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**A STUDY TO ASSESS THE INCIDENCE OF EARLY  
POST OPERATIVE ARRHYTHMIAS AFTER  
OPEN HEART SURGERY  
IN CHILDREN**



**PROJECT REPORT**

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**CERTIFICATE**

*Certified that is the bonafide work of Divya K.P. at Sree Chitra Thirunal  
Institute of Medical Science and Technology.*

*Submitted in practical fulfilment of the requirement in Diploma in  
Cardio Vascular and Thoracic Nursing from Sree Chitra Thirunal Institute  
of Medical Sciences and Technology.*

*Sarammo .P.P.*

**Place: Thiruvananthapuram**

**Date: 9/12/2005**

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**INVESTIGATOR**

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## CHAPTER 1

### Introduction

#### Back Ground of the Study

Arrhythmia is the abnormality in the rate, regularity or site of origin of the cardiac impulse or disturbances in the conduction of that impulse, such that the normal sequence of activation of atria and ventricles is altered. It may result from abnormalities of impulse initiation, impulse conduction or both.<sup>1</sup>

Knowledge and understanding of cardiac arrhythmias is particularly important in the pediatric age group where rapid and energetic treatment can be life saving. Cardiac arrhythmias of any form may occur as an isolated phenomenon or secondary to some causes particularly structural defects, that is certain forms of congenital heart diseases are commonly associated with rhythm disorders. Disturbances of heart rhythm can produce a wide range of hemodynamic effects, they may be completely asymptomatic or at the other end of the spectrum produce gross heart failure syncope and death.<sup>2</sup>

It has been estimated that 90% of all children born with serious congenital heart disease can be helped by cardiac surgical procedures and sequelae of the surgical procedure itself frequently causes arrhythmias. In reparative operations, residual abnormalities may lead to cardiac dysrhythmias and in palliative surgeries, residual hemodynamic abnormalities can often lead to dysrhythmias.<sup>3</sup>

Early post operative arrhythmias are frequently a relevant problem in the immediate postoperative management of children after surgical intervention for congenital heart disease. Studies show that it is significantly associated with procedure related risk factors. With improved surgical techniques it is becoming less frequent. However even in the most experienced centres, it is unlikely that postoperative arrhythmias will be eliminated and treatment in this situation requires special care and understanding of mechanisms.

Intra-atrial baffling procedures such as Mustard and Sennings complicated by early atrial arrhythmias in 40 to 50%, so special precautions are taken by using intra-operative mapping to identify conduction system. In correction of Tetralogy of Fallot the incidence of heart block may be upto 1%.

Pre-operative history of arrhythmias, prior cardiac operations, pre-existing myocardial compromise, intra-operatively cannulation of superior Vena Cava that can cause damage to Sino atrial node, prolonged cardio pulmonary bypass time, aortic cross clamp time and postoperatively hypoxia arrhythmia, acid base electrolyte imbalances, Drugs (increasing circulating Catecholamines), hypothermia are some of the risk factors of early postoperative arrhythmias.

Intensive Care Unit's approach to these early postoperative arrhythmias is very important. In the critical care setting treatment must frequently occur before specific cardiac diagnosis is made. These emergency therapies for Cardiac arrhythmias in children especially in the postoperative setting will be most effective if cardiac arrhythmias are anticipated. Any evidence of bradycardias Tachycardias or extrasystoles before the onset of a more serious arrhythmia should guide selection of therapy. For life threatening acute tachyarrhythmias when the patient demonstrates poor perfusion such as an acute change in unconsciousness, fall in peripheral perfusion or hypotension pharmacotherapy takes a second place to emergent electric cardiaversion. When the cardiac rhythm is unstable and extrasystoles or bradyarrhythmias are apparent, anticipatory and suppressing therapy for the specific rhythm disturbances may be indicated to prevent further deterioration into an acute life threatening rhythm disturbances. Important factors to consider when managing cardiac arrhythmias are the drugs the patient is receiving. Deleterious effects may occur

from intra-venous catecholamines and patients on digoxin warrant special attention. Thus the therapy for cardiac arrhythmias in the ICU depends on pre-existing rhythm disturbances, clinical setting, hemodynamic status, interaction with other drugs. As for all arrhythmias adequate oxygenation, correction of electrolyte disturbances and sedation are important baseline therapeutic endeavours. Although they occur frequently after cardiac surgeries in children are associated with low morbidity and mortality.

A 24 hours continuous ECG monitoring is a non-invasive and very sensitive method for the discovery of heart rhythm disturbances in children after cardiac surgery. Arrhythmias in Pediatric age is unique, and a pediatric critical care Nurse must be competent in detecting the pediatric arrhythmias and in delivering immediate management to save the life of a child who had overcome from complex cardiac operations. It is a challenging task for the nurses and must have a thorough knowledge about incidence types and possible risk factors of early postoperative arrhythmias.

### **Need for Study**

Accurate diagnosis and definitive management of cardiac rhythm disturbances have been improved by better understanding of the mechanisms responsible for dysrhythmia production and an expanded array of treatment modalities that includes new antiarrhythmic medications, pacemaker implantation, catheter ablation of the dysrhythmic focus. So in order to deliver the most appropriate and competent care to patient at risk for dysrhythmias, it is the responsibility of nurse to possess the necessary knowledge to make informed decisions. By monitoring patients in the appropriate leads and correctly interpreting the cardiac rhythm the nurse can recognize dysrhythmias promptly when they occur. However it is not enough for a competent nurse simply to interpret cardiac rhythms. She or he must

understand the physiologic process take in place during the dysrhythmias and corresponding implications for the patients care. If the nurse is familiar with this information she can intervene with the appropriate measures that will impact the patients outcome.

Since cardiac surgery is being carried with increasing frequency infants and children as a curative or palliating basis, it is not surprising that the incidence of arrhythmias in the pediatric age group is increasing. Although all types of arrhythmias are possible with any type of operation certain arrhythmias are highly related to particular defects and type of operations. The investigator had gone to many research studies on early postoperative arrhythmias after cardiac surgeries in children and found that it is very interesting and invaluable to have a study of incidence of early postoperative arrhythmias after cardiac surgery in children.

Nurses job does not end with the interpretation of a cardiac rhythm, but rather that is the beginning point of arrhythmia mangement. It is the nurse caring for that patient who is on frontline and be morethan likely be the first to note the arrhythmia. For that reasons, the aims of this study targets not only recognition and pharmacological management of cardiac rhythms, but also analysing the possible risk factors and the nursing process that must surround the decision making process.

### **Statement of the Problem or Title**

A study to assess the incidence of early postoperative arrhythmias after open heart surgery in children.

## **Objectives of the Study**

*This study is intended to*

- ◆ To assess the incidence of early postoperative arrhythmias after open heart surgery in children.
- ◆ To analyse the possible risk factors.
- ◆ To describe the management of early postoperative arrhythmias.

## **Operational Definitions**

***Incidence :*** Defined as the the number of cases of early postoperative arrhythmias Occuring in Pediatric population after open heart surgery during a defined time interval.

***Arrhythmia:*** Defined as the abnormalities in the rate and the regularity or site of origin of the Cardiac impulse or disturbances in the conduction of that impulse such that the normal sequence of activation of atria and ventricles is altered.

***Early postoperative period :*** Defined as the period of time from patients are received to ICU after surgery till they are transferred to wards.

***Open heart surgery :*** Defined as surgery performed in children with congenital cardiac defects either in a reparative or palliative aspect with the help of a cardio pulmonary bypass machine by which circulation is bypassed.

***Children :*** Defined as those who are under the age of 10 years.

### **Delimitations**

- ❖ Samples include patients undergoing cardiac surgery from only one Institution
- ❖ Sample size is limited to 20 no:only.
- ❖ Purposive sampling technique is used.

### **Summary**

This chapter has included the background of the study , need for the study, statement of the problem, objectives of he the study, definition of terms, delimitations.

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## CHAPTER II

### Review of Related Literature

Review of Literature is an important aspect of any research project from beginning to end. It gives greater insight into the problem and helps in selecting methodology, developing tool, and also analysing data. With these in view, an intensive review of literature has been done.

Studies relating to early post-operative arrhythmias after cardiac surgery in children done in India could not be located. Many studies in this area have been conducted abroad. A decision was made to review these studies to gain insight into the problem area, approach to investigation and methodology. Studies on incidence early and late arrhythmias following cardiac surgery and arrhythmias after certain catheterization procedures non cardiac surgical cases in paediatric intensive care-units were also reviewed and found helpful in formulating frame-work for the study, deciding about research design and developing the tool.

*The review of literature relevant to this study is presented in the following sections:-*

1. Studies on early postoperative arrhythmias after cardiac surgery in children.
2. Studies on procedural factors associated with early postoperative arrhythmias after repair of congenital heart defects.
3. Studies on impact of junctional ectopic tachycardia on post operative morbidity following repair of congenital heart defects.

### 1. *Studies on early post operative arrhythmias after cardiac surgery in children*

Emanuela Valsangiacomo et al (92) Conducted a study on early postoperative arrhythmias after cardiac surgery in children. The purpose of the study was to assess incidence, treatment, and risk factors of early postoperative arrhythmias. The study sample included 108 consecutive patients with a congenital heart defect underwent openheart surgery at the University Hospital Zurich, between November 1998 and January 2000. Patients were evaluated prospectively during the entire stay in the intensive care unit from post-operative admission to discharge from the ICU. The patients were grouped in three different categories of surgical complexity and continuous ECG monitoring was performed during the entire ICU stay. When an arrhythmias was detected on ECG monitor this was also documented with standard ECG. If it is failed an arterial ECG was recorded using the implanted temporary atrial ECG was recorded using the implanted temporary atrial pacingwires. The findings was that during a median postoperative time of 1 day (range 0 to 15 days) 64 critical arrhythmias occurred in 48 patients. The most common arrhythmias were sinus bradycardia, Atrioventricular block II to III Supraventricular tachyarrhythmias, premature complexes. Treatment of most of them was successful and included pacing, intravenous amiodarone, body cooling, overdrive pacing, electrolyte correction more than one treatment modality in some cases. Risk factors were lower body weight, longer cardiopulmonary bypass time, higher surgical complexity.

2. Plammatter et al (92) conducted a similar study. The objective was the evaluation of occurrence, clinical course necessity of treatment and outcome of early post operative cardiac arrhythmias after open heart surgery. It was a prospective study on 310 pediatric patients undergone cardiac surgery on CPB during the whole peri operative hospital stay. All patients had continuous electrocardiographic monitoring with memory function

during the whole intensive care stay. A 24 hours hotter recording was done thereafter in patients with arrhythmias. The findings were out of 310 patients studied 83 (27%) had postoperative arrhythmias. The occurrence rate was not different whether surgical access was by atriotomy, Ventriculotomy (26% VS 28% Res) Infants (39%) Cyanotic patients (36%) had a higher occurrence rate of arrhythmias ( $p < .05$ ). Arrhythmias were common after prolonged CPB time and with hemodynamically significant residual findings after correction had an increased occurrence rate of arrhythmias 53 (64%) required specific antiarrhythmic treatment. The use of antiarrhythmic drugs was required in only 7 of these patients only one patient (1.2 % of patients with arrhythmias) died from arrhythmias. No major complications resulting from arrhythmias occurred during postoperative clinical course in other patients.

3. Holtman et al (1997) conducted a study on incidence of arrhythmias in a Pediatric Cardiac intensive Care unit where manages critically ill children and adults with congenital and acquired heart disease. The purpose of this study was to prospectively evaluate the incidence of arrhythmias in a pediatric CICU patient population. All patients admitted to CICU at the Cardiac center at the children's Hospital of Philadelphia between December 1 1997, and November 30, 1998 were evaluated prospectively from CICU admission to hospital discharge via full disclosure telemetry reviewed every 24 hours. Arrhythmias reviewed included nonsustained and sustained supraventricular tachycardia (SVT) atrial flutter, fabulation, junctional ectopic tachycardia, and complete heart block.

The findings were that out of 629 patients, with a hospital stay ranged from 1 to 155 days, 602 undergone surgical interventions, included 482 utilizing cardiopulmonary bypass. During the study period there were 44 deaths, non of which were directly

attributable to a primary arrhythmia. The operative mortality was 5.1 % overall 29.0% admissions had one or more arrhythmias the most common arrhythmias was non sustained VT (18.% admissions) followed by non sustianed SVT (12.9% of admission) Patients admitted to a pediatric CICU have a high incidence of arrhythmias most likely associated with their underlying pathophysiology and to the breadth of medical and surgical intervention conducted.

4. Bonatti .V.et al (98) conducted a study on early and late postoperative complete heart-block in pediatric patients submitted to open heart surgery for congenital heart disease. The findings of this study were the incidence of complete heart block following open heart surgery for congenital heart disease is about 1% Most of postoperative complete heart blocks are the cosequences of procedures involving closure of VSD (Ventricular Septal Defect) that occur immediately after surgery or early in the postoperative period. In a few cases they also may occur many months to years after surgery. Early postoperative CHBS can be transient or permanent. Permanent pacing is generally not recommended in the former . On the contrary if complete heart block persists after at least two weeks of temporary pacing permanent pacing is needed because the block is usually due to his bundle damage or to trifasicular damage and is associated with extensive bradycardia and risk of asystole. Late postoperative CHB or to the progression at postoperative his purkinje conduction troubles suggesting triascicualr damage. Permanent pacing obiviously needed in the cas of documented late post-operative. CHB.

*Studies on procedural factors associated with early post operative arrhythmias after the repair of congenital heart defects.*

5 Pfammatter JP et al (42) conducted a study on procedural factors associated with early postoperative arrhythmias after repair of congenital heart defects. The hypothesis was tested that factors closely related to the surgical procedure itself were associated with a higher incidence of arrhythmias early in the postoperative course after repair of congenital heart disease. Samples were all consecutive patients undergoing 1 of 3 well defined surgical procedures were prospectively evaluated for the occurrence of arrhythmias during the entire post-operative hospital stay by means of continuous ECG monitoring with intensive care unit and use of 24hr holter monitors. Patients examined were those undergoing intratrial closure of a VSD, repair of complete AV canal defect and detraction of Fallot. The relation between procedural variables and the occurrence of arrhythmias was independently evaluated for each of these 3 part defects. The results of this study were early post operative arrhythmias occurred in 30% of patients with VSD (n=75) 35% of patients with TOF(n=52) and 47% of patients with repair of complete AV Canal defect. (n=45) patients with arrhythmias had prolonged extracorporeal bypass time ( $p < .05$ ) and longer aortic cross clamp time ( $p < .01$ ) as well as when higher maximum postoperative troponin serum levels  $P < .01$ . In patients with AV canal defect there was a significant relation between hemodynamically in complete surgical results and the occurrence of arrhythmias ( $P < .01$ )

6. Su-chiung et al (85) conducted a study on dysrhythmias after the modified Fontan Procedure. The objectives were to assess the occurrence of arrhythmias, also assessed the significance and the possible risk factors related to the arrhythmias after the

Fontan procedures. Samples were taken from 24 patients who had undergone Fontan procedure. Cardiac rhythms were analyzed by examining preoperative 12 lead ECGs, immediate post-operative bedside continuous ECG monitoring and late serial 12 lead ECGs. The results were, transient atrial dysrhythmias were common in the immediate post-operative period. Late postoperative premature atrial contractions were detected by ambulatory monitoring in 20 to 23 patients, eight (34.8%) had supraventricular tachycardia. Late ventricular dysrhythmias and eight (34.8%) had multiform premature ventricular contractions. Five of the latter had couplets and one of these five plus another had ventricular tachycardia. Seven patients with supraventricular tachycardia and five patients with ventricular dysrhythmia required antiarrhythmic medication. A symptomatic bradycardia was detected in five patients (21.7%). One patient had intermittent second degree atrioventricular block. No specific risk factors predicted dysrhythmias. Thus cardiac dysrhythmias were common in patients after the modified Fontan procedure, but were well tolerated in most patients. No sudden deaths or syncopal episodes have occurred during a mean follow-up of 5 years. One patient's death was related to severe left ventricular dysfunction. Permanent pacing has not been required in any patient.

7. Rhodes LA et al (90) conducted a study on arrhythmias and intracardiac conduction after the arterial switch operation. The objective of this study was to assess the incidence of arrhythmias after interatrial baffling procedures such as Mustard or Sennings. The sample size was 390 patients 230 with intact ventricular septum and 160 with a Co-existing ventricular septal defect underwent arterial switch operation from January 1st 1983 to December 31 1990 at Children's Hospital Boston Mass. Electro Cardio Grams and 24 Hrs. Holter monitoring studies were obtained in these patients and limited intracardiac

electrophysiologic studies performed 6 to 12 months after the operation. The results were obtained as AV node function is preserved in most patients, seven patients had first degree (2.0%), two (.7%) had second degree and five (1.7%) Complete AV block (all with co-existing ventricular septal defects). All five patients with complete heart block received a permanent pacemaker. In those patients not having a permanent pacemaker, sinus Rhythm present in 96% on the surface electrocardiogram and 99% during 24 hrs Holter monitor studies (1 month to 8.5 years, mean 2.1 years after the operation. Intracardiac electrophysiologic studies (n=158) demonstrated normal node recovery times and AH intervals in 97% of patients. Atrial ectopy present in 152 of 172 (81%) patients with the majority (64%) of patients only occasional premature beats without repetitive forms. Ventricular ectopy frequent finding during 24 hrs monitoring. The conclusion was that results from confirm that theoretical advance of anatomic correction over critical level, correction of transposition of great arteries with respect to preservation of sinus node function and low incidence of clinically significant tachy arrhythmias.

8. Anita Saxena et al (89) conduct a study on cardiac Arrhythmias after surgical correction of total anomalous Pulmonary venous connection. The objective was to determine the incidence of cardiac arrhythmias after TAPVC correction samples were from Wessex Cardiothoracic Centre Southampton General Hospital patients undergone TAPVC correction. A detailed history and examination, resting ECG, Chest-Xray examination, Twenty four hour ambulatory ECG monitoring with a dual-channel Holter system was performed and analysed against a patient diary or activity and symptoms. The results were sixteen patients aged 7 months to 20 yrs who has undergone surgical repair in the first year of life

for total anomalous pulmonary venous connection underwent assessment of cardiac rhythm by 24 hrs electrocardiogram monitoring, nine of them also had maximal exercise treatment tests, 3 months to 19.5 years after all except one who has occasional single supraventricular ectopic beats. But on 24-h ECG monitoring significant arrhythmias were recorded in six of the 16 patients including supraventricular tachycardia (three patients), brady arrhythmias (two patients), Sick sinus syndrome (Two patients) and multifocal supraventricular tachycardia and ventricular ectopic beats (two patients) five of these six patients were assessed more than 6yrs after surgery. An appropriate chronotropic response was seen on maximal exercise tread mill testing in our patients, three of them had arrhythmias previously recorded by 24-h ECG monitoring.

Studies on impact of Junctional Ectopic Tachycardia on post operative morbidity following repair of congenital heart defects.

9. Timothy M et al (98) conducted a study on postoperative junctional ectopic tachycardia in children. The objectives were to assess the incidence, risk factors and treatment of JET after cardiac surgery in children. Telemetry for each patient admitted to the cardiac intensive care unit from December 1997 to November 1998 for post operative cardiac surgical care was examined daily for postoperative JET. A nest case chart analysis of 33 patients who experienced JET from 594 consecutively monitored patients who underwent cardiac operation. Univariate and Multivariate analysis were conducted to determine factors associated with occurrence of JET. The findings were that the age range of patient with JET was 1 day to 10.5 years mean (1.8 months). Univariate analysis revealed that dopamine or Milrinone use post-operatively, longer CPB time and younger age were

associated with JET Multivariate modeling elicited that dopamine (Odds ratio  $P=0.02$ ) were associated with JET only 13 (39%) of patients with JET received therapeutic intervention. The dopamine use should be disclosed in the presence of postoperative junctional ectopic tachycardia.

**10.** O.I Miller et al ('97) conducted a study in impact of junctional ectopic tachycardia on post operative morbidity following repair of congenital heart defects. The objectives were to determine the incidence of post operative junctional ectopic tachycardia and to assess the impact of this arrhythmias on hospital morbidity and mortality. Samples were taken from all consecutive patients undergoing cardiac surgery between '97 to 00 at Great Ormond Street Hospital for children. By reviewing the post operative course of patients undergoing VSD closure  $n=161$ , TOF  $n=114$ , AVSD  $n=58$  common atrium  $n=10$ . All patients with JET received treatment in a stepwise manner by beginning with surface cooling continuous intravenous amiodarone atrial pacing if the hemodynamics proved unstable. A linear regression model assessed the effect of these treatments upon hours of mechanical ventilation in the cardiac intensive care unit. The findings were overall mortality was 2-9%  $n=10$ . With three of the patients having JETS with TOF. JETS occurred in 937 patients (10.8%). Most frequently after TOF repair (21.9%) followed by AVSD (10%) and VSD (3.7%) and no occurrence after repair of common atrial trunk.

These studies helped in tool construction for the present study.

### **Summary**

The review of Literature on the above areas helped the investigator to gain deeper knowledge about incidence of early post operative arrhythmias, management and risk factors. However, such studies done in Indian settings, could not be located.

The review of literature also helped in design of the study, development of tool, information about sample, data collection procedures and plan - for analysis.

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## CHAPTER III

### Research Methodology

Research Methodology is the way to systematically solve the research problem. It is the science that studies the steps that researcher adopts to study his problem with the logic behind

(C.R. Kothari)

This chapter provides brief description of different steps taken to conduct the study, population, sample and sampling techniques, inclusion criteria and exclusion criteria, development of data collection, content validity of the tool, reliability of the tool, pilot study, data collection procedure and plan for data analysis.

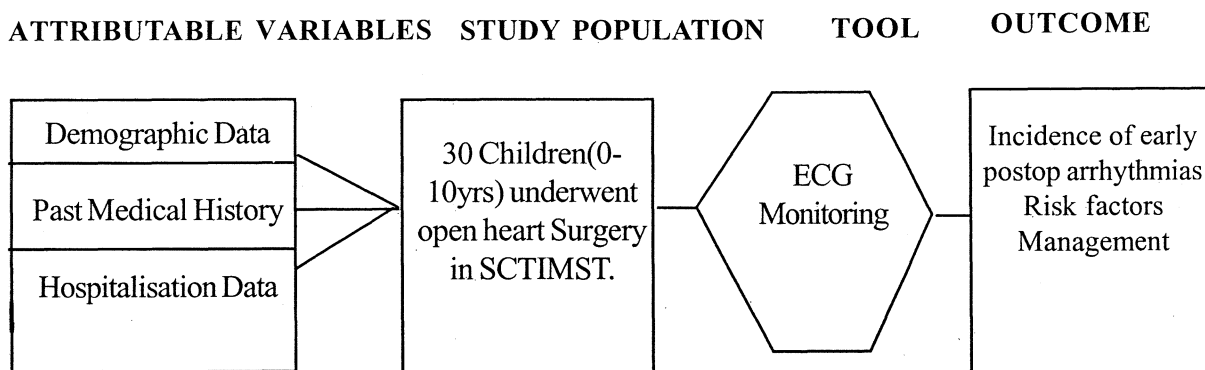
#### Research Approach

A descriptive study approach was selected as the objectives of the study were (i) to assess the incidence of early postoperative arrhythmias (ii) to analyse the possible risk factors.

#### Research Design

Research Design is the conceptual structure within which the research is conducted. It facilitates the smooth sailing of the various research operations and there by making research as efficient as possible yielding maximum information with minimal expenditure of effort, time and money. For fulfilling the objectives of the study, the following design was utilized for collection and analysis of data as shown in figure 1

*Figure 1. Schematic Design of the study*



### Setting

The study was conducted in the pediatric in the pediatric surgical Intensive Care Unit in Sree Chitra Thirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.

The rationale for selecting Sree Chitra Thirunal Institute for the study was the investigator's interest in finding out the incidence of early postoperative arrhythmias after open heart surgery in children in a "Institute of National Importance" like this. The investigator was also most familiar with this institute.

### Population

Children with congenital heart disease underwent open heart surgery with cardiopulmonary bypass in Sree Chitra Thirunal Institute for Medical Sciences and Technology. The population for the study was the children from 0 to 10 years of age.

### Sampling

Sampling technique refers to the process of selecting a portion of population to represent entire population. Convenient sampling technique is used for the present study.

### **Sample**

Sample is a subset of unit that composes the group. In the present study total 30 patients who had undergone open heart surgery. For the was selected us samples.

### **Pilot Study**

Before the original study, a pilot study was conducted in five patients undergone open heart procedures with the use of cardiopulmonary bypass. Necessary modifications in the observation data were made to conduct the actual study.

### **Data Collection**

The data were collected between September 2005 and October 2005 from 30 patients with congenital heart defect underwent open heart operation with cardiopulmonary bypass at Sree Chitra Thirunal Institute for Medical Sciences and Technology, Thiruvananthapuram. A record review was accomplished to determine patient and procedures related data. Demographic and medical history data collected included the patients age underlying cardiac diagnosis prior history and treatment of arrhythmias and prior cardiac surgeries. The operative note was reviewed to determine the details of the procedure and cardiopulmonary bypass.

After receiving in ICU, these patients were connected to continuous Electrocardiographic monitoring during the entire ICU stay with PHILIPS monitors which provide storage and retrospective printing of the monitored ECG. When an arrhythmia was detected on ECG monitor, documented and a standard 12 lead ECG is also taken.

### **Inclusion Criteria**

- ◆ Children belonging to 0-10 years of age underwent open heart surgery.
- ◆ Both male and female children.

### **Exclusion Criteria**

- ◆ Children who have beyond 10 years of age
- ◆ Children who had undergone cardiac surgery without cardio pulmonary

### **Tools and Techniques**

Tool selected was a structured observation schedule. There was no standard tool available to assess the incidence of early postoperative arrhythmias. So the Investigator constructed a observation data for the study purpose.

### **The research tool was devised on the basis of the following:**

- ◆ Review of relevant Literature
- ◆ Information received from experts in the field of medicine and nursing.
- ◆ Discussion with friends.
- ◆ Investigator's own experience and observation.

This observation schedule was prepared and submitted for validation of experts, corrections were made in the tool according to their recommendations.

The tool consisted of two sections:

#### ***Section A and Section B***

**Section A -** For obtaining demographic, medical history and hospitalization data.

**Section B -** For obtaining the data on incidence, risk factors, and management of early Postoperative arrhythmias after open heart surgery in children.

In the present study, the investigator documented arrhythmias witnessed and managed by herself and also witnessed by others. The Investigator obtained prior permission for the conduction of the study from the respective authorities of pediatric surgical Department of Sree Chitra Thirunal Institute of Medical Sciences and Technology. Thiruvananthapuram.

### **Plan of Analysis**

The Data collected from 30 samples would be analyzed by the investigator after preparing a master data sheet. Items are scored the number of times of their occurrences counted and percentage calculated.

### **Summary**

This chapter covers the research approach, research Design, Setting of the study, population, Selection of samples, criteria for sample selection, Tool and Technique, data collection process and analysis of data.

### **References**

- (1) Basavanthappa BV "Nursing Research" 1999 (New Delhi) Jaypee brothers Medical publishers Page no: 225-260
- (2) Kothari C.R "Research Methodology" Methods and Technology 2nd Edition Page no: 120-146

## CHAPTER IV

### Analysing and Interpretation of Data

#### Introduction

This chapter present the analysis and intepretation of data collected from 30 children belongs to the age group of 0-10 years with congenital cardiac defects underwent open heart surgery at Sree Chitra Thirunal Institute for Medical Sciences and Technology.

Analysis is a process of organizing and synthesing data in such a way that research questions can be answered and hypothesis tested. The overall aim of analysis is to organize, provide structure and to elicit meaning from research data.

The interpretation refers to the process of making sense of the results and of examining the implications of the findings with in a broder content.

**The findings of the present study are presented under the following headings:**

- Section A - Incidence of early postoperative arrhythmias
- Section B - Risk factors analysis
- Section C - Description of management of these early postoperative arrhythmias.

## Section A

Assessment of the incidence of early postoperative arrhythmias.

**Table 1**

Distribution of samples as according to the surgical Complexity.

Category	Surgical Procedures	No: of Patients n=30	Frequency %
I - Low Surgical Complexity	<ul style="list-style-type: none"> <li>◆ Atrial Septal defect closure(ASD)</li> <li>◆ Aortic coarctation repair</li> </ul>	<p>9</p> <p>1</p>	33%
II-Moderate Surgical Complexity	<ul style="list-style-type: none"> <li>◆ Ventricular Septal defect closure</li> <li>◆ ASD+VSD</li> <li>◆ Partial atrio-Ventricular Septal defect closure</li> <li>◆ Modified Glenn Shunt</li> <li>◆ Partial anomalous Pulmonary Venous connection repair</li> <li>◆ Intra cardiac repair</li> </ul>	<p>2</p> <p>1</p> <p>1</p> <p>3</p> <p>1</p> <p>3</p>	36%
III- High Surgical Complexity	<ul style="list-style-type: none"> <li>◆ Arterial switch operation</li> <li>◆ Sennings procedure</li> <li>◆ Fontal procedure</li> <li>◆ Total Atrio Ventricular Septal defect repair</li> <li>◆ TAPVC repair</li> <li>◆ NORWOOD procedure</li> </ul>	<p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	30%

*Data in Table 1 Shows that 33% of sample was surgical procedures of low complexity and 36% moderate complexity. 30% was High complexity .*

TABLE 2  
Distribution of Samples According to Age

S.No.	Age Group	Number of Patients	Percentage
1	0-2 Years	6	20%
2	2-4 Years	8	27%
3	4-6 Years	9	30%
4	6-8 Years	5	16.6%
5	8-10 Years	2	6%

*Data in Table 2 shows that 30% of the samples is 4-6 years of age and the 27% is 2-4 years 20% is 0-2 years 16.6% is 6-8 years 6% only 6% sample is from 8-10 years.*

TABLE 3

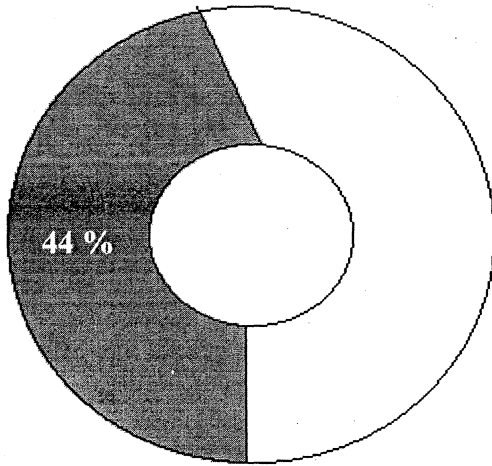
**Distribution of Samples According to the Perioperative Data**

Patient Characteristics	Surgical Complexity			Total
	I	II	III	
Patients No=30	10	11	9	30
Age (Months)	84	24	24	44
Weight (K.G)	15	4	2	7
CPB Time(Minutes)	52	80	118.5	87
ICU Stay(Days)	2	6	11	6
Inotropic support	2(20%)	11(100%)	9 (100%)	71%
Pacing	0	5(45%)	7 (78%)	40%
Arrhythmia	1(10%)	5 (45%)	7 (78%)	13(44%)

Table 3 shows that in 30 patients observed for early postoperative Arrhythmias , 13 patients had early post operative Arrhythmias of one or more types. 20 Arrhythmias were observed in these patients during an average observation time in the ICU of 6 days. The time of arrhythmias occurrence ranged from the same day of operation to 6 days after operation. 5 patients had two different types of arrhythmias and 1 patient had three types of arrhythmias . Hemodynamic impairment was observed in two arrhythmias two of them represented life threatening events managed by defibrillation and other emergency measures.

**Figure - 2**

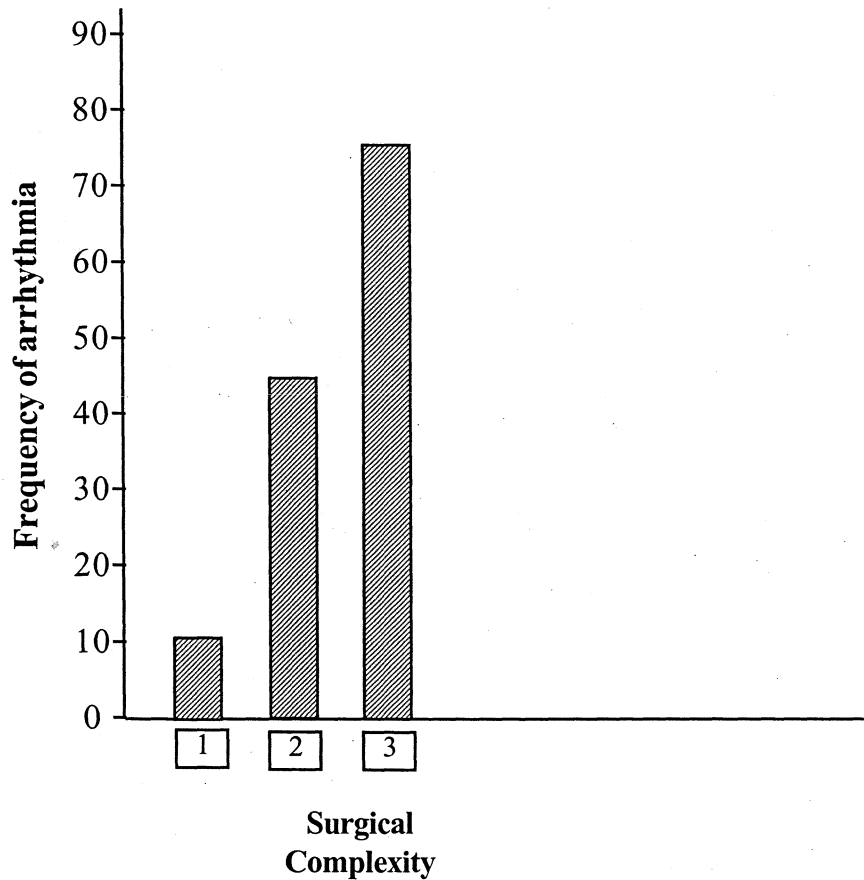
*PIE Diagram showing incidence of early postoperative Arrhythmias after open heart surgery in children*



*Shows that 44% of Children underwent open heart Surgery had early post operative arrhythmias.*

**Figure - 3**

*Incidence of Arrhythmia According to Surgical Complexity*



*Data in figure 3 shows that children underwent surgeries of high complexity had higher 78% of arrhythmias, moderate surgical complexity had 45% of arrhythmias and for low complexity only 10% of incidence of arrhythmias*

**TABLE - 4**  
**Incidence of Arrhythmia according to the age group**

S.No:	AGE Group	No:of Patients	Frequency of Arrhythmia	Percentage
1	0-2 Years	6	5	83.3%
2	2-4 Years	8	4	50%
3	4-6 Years	9	2	22.2%
4	6-8 Years	5	1	20%
5	8-10 Years	2	1	50%

*Data in Table 4 shows that incidence of early postoperative arrhythmias is 83.3% in 0-2 years , 50% in 2-4 years and 8-10 years , in 4-6 years it is 22.2% and 6-8 years it is 20%.*

**Figure - 4**

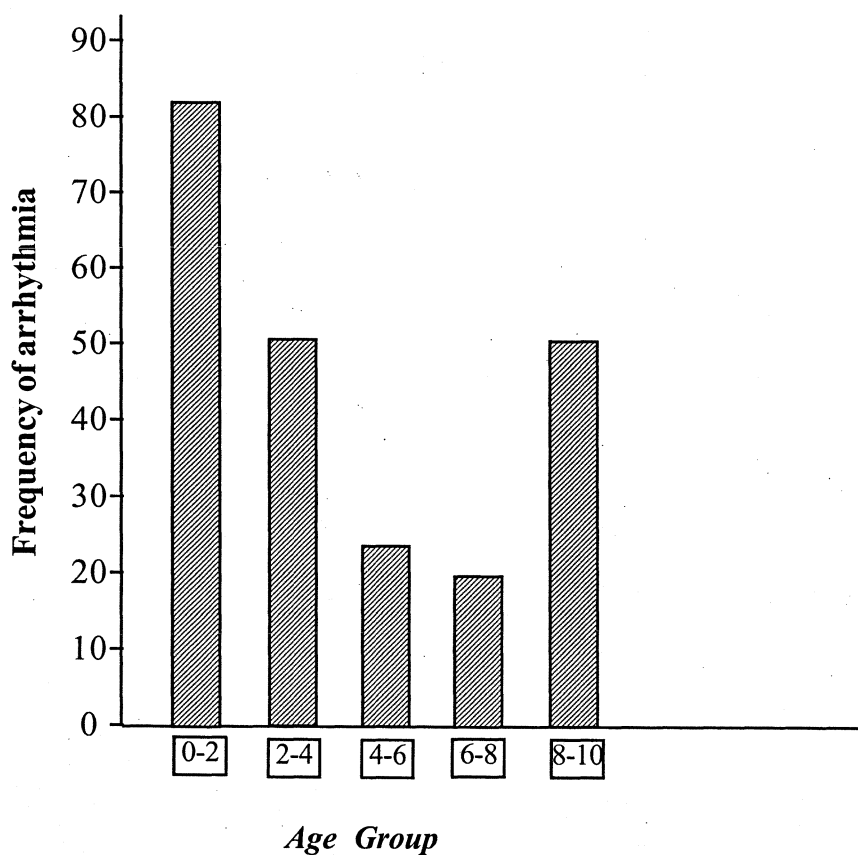


TABLE - 5

**DISTRIBUTION OF SAMPLES ACCORDING TO TYPES OF FREQUENCY OF  
CRITICAL EARLY POSTOPERATIVE ARRHYTHMIAS**

S.No:	Types of arrhythmias	No:of Pateints	Frequency %
1	Sinus bradycardia	4	30%
	with (junctional ectopic beats)	2	
2	Premature Complexes	5	25%
	(Atrial )	3	
	(Ventricular)	2	
3	Supra ventricular Tacycardia	4	20%
	Sinus Tacycardia	2	
	Paroxysmal Atrial Tacycardia	2	
4	Junctional ectopic Tacycardia	2	10%
5	AV Block(Complete heart Block)	2	10%
6	Sustained Ventricular Tacycardia	1	5%

*Data in Table 5 shows that brady arrhythmias (Sinus bradycardia ) are largely occur about 30% in early postoperative period may be due to conduction system injury during the repair of congenital heart defect. This is commonly associated with atrial surgery such as Fontan, Sennings or repair of ASD. Next 25% are premature complexes ,20% supra ventricular tacycardia, 10 % junctional ectopic tacycardia , 10% atrial ventricular block or AV dissociation. Sustained VT only in 5%*

**Section B**  
**ANALYSIS OF RISK FACTORS FOR EARLY POSTOPERATIVE ARRHYTHMIAS**

**TABLE 6**

S.No:	Risk Factors	Frequency	Percentage
1	Surgical Complexity	8	40%
2	Prolonged CPB Time	8	40%
3	Electrolyte imbalances Acid-base imbalances Drugs (Circulating catecholamines) Lower body weight Lower age Hypothermia	4	20%

*Data in Table 6 shows that independent risk factors for early postoperative arrhythmias are surgical complexity, prolonged CPB time comprise 40%, 40% respectively. Other risk factors include as Electrolyte ,acid-base imbalances , Drugs, Lower body weight, Age and hypothermia.*

**Section C**  
**DESCRIPTION OF MANAGEMENT OF**  
**EARLY POSTOPERATIVE ARRHYTHMIAS**

**TABLE - 7**

S.No:	Therapy	No: of Application
1	None	4
2	Pacing	8
3	Antiarrhythmics or Cardio active Drugs	6
4	Electrolyte Correction	6
5	CardioVersion	1
6	Body surface cooling	2

*Data in Table 7 16 arrhythmias corresponding to 80% of all arrhythmias were treated. Pacing was performed in 40% of all observed arrhythmias. Temporary pacing was performed during a median period of five days. One of the patients needed permanent pace maker implantation later. Common indications was complete heart block. Antiarrhythmics was not indicated in any of situation and most tachyarrhythmias were treated cardio active drugs like Digoxin and calcium channel blockers. Electric cardioversion was necessary in one situation and it was successful. Body surface cooling was also very effective in eliminating junctional ectopic tachycardia. Isoprenaline was also given in two patients with sinus brady cardia.*

## Cardio vascular nursing- standards of care for children with early post operative arrhythmias

### 1. Alteration in cardiac output : Decrease related to dysrhythmias

*Expected Outcome : Child will remain free of dysrhythmias or will not experience hemodynamic sequelae associated with dysrhythmia, as evidenced by the following:*

- Stable and appropriate vital signs for age.
- Absence of diaphoresis
- Warm skin
- Absence of colour changes
- Stable Neurologic status
- Adequate peripheral pulses

### **Nursing Interventions**

1. Monitor ECG per bedside monitor, ensuring that alarms are on and set to prescribed parameters.
2. Assess for hemodynamic sequelae if dysrhythmia occurs and notify the physician.
3. Obtain base line rhythm strip each shift and document on chart.
4. Assess with 12 lead ECG, CXR, ECHO as required.
5. Assist with vagal maneuvers as required.
6. Assist with pacemaker insertion as required, ensure proper functioning of pacemakers.
7. Document antidysrhythmics as ordered, ensuring correct dosage and effectiveness.
8. Monitor the child closely during antidysrhythmic administration (may cause bradycardia, AV block or proarrhythmia.)
9. Assist with cardio version as required (0.5 to 10 J/kg) ensuring sedation prior to cardio version and effectiveness of it.

### **Summary**

This chapter deals with the objectives in which the data were analysed, distribution of samples according to the surgical complexity, age, perioperative data, incidence of arrhythmia types of arrhythmia, risk factors, therapies of arrhythmias and the nursing care plan also described.

### **Reference**

- 1 John W. Best et al. "Research in Education" 7<sup>th</sup> Edition, 1999 Prentice hall of India Pvt Ltd Page No: 343-360

## CHAPTER V

### SUMMARY AND RECOMMENDATIONS

#### Introduction

A brief account of the study is given in this chapter which cover the objectives, findings of the study, implications, and finally suggestions for future research.

#### Summary

This study was designed to assess the incidence of early postoperative arrhythmias nafter open heart surgery in children. The investigator conducte this sr\tudy in Pediatric surgical Intensive Care Unit, Sree Chitra Thirunal Institute of Medical Sciences and Technology. The samples size was 30. The tool used for the study was observation schedule. The data thus obtained was analysed in terms of frequencies and presented in basis.

#### The objectives of the study.

- To assess the incidence of early postoperative arrhythmias after open heart surgery in children.
- To analyse the possible risk factors.
- To describe the management of these early postoperative arrhythmias.

#### Analysis of the study revealed that.

- The incidence of early postoperative arrhythmias after open heart surgery in children comprise 44%
- The incidence of early postoperative arrhythmias in higher surgical complex proce dures is 78%
- The incidence of early postoperative arrhythmias in lower age group is higher (83.3%)

- The most common types of arrhythmias after open heart surgery in children are sinus bradycardia with or without junctional escape beat(30%) Premature complexes 25%, supraventricular tachycardia 20%, Junctional ectopic tachycardia 10%, Conduction blocks 10%, Ventricular arrhythmias only 5%
- The independent risk factors for early postoperative arrhythmias are surgical complexity 40%, prolonged CPB time 40%, others include electrolyte, acid-base imbalances, Drugs that will increase circulating catecholamines lower body weight, Lower age group, all of them 4%.
- Arrhythmia therapies are needed in 80% cases. Pacing is performed in 40% of cases. Cardioactive drugs, like digoxin and calcium channel blockers are used to control the heart rate in tachy arrhythmias no other antiarrhythmias were not needed. Electrolyte correction (60%) cardioversion (5%) Body surface Cooling (10%) was also needed.
- The nurse plays a pivotal role on the recognition and subsequent treatment of early postoperative arrhythmias.

### **Implications**

- Findings of the study suggested there is a higher incidence of early postoperative arrhythmias after open heart in children, may be a relevant problem is the immediate post operative management.
- Findings of the study may be utilized when planning care for a postoperative child.
- Awareness regarding the risk factor of early postoperative arrhythmias will help to manage them effectively.
- The pediatric intensive care nurses approach to these situations, will be effective, if they are anticipating these early postoperative arrhythmias.

### **Recommendations for future studies**

- Similar study involving a large sample with more time can be conducted to correlate the findings
- Comparative study may be conducted in other institutions
- Study to assess the incidence of early post operative arrhythmias after cardiac surgery in adults can also be done.

## CHAPTER VI

# REFERENCES

### TEXT BOOKS

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3. Kothari C.R. “Research Methodology, Methods and technology ” 2 nd Edition  
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7. Lounsberg Patricia “Cardiac rhythm disorders” MosbyYear book 1988 pageno:114-164
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9. Hazinski “Nursing care of critically ill children”The C.V Mosby company,1984,page  
no:100-120.

## APPENDIX-1

### Data collection Tool

#### *Structured observation schedule*

#### Demographic data

- Sample no : \_\_\_\_\_
- Name of the patient: \_\_\_\_\_
- Age : \_\_\_\_\_
- Sex : \_\_\_\_\_
- Weight : \_\_\_\_\_
- Diagnosis : \_\_\_\_\_
- Type of surgery : \_\_\_\_\_

#### Pre-operative data-a record review

1. Any history of prior cardiac operations.
2. Any history of arrhythmias or arrhythmia therapies
3. Clinical condition of the patient
4. Relevant echo findings
5. Lab investigation reports

Hematocrit

Electrolytes

#### Intra operative data- a record review

1. Was it on Total Cardiopulmonary Bypass  
     Partial Bypass  
     Total Circulatory Arrest
2. Total Bypass time
3. Aortic Cross clamp time
4. Total Circulatory Arrest time if any

## Post operative Assessment

1. Time at which the patient is received in the ICU
2. Median ICU stay time
3. ECG findings when patient received
4. Arrhythmia observed at
  - Time
  - Frequency
  - which post operative day
5. Type of Arrhythmia
6. Any possible risk factors
  - Younger age
  - Low weight
  - Prolonged Bypass time
  - Prolonged Aortic Cross clamp time
  - Total Circulatory arrest time
  - Surgical Complexity
  - Electrolyte imbalance
  - Acid base in balance
  - Drugs (Increase the Circulating Catecholamine)
  - Hypothermia
  - Hypovolemia
  - Hypoxia
  - None
7. Hemodynamic effect of Arrhythmia
8. Treatment required
  - None
  - Pacing / Overdrive Pacing
  - Anti Arrhythmics or Cardio Active Drugs
  - Electrolyte correction
  - surface cooling
  - Cardioversion or Defibrillation
9. Nursing diagnosis and management
10. Outcome