groups (adenosine 57%, verapamil 50%) [10]. In resistant cases, Radio Frequency Catheter Ablation (RFCA) of the accessory pathway has to be considered. RFCA of cardiac arrhythmias in paediatric and young patients can be safely and effectively done. Results are similar in those obtained in adults suggesting that indications for ablation can also similar [11]. In our study, one patient developed SVT following Adrenalin infusion and the rhythm was reverted back to Normal Sinus Rhythm by administration of an intravenous bolus of adenosine. Around 42% of the children responded to intravenous adenosine while another 42% of children who were resistant to adenosine, responded to amiodarone and DC cardioversion. Digitalization was required in one resistant case. Of all the participants, 85% reverted to Normal Sinus Rhythm. Recurrence happened in one case without any precipitating cause. An increased association of WPW with specific congenital cardiac defects, notably Ebstein's anomaly and HOCM was noted. This finding was also in concurrence with other studies [4]. In the study done by Chun-wei Lu et al., Ebstein's anomaly was the leading type associated CHD in WPW patients, accounting for 26.6% of all associated CHD. The overall mortality of WPW patients was 0.71%, but the association with Ebstein's anomaly increased the mortality by almost ten-fold [12]. Death happened in a child

with Ebstein's anomaly in the present study. In Batte et al., study of prevalence of arrhythmias among the children with congenital heart disease, arrhythmias were found in 27.3%, (95%CI 21.0-33.6) [13]. According to the study by Lev M et al, approximately 25-33% of the cases of congenital CHB were expected to be associated structural heart disease. By far, the most commonly associated lesion has been L-TGA (L-Transposition of the Great arteries) with ventricular inversion [6]. In the present study, a total of 11 cases of Complete Heart Block (CHB) were studied. There was female preponderance and most of them were asymptomatic. Breathlessness was the most common presenting symptom. About 63.6% of the subjects showed cardiomegaly. One out of three cases of congenital CHB had L-TGA (Left - Transposition of Great Arteries). This was also in concurrence with the studies done by Lev M et al., [6]. Autoimmune diseases account for 60- 70% of all cases of congenital CHB and about 80% of cases in which there is a structurally normal heart [14]. In the study done by Friedman DM et al., who stated that CHB occurred in approximately 1.5% of pregnant mothers with anti- Ro/La antibodies [15]. In the present study, one child with congenital CHB presented as foetal bradycardia. However, but the mother didn't show RO/La antibodies. In Koichiro Niwa et al., study, the prevalence of rhythm disturbance was found in 1.25% of elementary school students aged from 5 to 6 years and 2.3% of junior high school students aged from 12 to 13 years [16].

The most common paediatric cardiac arrhythmias were ventricular ectopics and the next one was sinus node dysfunction. Among the sinus node dysfunction sinoatrial arrest was the frequently observed one, which mainly presented as breathlessness. The sustained tachyarrhythmia frequently found in children was SVT. In children with bradycardia the treatment of choice is cardiac pacing. Atrial fibrillation was uncommon in children and it occurred mainly in older children with RHD. Treatment of paediatric arrhythmias should be guided by the severity of the patient, the structure and function of the heart. If an acute arrhythmia produces hemodynamic compromise, the patient should be cardioverted or defibrillated. If the rhythm is slow, cardiopulmonary resuscitation should be initiated.

LIMITATION

The prevalence of cardiac arrhythmias in this paediatric tertiary care hospital couldn't be checked since we didn't investigate all the children reporting to the hospital with routine ECG.

CONCLUSION

Cardiac arrhythmias in children can present at anytime and their recognition requires high index of suspicion. While majority of

children with arrhythmias have structurally normal heart, they are frequently found in children with underlying heart disease.

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