International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG(USA) Volume 6, Issue 11 -2019

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2019.06.11.012

Childhood Dysrhythmias
Clinical Pattern, Management and Immediate Outcome

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Abstract

Background: Cardiac dysrhythmias are disturbances in the rhythm of the heart manifested by irregularity or by abnormally fast rates ('tachycardias') or abnormally slow rates ('bradycardias').
Objective: Study the clinical patterns of childhood dysrhythmia & the associated congenital heart disease in hospital.
Patients and Methods: This is cross-sectional study was done in Ibn Al-Bitar Cardiac Center in period from the first of March 2015 to the first of March 2016. Where the patients equal or less than 18 years old presented to outpatient pediatric cardiology clinic for each one of them complete history was taken, physical examination, electrocardiogram, and Echo study was done.
Results: - Sixty-four patients presented with different types of pediatric dysrhythmias from total number of 659 (91%) patients under the age of 18 years of them 38 (59.4%) were males and 26 (40.6%) were females. The patients with congenital heart diseases were 39 (60.9%) and without congenital heart diseases were 25 (39.1%). The types of dysrhythmias were supraventricular tachycardia 24 (37.5%), complete heart block 12 (18.8%), ventricular tachycardia 7 (10.9%), junctional arrhythmia 7 (10.9%), atrial fibrillation 6 (9.4%), atrial flutter 3 (4.7%), 2nd degree heart block 3 (4.7%) and 1st degree heart block 2 (3.1%).
Conclusions: -The most common type of pediatric dysrhythmias was supraventricular tachycardia and most of cases respond well to amiodarone. All cases of ventricular tachycardia and most cases of complete heart block were postoperative correction of congenital heart disease. Most cases of dysrhythmias were associated with underlying congenital heart disease.

Keywords: Cardiac dysrhythmias, childhood dysrhythmia, Clinical Pattern, Management and Immediate Outcome

Introduction

The frequency and clinical significance of dysrhythmia are different in children compared with adults. Although dysrhythmia are relatively infrequent in infants and children, the common practice of monitoring cardiac rhythm in children requires primary care physicians, emergency department physicians, and intensive care physicians to be able to recognize and manage basic dysrhythmias[(1)].The normal heart rate varies with age: The younger the child, the faster the heart rate. Tachycardia is defined as a heart rate beyond the upper limit of normal for the patient's age, and bradycardia is defined as a heart rate slower than the lower limit of normal[(1)].

Cardiac dysrhythmias are disturbances in the rhythm of the heart manifested by irregularity or by abnormally fast rates ('tachycardias') or abnormally slow rates ('bradycardias') [(2)].

The supraventricular tachycardia (SVT) occurring in earlier life is commonly accessory pathway mediated. Atrioventricular reciprocating tachycardia (AVRT) represents 85% of thearrhythmias in fetal life and 82% of the dysrhythmias occurring during infancy. Atrioventricular nodal reentrant tachycardia (AVNRT) is uncommon during infancy accounting only for 4% of the dysrhythmias. The incidence of atrial tachycardia is around 10-15%during childhood and most resolve spontaneously[(3)]. Wolff-Parkinson-White (WPW) syndrome is a typical example of AVRT in children. Atrial tachycardias in childhood are commonly seen as a result of postoperative atrialscarring, distortion of anatomy, changes in the wall stress and changes in the atrial refractoriness associated with sinus node dysfunction[(4)].Atrial fibrillation is very rare in infants and children. Most newborns with atrial fibrillation have a structurally normal heart. When an underlying cardiacpathology exists, it is usually a condition with enlarged right atrium such as Ebstein's anomaly of tricuspid valve or tricuspid atresia[(4)].Ventricular premature contractions (VPCS) are the commonest ventricular conduction anomaly seen in neonates. Ventricular arrhythmias are rare in childhood and may be benign or malignant. Junctional ectopic tachycardia (JET) is the commonest (22%) dysrhythmia seen in the immediate post-operative period following intracardiac repair mostly following Tetralogy of Fallot (TOF) correction[(5)]. Late post-operative dysrhythmias are the commonest medical problem encountered after repair of congenital heart defects. Congenital complete heart block is reported to occur with an incidence of 1 per 25000 live births[(6)].

Dysrhythmias may result from disorders of impulse generation(too fast or too slow), disorders of impulse conduction (block or reentry), or any combination thereof [(7)].

Clinical Presentation of Bradyarrhythmias are relatively uncommon. Most symptoms associated with true sinus node dysfunction are caused by inadequate chronotropic response to stress or exertion. Overt symptoms are relatively uncommon in patients with first- and second-degree atrioventricular (AV) block, except when there is limited ability to increase the ventricular rate during stress or exercise. Syncope and sudden death owing to complete AV block may result from bradycardia-dependent polymorphic ventricular tachycardia with degeneration to ventricular fibrillation. The fetus and infant with congenitally complete AV block and no associated heart disease usually are asymptomatic. Older patients with congenital AV block may manifest varying degrees of exercise limitation or syncope. Sudden death is uncommon during the first decade but increases thereafter. Both syncope and sudden death may be due to bradycardia-dependent ventricular tachycardia (torsades de pointes) rather than to the bradycardia itself[(8)]. Clinical Presentation of Tachyarrhythmias patients with incessant tachycardia at relatively slow rates may have few overt symptoms until congestive heart failure develops after weeks or months of ongoing tachycardia. On the other hand, patients with paroxysmal tachycardia may have hemodynamic collapse soon after tachycardia begins. Sustained tachycardia in the fetus may result in congestive heart failure or hydrops fetalis. Whereas in the neonate, rapid tachycardia of (12-24 hrs) duration typically results in heart failure, in the fetus, intermittent tachycardia, at relatively slow rates, may produce heart failure only over days to weeks. Symptoms associated with tachycardia usually are nonspecific in infants and neonates. Consequently, tachycardia may go unrecognized for many hours and significant hemodynamic compromise may result. Palpitations are the usual presenting symptom in older children or adolescents with paroxysmal tachycardia, but other nonspecific symptoms such as light-headedness, chest pain, dyspnea, pallor, or nausea may occur. Syncope is uncommon with tachycardia[(8)].

Symptoms of supraventricular tachycardia are usually related to the heart rate. In general, the faster the heart rate, the worse the child tends to feel. Fortunately, SVT is rarely life-threatening .History of poor feeding, lethargy, irritability, pallor in infants. History of palpitation, dizziness, chest pain, syncope and shortness of breath in older children and adolescents. Signs and symptoms of congestive heart failure in some infants. History of abrupt onset and termination [(9)].Attempt vagal maneuver (i.e., application of ice, Valsalva maneuver or carotid massage).if unsuccessful, give adenosine (100 mcg/kg) rapid bolus, increase the dose and repeat as needed. Synchronized DC cardioversion if adenosine is unsuccessful, starting at (0.5 J/kg).Intravenous amiodarone alternative in experienced hands [(9)].

Fortunately, AF in children is very uncommon [(10).] Patients are usually symptomatic at presentation and in the setting of rapid ventricular rates, hypotension and syncope may ensue. As in adults, the possibility of atrial thrombus with the risk of embolic stroke is of great concern. Children and adolescents present with complaints of palpitations. Weakness and signs of congestive heart failure may be seen [(11).]If the patient has rapid ventricular response with reduced cardiac output, DC cardioversion starting at 2J/kg is used. For stable patients, pharmacotherapy aimed at ventricular rhythm or rate control can be used. IV rhythm control agents include amiodarone and ibutilide [(11)]

Ventricular Tachycardia **(**VT**)** Is a tachycardia with rates greater than (120 beats/minute) and originating within the ventricles or the lower conduction system with ventriculoatrial dissociation[(12)].Clinical presentation is variable, symptoms may range from palpitations, light headedness, syncope, and shortness of breath, neck fullness, and chest pain to death [(13)].In patients with sustained VT with hemodynamic compromise, direct current (DC) cardioversion is indicated. In stable monomorphic VT, IV procainamide or amiodarone, and/or transvenous catheter pace termination maybe employed. In patients with polymorphic VT, DC cardioversion, IV amiodarone and beta blockers may be employed. [(14)] Patients with first degree AV block are asymptomatic unless associated with significant left ventricular dysfunction marked prolongation of the PR interval can cause symptoms mimicking pacemaker-like syndrome[(15)].Mobitz type I block is usually well tolerated; but may present with significant bradycardia. Patients with Mobitz type II block may be asymptomatic; but can present with bradycardia, exercise intolerance, syncope, postural hypotension, and sudden death [(16)].Many patients with Third-degree **(**Complete**)** Atrioventricular Heart Block are asymptomatic in early life. Symptoms range from none to chest pain, weakness, syncope, exercise intolerance, dizziness, and congestive heart failure in congenital complete heart block. Symptoms are usually dependent on ventricular rate, frequency of premature ventricular beats, and atrioventricular synchrony [(17)].Primary mode of management of patients with complete heart block is pacemaker implantation [(18)].

Aims of Study

1. Study the clinical patterns of childhood dysrhythmia & the associated congenital heart disease.
2. Study the management & immediate outcomes.

Patients and Methods

This is cross-sectional study was done in Ibn Al-Bitar Cardiac Specialized Center in period from the first of March 2015 to the first of March 2016.

Where every patient less than or equal to 18 years old referred to our center as case of dysrhythmia with one or more of the following presenting symptoms:

- Tachycardia or palpitation.
- Chest pain or discomfort.
- Pre-syncopic or syncopic attacks.

For each one of them done the following:-

Complete history including age, sex, date of presentation, chief complaint or presenting symptoms and duration, history of previous similar complaint in patient or one of his /or her family, history of congenital structural heart disease or dysarrthymia in patient or family, past medical history such as hyper / or hypothyroidism, drug history, past cardiac surgical history and prenatal, natal and postnatal history for neonates.

Complete physical examination (general and cardiac examination). Investigation including: -

- 12 leads ECG
- 2D Echo study.
- Thyroid function test.
- Serum electrolytes.
- The Holter study for those with unexplained arrhythmias, syncope & presyncope.

The confirmed cases with specific type of arrhythmias were kept under close observation and monitoring and the treatment was given to indicate cases with documentation of immediately response to treatment. Those with sinus arrythemias were excluded from the study.

Results

The total number of patients were 659 presented with suspected dysrhythmia of them 64 (9%) diagnosed with dysrhythmiasas shown in figure (1).

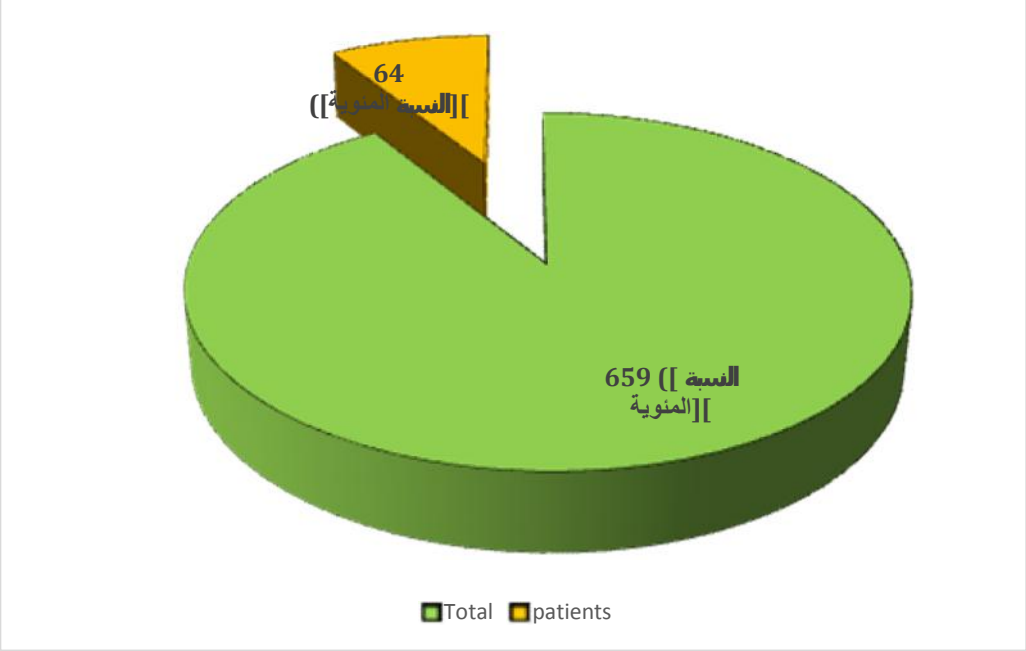

Figure (1):- The number and percentage of total patients and patients with dysrhythmias.

The number of males were 38 (59.4%) and the number of females were 26 (40.6%) as shown in figure (2).

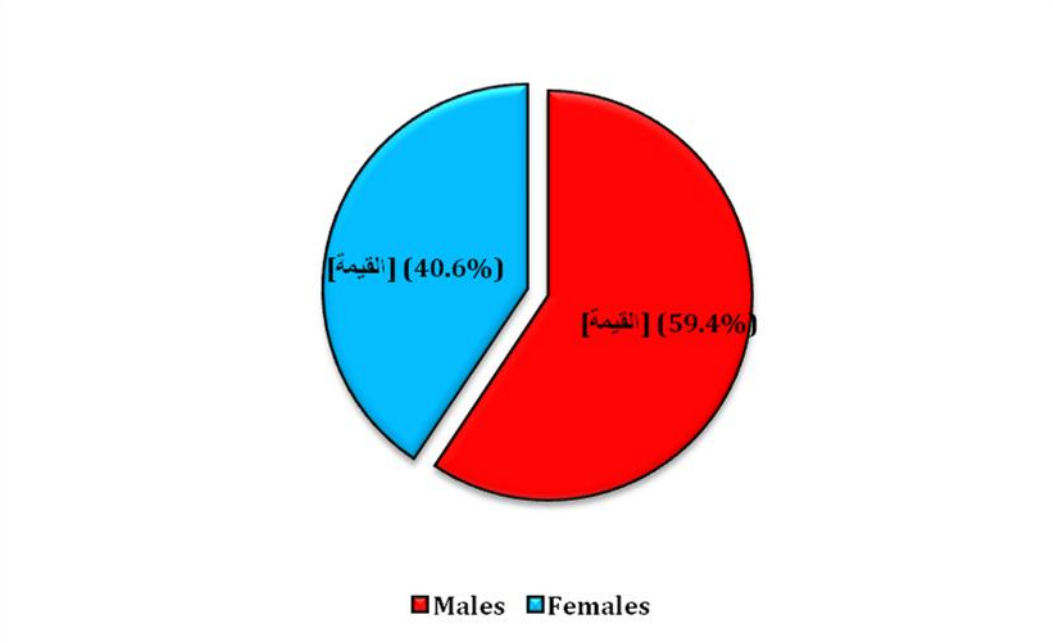

Figure (2):- The number and percentage of males and females.

The mean ± SD of ages (8.116 ± 5.0924 yrs) with median (8 yrs) divided into four age groups, first group infants ≤ 1yr were 10 (15.6%), second group toddlers > 1yr - ≤ 5yr were 8 (12.5%), third group children > 5yr - ≤ 12yr were 32 (50%) and fourth group teenagers and adolescents were 14 (21.9%) as shown in figure (3).

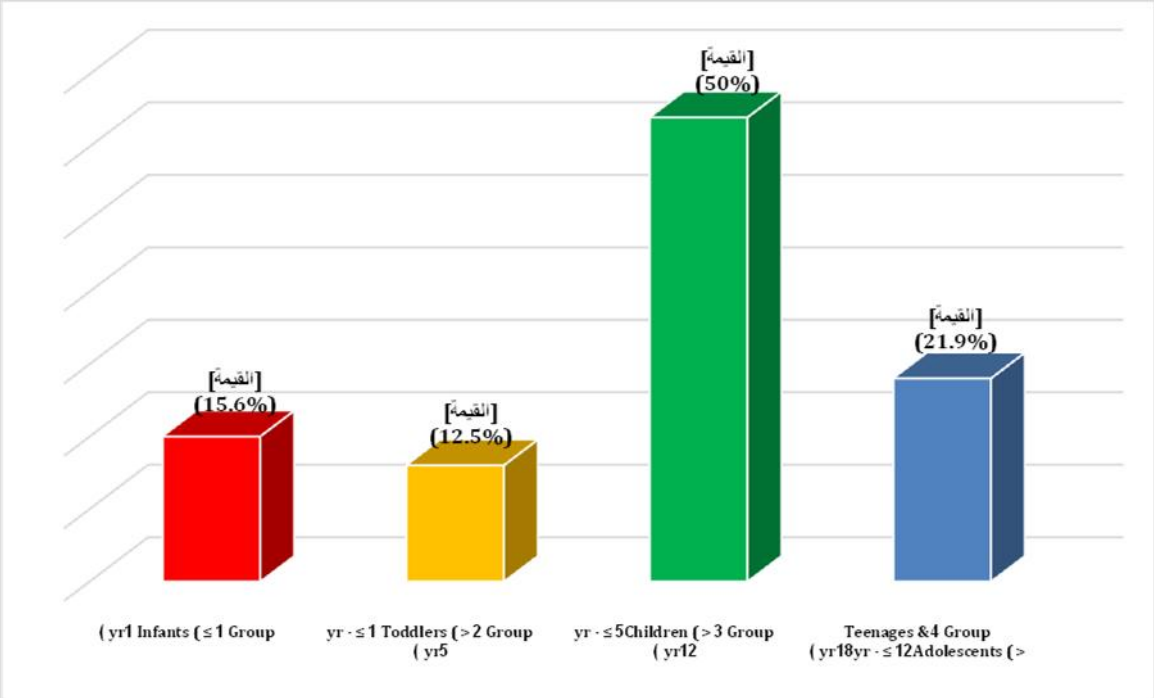

Figure (3):- The number and percentage of age groups of patients.

The number of patients associated with CHD were 39 (60.9%) and without CHD were 25 (39.1%) as shown in figure (4).

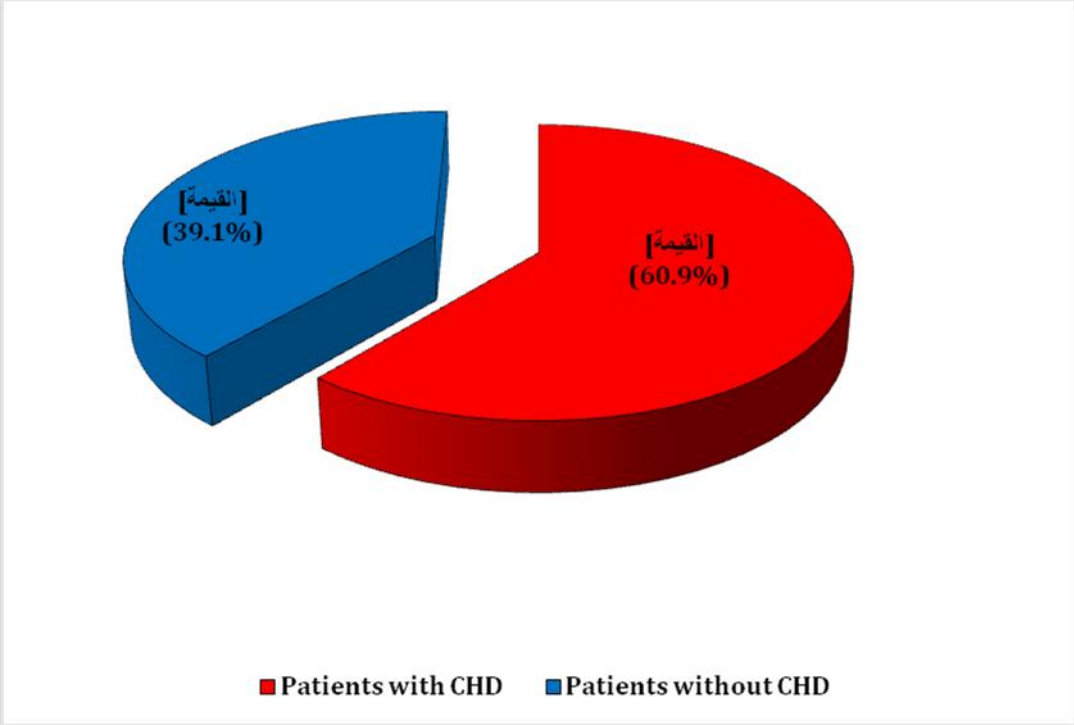

Figure (4):- The number and percentage of patients with CHD and patients without CHD.

The most common presenting symptoms were tachycardia and / or palpitation37 (57.8%), syncope and pre-syncope 17 (26.6%) & chest pain 10 (15.6%) respectively as shown in table (1).

Table (1):- The frequency and percentage of presenting symptoms.

Presenting symptoms	Number	Percentage
Tachycardia and / or palpitation	37	57.8%
Syncope & pre-syncope	17	26.6%
Chest pain	10	15.6%
Total	64	100%

The most common associated CHD were ASD II 10 (25.6%), corrected VSD 6 (15.4%) (4 cases corrected by surgery and 2 cases by catheterization), corrected TOF 6 (15.4%), post complete Fontan 6 (15.4%) (3 cases tricuspid atresia and 2 cases DORV and 1 case single ventricle), corrected AV canal 5 (12.8%), VSD 4 (10.3%) and TOF 2 (5.1%) respectively as shown in table (2).

Table (2):- The distribution of study groups according to associated CHD.

Type of associated CHD	Number	Percentage
ASD II	10	25.6%
Corrected VSD	6	15.4%
Corrected TOF	6	15.4%
Post Fontan	6	15.4%
Corrected AV canal	5	12.8%
VSD	4	10.3%
TOF	2	5.1%
Total	39	100

The most common type of dysrhythmias was SVT 24 (37.5%), complete heart block 12 (18.8%), VT 7 (10.9%), junctional arrhythmia 7 (10.9%), AF 6 (9.4%), atrial flutter 3 (4.7%), 2nd heart block 3 (4.7%) and 1st degree heart block 2 (3.1%) respectively as shown in table (3).

Table (3):- The distribution of study groups according to the type of dysrhythmias.

Type of arrhythmias	Number	Percentage
Supraventricular tachycardia	24	37.5%
Complete heart block	12	18.8%
Ventricular tachycardia	7	10.9%
Junctional arrhythmia	7	10.9%
Atrial fibrillation	6	9.4%
Atrial flutter	3	4.7%
2^{nd} degree heart block	3	4.7%
1^{st} degree heart block	2	3.1%
Total	64	100%

The distribution of types of dysrhythmia among age groups was as following:- first group infants only 10 cases of SVT, second group toddlers were 5 cases of SVT, 1 case of complete heart block and 2 cases of junctional arrhythmias respectively, third group were 7 cases of complete heart block, 6 cases of SVT, 6 cases of AF, 5 cases of junctional arrhythmia, 3 cases of VT, 2 cases of 1st degree heart block, 2 cases of 2nd degree heart block and 1 case of atrial flutter respectively, fourth group the teenagers and adolescents were 4 cases of complete heart block, 4 cases of VT, 3 cases of SVT, 2 cases of atrial flutter and 1 case of 2nd degree heart block respectively as shown in table (4).

Table (4):- The distribution of different types of dysrhythmia among age groups.

Type of dysrhythmias	Age groups				Total
	Group 1 Infants(≤ 1yr)	Group 2 Toddlers (>1yr - ≤ 5yr)	Group 3 Children (>5yr - ≤ 12 yr)	Group 4 Teenagers & Adolescents (>12yr - ≤18yr	
Supraventricular tachycardia	10	5	6	3	24
Complete heart block	-	1	7	4	12
Ventricular tachycardia	-	-	3	4	7
Junctional arrhythmia	-	2	5	-	7
Atrial fibrillation	-	-	6	-	6
Atrial flutter	-	-	1	2	3
2nd degree heart block	-	-	2	1	3
1st degree heart block	-	-	2	-	2
Total	10 (15.6%)	8 (12.5%)	32 (50%)	14 (21.9%)	64 (100%)

The associations of types of CHD with different types of dysrhythmias was as following:- without CHD were 14 cases of SVT, 7 cases of junctional arrhythmia, 3 cases of complete heart blocks and 1 case of 2nd degree heart block. ASDII were 3 cases of AF, 2 cases of SVT, 2 cases of 2nd degree heart block, 2 cases of 1st degree heart block and 1 case of atrial flutter. VSD were 3 cases of SVT and 1 case complete heart block. Corrected VSD were 4 cases of complete heart blocks and 2 cases of VT . TOF were only 2 cases of SVT. Corrected TOF were 3 cases of VT, 2 cases of complete heart block and 1 case of SVT. Corrected AV canal were 2 cases of complete heart block, 2 cases of atrial flutter and 1 case of AF. Post complete Fontan were 2 cases of SVT, 2 cases of VT and 2 cases of AF as shown in table (5).

Table (5):- The distribution of different types of dysrhythmia among different types of CHD.

Type of CHD	Type of arrhythmias								
	SVT	Complete heart block	VT	Junctional arrhythmia	AF	Atrial flutter	2nd degree heart block	1st degree heart block	Total
Without CHD	14	3	-	7	-	-	1	-	25
ASDII	2	-	-	-	3	1	2	2	10
VSD	3	1	-	-	-	-	-	-	4
Corrected VSD	-	4	2	-	-	-	-	-	6
TOF	2	-	-	-	-	-	-	-	2
Corrected TOF	1	2	3	-	-	-	-	-	6
Corrected AV canal	-	2	-	-	1	2	-	-	5
Post Fontan	2	-	2	-	2	-	-	-	6
Total	24	12	7	7	6	3	3	2	64

The response of dysrhythmias to the treatment was as following:- SVT 24 cases of them 14 cases (58.3%) were respond to amiodarone, 5 cases (20.8%) were respond to adenosine, 3 cases (12.5%) were respond to DC shock and 2 cases (8.3%) were respond to propranolol, complete heart block 12 cases all of them treated with pacemaker, VT 7 cases of them 5 (71.4%) treated with amiodarone and 2 cases (28.6%) treated with DC shock, junctional arrhythmias 7 cases kept under observation, AF 6 cases of them 5 cases (83.3%) respond to amiodarone and 1 (16.7%) respond to propranolol, atrial flutter 3 cases 2 of them (66.7%) respond to propranolol and 1 (33.3%) respond to amiodarone, 2nd degree heart block 3 cases all of them treated with pacemaker, 1st degree heart block 2 cases kept under observation without treatment.

Table (6):- The immediately response of different types of dysrhythmia to the treatment.

Type of arrhythmias	Treatment						Total
	Observation	Adenosine	Amiodarone	Propranolol	DC	Pacemaker	
Supraventricular tachycardia	-	5 (20.8%)	14 (58.3%)	2 (8.3%)	3 (12.5%)	-	24 (100%)
Complete heart block	-	-	-	-	-	12 (100%)	12 (100%)
Ventricular tachycardia	-	-	5 (71.4%)	-	2 (28.6%)	-	7 (100%)
Junctional arrhythmia	7 (100%)	-	-	-	-	-	7 (100%)
Atrial fibrilation	-	-	5 (83.3%)	1 (16.7%)	-	-	6 (100%)
Atrial flutter	-	-	1 (33.3%)	2 (66.7%)	-	-	3 (100%)
2nd degree heart block	-	-	-	-	-	3 (100%)	3 (100%)
1st degree heart block	2 (100%)	-	-	-	-	-	2 (100%)

Discussion

In comparison with study done in Cairo university by Ranya A. Hegazy & Wael N. Lotfy [19] where in this retrospective study during 6 years period by Holter monitoring for 1319 persons with age ranging (5 days-16 year) where 141 (10.7%) diagnosed with specific types of dysrhythmias, in our study 64 (9%), presenting symptoms were palpitation 261 (19.8%), syncope 234 (17.8%) & chest pain 132 (10%) while in our study the palpitation and/ or tachycardia 37 (57.8%), syncope 17 (26.6%) and chest pain 10 (15.6%). The most common types of dysrhythmias were SVT 27 (2.04%), complete heart block 19 (1.4%), VT 19 (1.4%), 2nd degree heart block 16 (1.2%), 1st degree heart block 14 (1.06%) and AF 7 (0.53%) while in our study SVT 24 (37.5%), complete heart block 12 (18.8%), VT 7 (10.9%), 2nd heart block 3 (4,7%), 1st degree heart block 2 (3.1%) and AF 6 (9.4%). The 2 studies are approximately compatible despite of large sample size and used more specific screening test (holter monitor).

In comparison with retrospective study done in Australia by Henning Clausen, Theane Theophilos, Kim Jackno & Franz E Babl[20] All children <18 years of age presenting with cardiac arrhythmia within 6 years duration to emergency department of Royal Children's Hospital included in the study based on documented electrophysiological testing, cardiology consultation, 24 hr ECG recordings & ECG analysis, where 444 cases diagnosed as dysrhythmia of them 250 cases (56.3%) was SVT, 18 cases (4.1%) was conduction disorder (i.e. complete heart block 4, 1st degree heart block 4 and 2nd heart block degree 4 & prolong QT-interval 6), VT 17 cases (3.8%) & 7 cases (1.6%) was AF, this compatible to our study SVT 24 (37.5%), complete heart block 12 (18.8%), VT 7 (10.9%), 2nd heart block 3 (4,7%), 1st degree heart block 2 (3.1%) and AF 6 (9.4%). The age distribution of dysrhythmias in this study was: third group 193 (43.4%), fourth group 142 (32%), second group 62 (14%) & first group 47 (10.6%) respectively, this also compatible with our study: third group 32 (50%), fourth group 14 (21.9%), first group 10 (15.6%) & second group 8 (12.5%). The most common type of presentations was palpitations 238 (53.6%), chest pain 86 (19.4%) & syncope 32 (7.2%) while in our study the palpitation and/ or tachycardia 37 (57.8%), syncope 17 (26.6%) and chest pain 10 (15.6%), the 2 studies are approximately compatible. The number of patients with CHD was 57 (12.9%) while in our study was 39 (60.9%) this is not compatible because of large sample size and long duration of study.

In comparison with another retrospective multicenter study done by J. Philip Saul, William A. Scott, Stephen Brown & …. et al [21] in which 61 patients with tachyarrhythmias with age range (1month-15yrs) were enrolled during 13 months by 27 centers in 7 countries of them 31(50.8%) were junctional ectopic tachycardia, 26 (42.6%) were SVT & 4 (6.6%) were VT while in our study the most common type of dysrhythmias was SVT 24 (37.5%), VT 7 (10.9%) and junctional dysthymia 7 (10.9%). The number of patients associated with CHD was 43 (71%) which compatible with our study 39 (60.9%). Regarding the treatment of SVT with administration of IV amiodarone was effective in 22 patients (85%) and ineffective in 4 patients (15%) while in our study it was effective in 14 patients (59%) and the remainder of patients respond to another type of treatment, the difference is that amiodarone was considered first line of treatment in compared study.

Conclusions

1) The most common type of pediatric dysrhythmia was supraventricular tachycardia and most of cases respond well to amiodarone.
2) All cases of ventricular tachycardia and most cases of complete heart block were occurred postoperative correction of congenital heart disease.
3) Most cases of dysrhythmias were associated with underlying congenital heart disease.

References

1. Part: 6, Chapter: 24, Myung K. Park, Park's Pediatric Cardiology for Practitioners 6th edition ©2014:967
2. Kastor JA (2000) Arrhythmias, 2nd edn. Philadelphia: WB Saunders. Zipes DP and Jalife J (2000) Cardiac Electrophysiology from Cell to Bedside, 3rd edn. Philadelphia: WB Saunders.
3. Van Hare G F. Indications for radiofrequency ablation in the pediatric population. JCardiovasc Electrophysiol 1997; 8:952-62.
4. Wren C. Ventricular arrhythmias. Wren C, Campbell RWF, editors. Pediatric cardiac arrhythmias. Oxford: Oxford University Press; 1996. pp 127-56.
5. Rekawek J, Kansy A, Miszczak-Knecht M, Manowska M, Bieganowska K, Brzezinska-Paszke M, Szymaniak E, Turska-Kmieć A, Maruszewski P, Burczyński P, Kawalec W. Riskfactors for cardiac arrhythmias in children with congenital heart disease after surgicalintervention in the early postoperative period. J Thorac Cardiovasc Surg. 2007; 133:900-4.
6. Michealsson M, Engle MA. Congenital Complete heart block: an international study of thenatural history. Cardiovasc Clin.1972; 4:85-101.
7. Rosen MR. The links between basic and clinical cardiac electrophysiology. Circulation 77:251, 1988.
8. Bryan C. Cannon and Christopher S. Snyder. Moss and Adams' Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adults, 8th edition ©2013, Chapter 18: Disorders of Cardiac Rhythm and Conduction, pp 441-469.
9. Carla R Hanash and Jane E Crosson Emergency diagnosis and management of pediatric arrhythmiasJ Emerg Trauma Shock. 2010 Jul-Sep; 3(3): 251–260.
10. Nanthakumar K, Lau YR, Plumb VJ, et al. Electrophysiological findings in adolescents with atrial fibrillation who have structurally normal hearts. Circulation 2004; 110:117-123.
11. Emergency diagnosis and management of pediatric arrhythmias https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2938490.
12. Khairy, P.M. Landzberg, et al. (2004). "Value of Programmed Ventricular Stimulatino after Tetralogy of Fallot Repair: a Multicenter Study." Circulation 109(16): 1994-2000.
13. Silka, M. J. and A. Garson, Jr. (1999). Ventricular Arrhythmias. Clinical Pediatric Arrhythmias. P. C. Gillette and A. Garson, Jr. Philadelphia, W.B. Saunders Company: 121-145.
14. Zipes, D. and A. Camm (2006). "ACC/AHA/ESC 2006 guidelines for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death." Journal of The American College of Cardiology 48(5): e247-346.
15. Sherron, P.E. Torres-Arraut, et al. (1985). "Site of conduction delay and electrophysiologic significance of first-degree atrioventricular block in children with heart disease." Am J Cardiol 55(11): 1323-7.
16. Young, D.R. Eisenberg, et al. (1977). "Wenckebach atrioventricular block (Mobitz type I) in children and adolescents." Am J Cardiol 40(3): 393-9. von Bernuth, G.R. Toussaint, et al. (1989). "[Heart rate and heart rhythm in healthy infants nd children]." Klin Padiatr 201(2): 98-103.
17. Beaufort-Krol, G. C.M. J. Schasfoort-van Leeuwen, et al. (2007). "Longitudinal echocardiographic follow-up in children with congenital complete atrioventricular block." Pacing Clin Electrophysiol 30(11): 1339-43.
18. Gregaratos, G. (2002). "ACC/AHA/NASPE 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices." Circulation.
19. Ranya A. Hegazy, MD 1, Wael N. Lotfy, MD, MRCP 2. The Value of Holter Monitoring In the Assessment of Pediatric Patients. Indian Pacing and Electrophysiology Journal (ISSN 0972-6292), 7(4): 204-214 (2007).

20. Henning Clausen, Theane Theophilos, Kim Jackno & Franz E Babl. Pediatric arrhythmias in the emergency department. Emerg Med J 2012; 29:732-737.

21. J. Philip Saul, MD; William A. Scott, MD; Stephen Brown, MD; Pablo Marantz, MD; Valeria Acevedo, MD; Susan P. Etheridge, MD; James C. Perry, MD; John K. Triedman, MD; Susan W. Burriss, BSN, MS; Paul Cargo, RN; Jay Graepel, PhD; Eeva-Kaarina Koskelo, PhD; Rebecca Wang, MD. Intravenous Amiodarone for Incessant Tachyarrhythmias in Children A. Circulation. 2005; 112:3470-3477. American Heart Association. http://www.circulationaha.org.

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Quick Response Code	Subject: Medical Sciences
DOI:10.22192/ijarbs.2019.06.11.012	

How to cite this article:
Ameer Adnan Muhsen, Hussein Jubair Lazim, Omar Zidanekhalaf Alqaisy. (2019). Childhood Dysrhythmias: Clinical Pattern, Management and Immediate Outcome. Int. J. Adv. Res. Biol. Sci. 6(11): 85-95.
DOI: http://dx.doi.org/10.22192/ijarbs.2019.06.11.012