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A Study to Assess the Knowledge of Nurses on Management of Complications Related to Surgeries of Pediatric Patients Admitted with Cardiac Septal Defects in Selected Hospitals at Shimoga in View of Providing Information Brochure

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Abstract: ***Congenital heart disease is the structural malformations of heart or great vessels, present at birth. It is the most common congenital malformation. Operative repair of defects in the atrial and ventricular septal are the most commonly performed open operations for congenital heart disease.[1] A study to assess the Knowledge of nurses on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects in selected hospitals at Shimoga in view of providing information brochure. Objectives: To assess the knowledge of nurses on management of complications related to surgical procedures for congenital cardiac septal defects. To associate knowledge of nurses with selected demographic variable regarding management of complications related to surgical procedures for congenital cardiac septal defects. To prepare and distribute the information brochure regarding the management of Complications related to cardiac septal surgeries. Conceptual framework based on modified General System Theory (Bertalanffy & J.W Kenny) 1968: The present study is intended to assess the knowledge of nurses on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects. The conceptual framework used for this study is based on General system model approach. Research Methodology: In this study descriptive approach was used to assess the knowledge of staff nurses on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects. The sampling structured questionnaires on post-operative complication of septal defect surgeries and its management used for data collection. Results: The majority of respondents 51 (85%) belong to the age group of 20- 29 years where as 08 (13.3%) belong to 30-39 years of age and 01 (01.7%) were belongs to 40- 49 years. In relation to the gender, the maximum numbers 54 (90%) were females and 06 (10%) were males. In relation to educational status, the majority of the respondents 39 (65%) were educated up to P.C.B.Sc, (N), whereas 14 (23.3%) were educated up to GNM, and 07 (11.7%) studied B.Sc (N).With regard to professional experience, maximum numbers 31 (51.7%) were had less than 01 years, 23 (38.3%) were had between 1 to 5 years, 04 (6.7%) were had above 10 years and 02 (3.3%) were had between 6 to 10 years of professional experience. With respect to present area of work, the maximum respondents 30 (50%) were currently working in post-operative ward, 25 (41.7%) were working in intensive thoracic unit, and 05 (08.4%) were working in operation theatre. With regards to designation, the maximum respondents 52 (86.7%) were working as staff nurses, 06 (10%) were working as ward in charge, and 02 (3.3%) were working as nursing supervisors. With respect to native place, the maximum respondents 31 (51.7%) were belongs to Kerala, 31 (51.7%) were belongs to Karnataka, and no one from Tamil Nadu and other state. one from Tamilnadu and other state. In relation to the participation in any seminars/ CNE/ CME/Workshop, the maximum numbers 52 (86.7%) were responded yes and 08 (13.3%) were responded.***

Keywords: Congenital heart disease, complications, cardiac septal defects, descriptive approach, General system model approach

1. Introduction

Operative repair of defects in the atrial and ventricular septal are the most commonly performed open operations for congenital heart disease. The incidence of the complications following repair has declined since the early experiences with intracardiac surgery and now appear to be related to the patient‘s overall status and to the age of the patient at operation. The management of complications following the repair of the septal defects is based a clear understanding of location, type, developmental anatomy, and preoperative patient physiology.[2]Atrial septal defect is an abnormal opening between right and left atria resulting left to right shunting of blood and it accounts for 9 percent of all congenital heart disease. Ventricular septal defect is an abnormal opening in the septum between right and left ventricles. It is the most common cyanotic congenital heart defects with the left to right to right shunt. Approximately it is found that about 25 percent of all congenital heart disease.

Based on the personal experience of the investigator, as she has worked as clinical nurses in Nanjappa Life Care Centre at shimoga, majority of infants will under cardiac surgeries and suffer with complication like hypocalaemia, hypokalaemia, hypotension as well as hypertension, bleeding from intracardiac drainage, also could able to witness sudden changes in electro cardiogram. It is felt that, to work in this type of setting and cases nurses need high and proficient nursing competencies. Hence the investigator felt a need to assess the knowledge of nurses regarding management of post- operative complication in Pediatric intensive thoracic unit also planned to provide information booklet to enhance nurses knowledge.

R Smitha, SC Karat, D Narayanappa, B Krishnamurthy, SN Prasanth, NB Ramachandra conducted a study on Prevalence of congenital heart diseases in Mysore with an objective of to study the prevalence of congenital heart diseases in Indian

population. Results showed that the prevalence of CHDs for five years in Mysore hospitals ranges from 6.6 to 13.06 per 1000 live births. The most frequent type of CHD was found to be VSD (40.47%) followed by ASD (19.06%), TOF (13.38%) and PDA (9.53%). It is clear that the maximum CHDs were detected in the first year of life when compared to the later years of life. The prevalence of CHDs in Mysore is increasing from 2000 to 2004 which might be due to the improvement of diagnosis, attention or knowledge among the medical authorities on the disease and it revealed that he prevalence of CHDs in Mysore is not very high as reported in other parts of the country, however; it is an important disease which needs an immediate medical attention.[3]

Annemien E. van den Bosch, Derk-Jan Ten Harkel, Jackie S. McGhie, Jolien W. Roos-Hesselink, Maarten L. Simoons, Ad J.J.C. Bogers, Folkert J. Meijboom conducted a study on Feasibility and Accuracy of Real-time 3-Dimensional Echocardiographic Assessment of Ventricular Septal Defects. The aim of this study was to evaluate feasibility, accuracy and clinical applicability of real time (RT) transthoracic 3-dimentional (3D) echocardiography (3DE) in determination of the position, size, and shape of a ventricular septal defect (VSD), in all, 34 patients (age: 2 months to 46 years), who were scheduled for surgical closure of a VSD, were enrolled in the study. VSD localization, shape and dimensions were assessed and compared with measurements performed by the surgeon. Acquisition of RT-3DE datasets was feasible in 30 of 34 (88%) patients. Duration of 3D data acquisition was 6±2 minutes. Reconstruction time was 23±16 minutes. Localization and number of VSD were determined correctly by RT-3DE in all patients. There was a good correlation of VSD measurements between RT-3DE and operation (r=0.95). RT-3DE allows accurate determination of VSD size, shapes and location. The short acquisition time and acceptable reconstruction time make this technique clinically applicable.[4]

Felix Berger, Michael Vogel, Vladimir Alexi-Meskishvili, Peter E. Lange conducted study on Comparison of results and complications of surgical and amplatzer device closure of atrial septal defects. The objective was Results and complications of surgical versus transcatheter treatment of atrial septal defect in the current era are compared. Results showed that 61 patients underwent surgery at a median age of 20 years (0.5-74 years) and 61 had the defect closed with an Amplatzer device at a median age of 12 years (0.8-77.7 years) ($P > .2$). Hospital stay in surgically treated patients was 8 days (6-19 days) versus 3 days (3-14 days) in interventionally treated patients ($P < .001$). Atrial septal defect and shunt sizes were larger in the surgical group ($P < .001$). Closure rates in the 2 groups were identical (98%). One patient (68 years) in the surgical group had a perforated duodenal ulcer that necessitated an operation 8 days after closure of the atrial septal defect, and 1 (26 years) had an infected lateral thoracotomy wound necessitating plastic surgery. Embolization of the Amplatzer device to the left ventricle was observed in 1 patient (29 years). The device could be retrieved from the heart, but vascular surgery was required to extract it from the femoral artery and oit revealed that as complete closure rates and complications are identical, but duration of hospital stay is shorter with less morbidity, we prefer implantation of an Amplatzer septal occluder to surgery wherever possible. [5]

Gianfranco Butera, Mario Carminati, Massimo Chessa conducted a study on Percutaneous versus surgical closure of secundum atrial septal defect. 535 patients underwent surgical repair of ostium secundum ASD (group A). 751 consecutive patients underwent percutaneous ASD closure (group B). The following outcomes were studied: mortality, morbidity, hospital stay, and efficacy. There were no postoperative deaths. The overall rate of complications was higher in group A than in group B: 44% (95% CI 39.8%-48.2%) versus 6.9 % (95% CI 5%-8.7%) ($P < .0001$). Major complications were also more frequent in group A: 16% (95% CI 13%-19%) versus 3.6% (95% CI 2.2%-5.0%) ($P = .002$). Multiple logistic regression analysis showed that surgery was independently strongly related to the occurrence of total complication (odds ratio [OR] 8.13, 95% CI 5.75-12.20) and of major complications (OR 4.03, 95% CI 2.38-7.35). The occurrence of minor complications was independently related to surgery (OR 7.33, 95% CI 4.75-11.02), childhood (OR 1.52, 95% CI 1.01-2.34), and presence of systemic hypertension (OR 1.35, 95% CI 1.01-4.41). Hospital stay was shorter in group B (3.2 ± 0.9 vs 8.0 ± 2.8 days, $P < .0001$). Percutaneous ASD closure provides, in experienced hands and in highly specialized centers, excellent results with a lower complication rate and requires a shorter stay in hospital.[6]

Caroline C Menache, Adré J du Plessis, David L Wessel, Richard A Jonas, Jane W New burger conducted a study on current incidence of acute neurologic complications after open-heart operations in children. Open-heart operations were performed in 706 children. Sixteen children (2.3%) had neurologic complications develop, including 9 (1.3%) with definite clinical seizures, 1 with suspected seizures and bilateral subdural hemorrhage, 2 with coma after cardiac arrest, 2 with transient mild choreoathetosis, 1 with facial palsy, and 1 with persistent irritability. Causes of seizure were cyclosporin A toxicity posttransplant (4), cerebral ischemia post cardiac arrest (3), and unknown (2). In infants less than 1 year of age, the incidence of seizures was 1.2%. This review suggests a decrease in acute neurologic morbidity after pediatric open heart operation. Clinical seizures remain the most common complication. Posttransplant, cyclosporin-associated seizures have emerged as an important etiologic category, coincident with an increase in cardiac transplantation in children. [7]

2. Assumption

1) Nurses may have insufficient knowledge regarding management of complication related to surgical procedures for congenital cardiac septal defects.
2) Information brochure may have effect on knowledge regarding management of complication related to surgical procedures for congenital cardiac septal defects.

Hypothesis: **H_1-** There is significant association between pre-test levels of knowledge of staff nurses in management of complications related to surgical procedures for congenital cardiac septal defects with selected demographic variable.

Limitations: It was a tedious procedure for the investigator to get the permission for conducting the study. It was difficult for the investigator to get co-operation from the subjects.

Conceptual Framework based on Modified General System Theory (Bertalanffy & J.W Kenny) 1968.

Input: The Input in the present study refers to the baseline variables such as age, gender, educational qualification, professional experience, present area of work, designation, native place, and participation in any seminars / CNE/CME/workshop of the nurses working in ITU/OT/ post-natal ward the post-operative ward, ITU and OT regarding complications related to surgeries of pediatric patients with cardiac septal defects by administering structured questionnaire which consists of general information on congenital cardiac problems, complications related to surgery of cardiac septal defects, management of complications related to surgery of cardiac septal defects.

Output: It refers to the findings obtained which would be classified as adequate, moderate and inadequate level of knowledge.

Feedback: In this study feedback is necessary to those who belong to the group that fall under inadequate and moderately adequate, to reassess the knowledge.

Research Design: The research design which is used to achieve objectives of this study is non - experimental descriptive design was used to assess the knowledge.In this study the research was conducted in the Nanjappa life care hospital with 100 beds, which is situated at Gadikoppa, Sagar Road, Shivamoga., In this study accessible population were 200 staff nurses in Nanjappa life care hospital, Shivamoga. The sample size was 60 staff nurses were selected.

Inclusion Criteria: Staff nurses who are

- Registered with either diploma or degree qualification in nursing.
- Working in the post-operative ward / ITU/ OT of selected hospitals, Shivamoga.
- Willing to participate in the study
- Attending the morning and evening shift.
- Available at the time of data collection.

- **Exclusion Criteria**
- Nurses who have already previously participated in the similar studies.
- Nurses who were attending the night shift.

Development and Description of the Tool: Based on the review of literature, discussion with the experts and with the investigator ‘s personal and professional experience, a self-administered structured questionnaire consisting of 30 items were developed and planned as follows. There were totally 30 items. Each item is multiple choices in nature with 4 responses in each question. There was one correct response that carried one mark and the wrong response carried zero.

Section A: A self-administered structured questionnaire for collecting demographic data of staff nurses working in selected hospital. The investigator sought information on demographic data of nurses such as age, gender, educational qualification, professional experience, present area of work, designation, native place, and participation in any seminars / CNE/ CME/ workshop.

Section B: A self-administered structured questionnaire to assess the knowledge on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects. This section sought information to assess the knowledge of the staff nurses on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects.

Pilot Study: Formal approval was obtained from director of the Nanjappa Life Hospital, Shimoga for the pilot study. The pilot study was conducted from 26/06/2015 to 02/07/2015.The investigator selected 10 staff nurses in who fulfill the inclusion criteria as samples for the study by using convenience sampling technique. After a brief self-introduction, the investigator explained the purpose of the study and obtained consent from them. The investigator has collected the demographic data. Self- administered structured questionnaire were administered to subjects on an individual basis to assess the level of knowledge on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects.

The statistical analysis of the pilot study showed the feasibility and practicability of the study and as there was no modification, the investigator proceeded with the main study. Demographic data was about 10 minutes, for self-administered questionnaires were about 30 minutes. Data collected were analyzed and the results indicated that there was less than average level of knowledge and few of them had more than or equal to average score on management of complications related to surgeries of pediatric patients admitted with cardiac septal defects. The subjects were comfortable and cooperated well during the study. The statistical analysis of the pilot study showed the feasibility and practicability of the study and as there was no modification, the investigator proceeded with the main study.

Procedure for Data Collection: Data collection is the gathering of information needed to address research problem. Formal written permission was obtained from the Director of the Nanjappa Life Hospital, Shimoga for conducting the main study. The investigator conducted the main study in the month of July-August for a period four weeks.

Phase 1: After obtaining the permission from the significant authorities' self-structure questionnaire was used to assess demographic data for 10 minutes, followed by self-administered structure questionnaire to assess the knowledge items for 30 minutes.

Phase 2: Investigator distributed the instructional brochure at the end of the study based on the results obtained**.**
Duration of main study was 4 weeks and study was conducted from 23/04/2015 to 26/05/2015.

Processing of the data: Data collected was processed every day. Missed out data were identified and immediately next day it was rectified. During the data collection subjects were cooperative and the investigator was able to collect all the necessary information from the subjects without any problems.

Plan for the data analysis: The data obtained was analyzed on the basis of the objectives of the study using descriptive and inferential statistics

3. Results

Section- A: Table sowing the frequency and percentage distribution of demographic variables of nurses, n=60

S. No.	Demographic variables	Frequency	Percentage (%)
1	Age (years)		
	20 -29 years	51	85
	30 – 39 years	08	13.3
	40 – 49 years	01	1.7
	50 and above	00	00
2	Gender		
	Male	06	10
	Female	54	90
3	Educational status		
	GNM	14	23.3
	B.Sc. (N)	07	11.7
	P.C.B.Sc (N)	39	65
4	Professional experience in years		
	Less than 1 years	31	51.7
	1-5 years	23	38.3
	6-10 years	02	3.3
	Above 10 years	04	6.7
5	Present area of work		
	Post operative ward	30	50
	Intensive thoracic unit	25	41.7
	Operation theatre	05	08.4
6	Designation		
	Staff nurse	52	86.7
	Ward incharge	6	10
	Nursing Supervisor	2	3.3
7	Native place		
	Karnataka	29	48.3
	Kerala	31	51.7
	Tamilnadu	00	00
	Others	00	00
8	Participation in any seminars/ CNE/ CME/Workshop		
	Yes	52	86.7
	No	08	13.3

Picture below showing the distribution of nurses according to level of knowledge regarding management of complications related to surgeries of pediatric patients admitted with cardiac septal defects

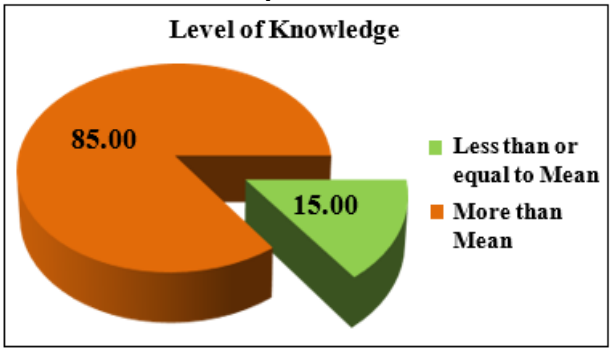

Table below showing Mean, Range, Standard Deviation & Mean Percentage of Knowledge regarding management of complications related to surgeries of pediatric patients admitted with cardiac septal defects, n=60

S. No	Aspects of Knowledge	Maximum score	Range	Mean	SD	Mean percentage
1	General information	05	0-5	2.98	1.27	59.60
2	Management of complications of surgeries related to cardiac septal defects	25	0-24	17.62	3.56	70.48
Overall		30	0-29	20.60	3.67	68.66

Mean Percentage distribution of nurses on different aspects of knowledge regarding management of complications related to surgeries of pediatric patients admitted with cardiac septal defects.

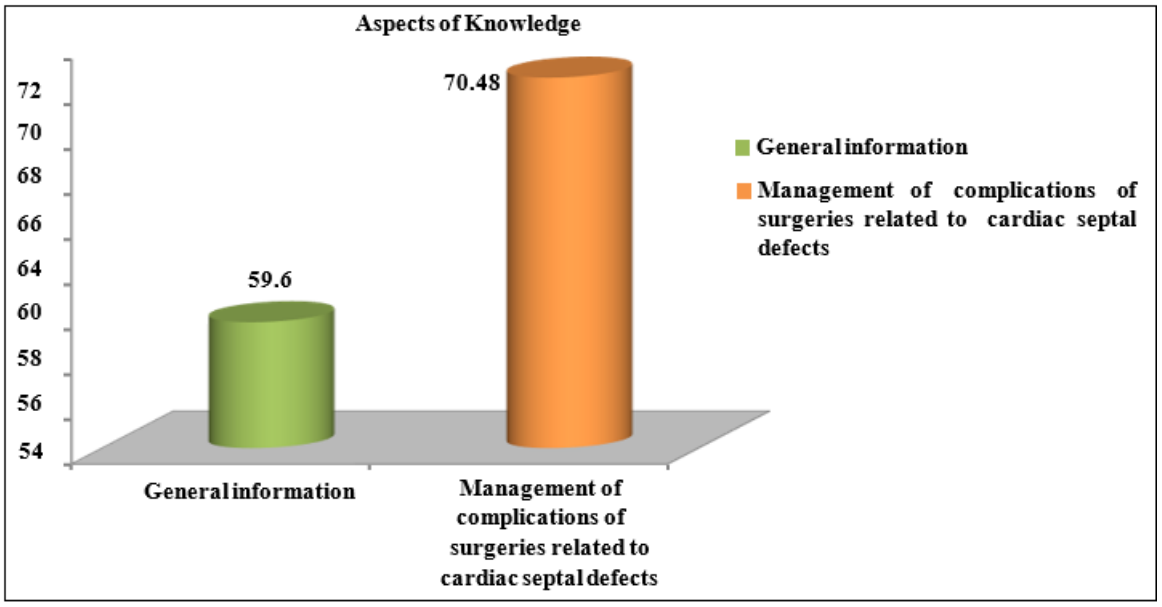

Table below showing association of level of knowledge with selected demographic variables of nurses such as Age, Gender, Educational status and Professional experience, n = 60

S. No.	Demographic variables	f	%	Knowledge				χ^2- Value	p- Value
				≤ Median		> Median			
				No	%	No	%		
1	**Age (years)**							1.869, df=2, S	p<0.05
	20 -29 years	51	85	9	15	42	70		
	30 – 39 years	08	13.3	0	0	8	13.34		
	40 – 49 years	01	1.7	0	0	1	1.66		
	50 and above	00	00	0	0	0	0		
2	**Gender**							1.176, df=1, S	p<0.05
	Male	06	10	0	0	6	10		
	Female	54	90	9	15	45	75		
3	**Educational status**							5.701, df=2, S	p<0.05
	GNM	14	23.3	0	0	14	23.34		
	B.Sc. (N)	07	11.7	0	0	7	11.66		
	P.C.B.Sc (N)	39	65	9	15	30	50		
4	**Professional experience in years**							9.905, df=3, NS	p>0.05
	Less than 1 years	31	51.7	9	15	22	36.66		
	1-5 years	23	38.3	0	0	23	38.34		
	6-10 years	02	3.3	0	0	2	3.34		
	Above 10 years	04	6.7	0	0	4	6.66		

Note: S- Denotes significant at p<0.05 and **NS**- Not significant

Table showing the association of level of knowledge with selected demographic variables of nurses such as Present area of work, Designation, Native Place and Participation in any seminars/ CNE/ CME/Workshop

S. No.	Demographic variables	f	%	Knowledge				χ^2- value	p- Value
				≤ Median		> Median			
				No.	%	No.	%		
5	**Present area of work**							10.588, df=2, NS	p>0.05
	Post operative ward	30	50	9	15	21	35		
	Intensive thoracic unit	25	41.7	0	0	25	41.66		
	Operation theatre	05	08.4	0	0	5	8.33		
6	**Designation**							1.629, df=2, S	p<0.05
	Staff nurse	52	86.7	9	15	43	71.66		
	Ward incharge	6	10	0	0	6	10		
	Nursing Supervisor	2	3.3	0	0	2	3.33		
7	**Native place**							11.318, df=1, NS	p>0.05
	Karnataka	29	48.3	9	15	20	33.33		
	Kerala	31	51.7	0	0	31	51.66		
	Tamilnadu	00	00	0	0	0	0		
	Others	00	00	0	0	0	0		
8	**Participation in any seminars/ CNE/ CME/Workshop**							1.629, df=1, S	p<0.05
	Yes	52	86.7	9	15	43	71.66		
	No	08	13.3	0	0	8	13.33		

Note: S- Denotes significant at p<0.05 and **NS**- Not significant

4. Discussion

Part-I : Characteristics of the demographic variables of nurses in terms of the frequency and percentage distribution as depicted in table 1(a) showed that majority 51 (85%) belong to the age group of 20- 29 years, 54 (90%) were females and 06 (10%) were males, 39 (65%) were educated up to P.C.B.Sc, (N), 31 (51.7%) were had less than 01 years of professional experience, 30 (50%) were currently working in post-operative ward, 52 (86.7%) were working as staff nurses, 31 (51.7%) were belongs to Kerala state, 52 (86.7%) were responded yes for the participation in any seminars/ CNE/ CME/Workshop.

The present study shows that the highest Mean score of subjects was 17.62 with SD 3.56 and Mean score percentage of 70.48 obtained for knowledge on general information. The lowest Mean score of subjects was 2.98 with SD 1.27 and Mean score percentage was 59.60 obtained for knowledge of management of complications related to surgeries of pediatric patients admitted with cardiac septal defects. The overall Mean score of subjects was 20.60 with SD 3.67 and the Mean score percentage of subjects for overall knowledge was 68.66. This indicates that the nurses have more than mean level of knowledge regarding management of complications related to surgeries of pediatric patients admitted with cardiac septal defects.The finding of the present study was consistent with study done regarding assessment of knowledge staff nurses in improving the skills of managing complications of post operative cardiac surgeries on pediatric patients. The study found the nurses had a relatively good level of knowledge (78%) among them and the educational program had a positive effect in managing complications of post-operative cardiac surgeries on pediatric patients.[8]

Part-II: Testing of hypotheses: The second objective was to assess the degree of association of knowledge of nurses with selected demographic variable regarding management of complications related to surgical procedures for congenital cardiac septal defects.

There was significant association of level of knowledge with their selected demographic variables such as Age, Gender, Educational status, designation and Participation in any seminars/ CNE/ CME/Workshop at the $p<0.05$ level. This shows that as the more than mean knowledge score Therefore the hypothesis H_1 –There is significant association between pre-test levels of knowledge of staff nurses in management of complications related to surgical procedures for congenital cardiac septal defects with selected demographic variable was accepted.

5. Recommendations

On the basis of the study that had been conducted, certain suggestions are given for future studies. A similar study can be undertaken with a large sample for better generalization of findings. A similar study can be undertaken by adopting an experimental design.

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References

[1] Pediatric Nursing 2nd Edition, Parul Datta, Page no 318 to 324.
[2] Ghai Essential peadiatric, o.p. Ghai. Page no.123 to 156.
[3] R Smitha, SC Karat, D Narayanappa, B et al. Prevalence of congenital heart diseases in Mysore. Indian journal of human genetics. 2006: 12(1):11-16.
[4] Annemien E. van den Bosch, Derk-Jan Ten Harkel, Jackie S. McGhie, et al. Feasibility and Accuracy of Real-time 3-Dimensional Echocardiographic Assessment of Ventricular Septal Defects. American Society of Echocardiography. Jan 2006: 19(1): 07-13.
[5] Felix Berger, Michael Vogel, Vladimir Alexi-Meskishvili, Peter E. Lange et al. Comparison of results and complications of surgical and amplatzer device closure of atrial septal defects. The journal of thoracic

and cardio vascular surgery. Aug 2008: 118 (4): 674-680.

[6] Gianfranco Butera, Mario Carminati, Massimo Chessa et al. Percutaneous versus surgical closure of secundum atrial septal defect. American heart journal. Jan 2006: 151 (1): 228-234.

[7] Caroline C Menache, Adré J du Plessis, David L Wessel, et al. Current incidence of acute neurologic complications after open-heart operations in children. The annals of thoracic surgery. Jun 2002: 73 (6): 1752-1758.

[8] Kiawi E, Edwards R, Shu J, Unwin N, Kamadjeu R. A study to assessment of knowledge staff nurses in improving the skills of managing complications of post operative cardiac surgeries on pediatric patients, South Korea. Transplant and septal Proc. 2005 Dec; 37(10):4153-4158.