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**Assessment of the Knowledge among Nurses about
Patient Safety after Cardiac Catheterization in Sudan
Cardiac Center**

**A Thesis Submitted in Partial Fulfillment for the Requirement of the
Degree of M.Sc in Medical Surgical Nursing**

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Dedication

To almighty Allah, The most Merciful of all. My Creator, the one in whose hands my soul belongs. The Ever-Living, the Self-Sufficient, the Self-Existing, the First, the Last. The one who has given me so much than I deserve.

To my parents and family for their cooperation both financially and emotionally.

Randa

Abstract

This research aimed to assess the knowledge among cardiac nurses about patient safety after cardiac catheterization. The main objective of the research is to identify the extent of the knowledge of nurses related to patient safety after cardiac catheterization. For the achievement of this task, the primary data were collected through a field survey of the study population which consisted of sample of (30) nurses of Sudan Cardiac Center. The researcher designed a questionnaire of seven questions about the tasks which the nurse is entrusted to carry out for cardiac catheterization, The data were analyzed using statistical analysis (SPSS) and presented in graphical formats. The research arrived to the findings that among cardiac nurse at Sudan Cardiac Center, the development of complications in patents after cardiac catheterization is minimal and this is attributed to the adequate knowledge of the staff nurses and the comprehensive nursing care which is performed to the patents. Likewise, the research recommends the necessity of giving tough courses to the nursing staff in knowledge and practice and concept, in order to update their knowledge and practice in ICU and WARD. Furthermore, the researcher recommends that Sudan Cardiac Center should regularly conduct an assessment for the nursing staff and an evaluation of their knowledge and practice so as to update the knowledge and to ensure their coping with the latest developments and equipment and techniques in the field.

المستخلص

هدفت هذه الدراسة إلى تقييم مستوى المعرفة وسط ممرضات أمراض القلب حول سلامة المرضى بعد إجرائهم لعملية القسطرة القلبية وقد وضع البحث هدفاً رئيسياً وهو تحديد مدى المعرفة التي تتمتع بها الممرضات فيما يتعلق بسلامة المرضى بعد إجرائهم لعملية القسطرة القلبية، ولتحقيق هذا الهدف تم جمع المادة الأولية بواسطة مسح لمجتمع الدراسة الذي تكون من (30) ممرضة في مركز السودان للقلب. وقد صممت الباحثة استبيان من سبعة أسئلة حول المهام الموكلة للممرضة في سبيل رعاية مرضى قسطرة القلب، تم تحليل البيانات باستخدام التحليل الإحصائي (SPSS) وعرض في أشكال بيانية. توصلت الدراسة إلى نتيجة مفادها أن فيما يتعلق بالممرضات في مركز السودان للقلب فإن نشوء مضاعفات لمرضى القسطرة القلبية يتسم بالحد الأدنى. ويعزى ذلك إلى المعرفة الكامنة التي تتمتع بها الممرضات بالمركز المذكور وإلى الرعاية الشاملة التي يقمن بها للمرضى. أيضاً توصي الدراسة بضرورة إعطاء دورات مكثفة حول التمريض الجراحي للممرضات فيما يتعلق بمفهوم المعرفة والممارسة في غرفة العناية المكثفة وعنبر القلب. أيضاً توصي الدراسة بأن يجرى مركز السودان للقلب تقييم بانتظام للممرضات وتقييم معرفتهن وممارستهن من أجل تحديثها وضمان مواكبتهن لأحدث التطورات والأساليب والمعدات في هذا المجال.

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List of Abbreviations

Abbreviations	
CAG	Coronary angiogram
PTCA	Percutaneous transluminal coronary angioplasty
EPS	Electrophysiological study
RFA	Radio frequency ablation
PTMC	Percutaneous transluminal mitral commissurotomy
PCI	Percutaneous Intervention
CMICU	Cardiology medical intensive care unit
CMWRD	Cardiology medical ward
SCS	Sudan Cardiac Center

Chapter One
Introductions
Justification
Objectives

Chapter One

1.1 Introduction

Cardiac catheterization is a valuable diagnostic procedure which does a comprehensive examination of how the heart and its blood vessels function. One or more catheters are inserted through a peripheral blood vessel in the antecubital artery or vein or femoral artery or vein with x-ray guidance. This procedure gathers information such as adequacy of blood supply through the coronary arteries, blood pressures, blood flow throughout chambers of the heart, collection of blood samples, and X rays of the heart's ventricles or arteries. (Anderson K, Bregendahl M, Kaestel H, Skriver M, Ravkilde J. 2005).

A test that can be performed on either side of the heart, cardiac catheterization checks for different functions in both the left and right sides. When testing the heart's right side, tricuspid and pulmonary valve function are evaluated, in addition to measuring pressures of and collecting blood samples from the right atrium, ventricle, and pulmonary artery. Left-sided heart catheterization is performed by way of a catheter through an artery which tests the blood flow of the coronary arteries, function of the mitral and aortic valves, and left ventricle. (Anderson K, et.al., 2005).

Some complications occurs during the transfer of patients after cardiac catheterization or delayed or inadequately provided care. Patient safety is defined as being free from accidental harm as a result of a health

care encounter. It is the responsibility of the cardiac catheterization team to make that commitment to every patient and to each other. A well-functioning unit with a culture of safety, demonstrated clinical quality outcomes, and high internal/external customer satisfaction scores can avoid the risks associated with a less reliable unit. (Anderson K, et.al., 2005).

1.2 Background

Peripheral vascular complications include hematomas. Pseudo aneurysms, arteriovenous fistulae, acute arterial occlusions, cholesterol emboli, and infections that occur with an overall incidence of 1.5-9%. Major predictors of such complications following coronary interventional procedures include advanced age, repeat percutaneous transluminal coronary angioplasty, female gender, and peripheral vascular disease. Minor predictors include level of anticoagulation, use of thrombolytic agents, elevated creatinine levels, low platelet counts, longer periods of anticoagulation, and use of increased sheath size. (Nasser, 1995). Coronary care unit is a nursing specialty that works with patients who suffer from various cardiac diseases like acute coronary syndrome ,myocardial infarction, rheumatic heart disease, various arrhythmias, patients who had undergone various cardiac interventional procedures like coronary angiogram, percutaneous transluminal coronary angioplasty, percutaneous transluminal mitral commissurotomy, permanent pacemaker implantation, device closures ,balloon mitral valvotomy, balloon pulmonary valvotomy etc.(Barkman A, Lunse CP, 1994).

Cardiac nurse must assess and care for patients with cardiac problems as well as patients undergone cardiac catheterizations procedures, patient for any negative signs of a change in condition, safe transport, administering medication, help with basic personal care needs

and control of bleeding, maintenance of haemostatis .This will help in minimizing the vascular complications in patient. Increased risk for vascular complications was found in patients who were older than 70 years, were female, had renal failure, underwent percutaneous intervention. (Dumont J. P 2006).

The data collected from the cardiac unit of Sudan Cardiac Center reveals that approximately 3800 cardiac catheterization procedures are done annually. Out of this, only 3% are done as emergency procedures, while others are done electively. The various interventional procedures done are percutaneous coronary intervention (PCI), percutaneous transluminal +- mitral commissurotomy (PTMC), cardiac catheterization study, atrial septal defect device closure(ASD DC), Ventricular septal defect device closure(VSD DC), electrophysiological study(E PS), radiofrequency ablation (RFablation), and Permanent pacemaker insertion(PPI) etc.

Complications are usually temporary and may include minor infections, bleeding, abnormal heartbeats, and reaction to medications or dye. There is also a possibility that more serious but rare problems may develop during the procedure. These major cardiac catheterization complications include heart or lung problems, stroke, heart attack, or kidney failure. The frequency of haematoma was 1.3% (>10 cm) and 8.9% (>5 cm), which corresponds with reports from similar studies and departments. The factors found to increase the risk of haematoma

development can provide background for procedural changes and increase the focus on patients at increased risk in order to minimize the development of haematomas (Anderson, 2005).

The following table shows complications after cardiac catheterization.

1) Minor Complications	<ul style="list-style-type: none"> a) Bleeding b) Reaction to medications or dye. c) Allergic skin reaction to tape, dressing, a latex d) Abnormal heartbeats e) Bruising
2) Major Complications	<ul style="list-style-type: none"> a) Serious bleeding b) Heart or lung problems, including irregular heart rhythms and lung or heart failure. c) Stroke. d) Heart attack. e) Blood vessel, nerve, or orange damage. f) Blood clots in the legs, pelvis, or lungs. g) Failure of medical equipment.

Decreasing the amount of time patients are required to remain flat and supine is associated with no increase in hematoma and bleeding tendencies and is associated with a reduction in the perceptions of pain. (Fowlow, B, 1995).

Hemostasis and ambulation can be achieved faster with the suturing device than with manual compression, with a potential reduction in access site complications. (Gerekens, U, 1999). Local vascular complications may be diminished by a cautious and sensitive puncture

technique with additional care in patients at higher risk for vascular complications (Heintzen M. p, 1998). Requisite time in bed after percutaneous transluminal coronary angioplasty has been reduced to 4 hours at the University of Virginia Medical Center, the same time required for patients undergoing cardiac catheterization (Keeling AW 2000). Vascular access site complications may be reduced by early sheath removal, by avoiding placement of venous sheaths and by limiting heparin dosing to avoid excessive activated clotting times. (Mandak JS 1998). Angio-Seal and Prostar obtain a fast vascular access hemostasis after interventional procedures, with a low incidence of major vascular complications. (Sesana M 2000).

1.3 Rational of the study:

Patient safety in minimizing complications is increasingly increasingly recognized as essential in practice of coronary care unit. Every individual have the right for safe and effective quality healthcare. Cardiac nurses are responsible for providing patient's safety and minimizing vascular complications after cardiac catheterization procedures. They should be aware about the guidelines for providing safety for the patient. Each nurse should know the high risk patient, safe practices for handling and maintenance of homeostasis.

1.4 Statement of the problem:

The investigator's experience in coronary care unit in Sudan Cardiac Center (SCC) showed that some of the newly joined staff in Cardiology Department are less aware about safe practices. Hence, the investigator planned to conduct a study to assess the knowledge of cardiac nurses on safety practices after cardiac catheterization procedures in cardiac unit.

A study to assess the knowledge among cardiac nurses about patient safety after cardiac catheterization.

1.5 Objectives:

The objectives of this study are:

1. To identify the extent of knowledge of nurses related to patient safety after cardiac catheterization.
2. To know the gaps in the nurses knowledge related to patient safety after cardiac catheterization and,
3. To suggest further training for those nurses to upgrade their knowledge so as to fill any gaps and knowledge deficit in certain tasks and to cope with the new developments in the nurses care in this field and to keep in tandem with the new equipment and techniques in the field of nurse care for patients.

1.6 Operational definition:

Cardiac catheterization: It is the insertion of a catheter into a chamber or vessel of the heart. This is done for both investigational and

interventional purposes. Subsets of this technique are mainly catheterization involving the catheterization of the coronary arteries, and catheterization of cardiac chambers and valves.

Cardiac nurse: cardiac nurse is a registered nurse working in CCU and cardio medical ward in SCC, involved in care of patients after cardiac catheterization.

Knowledge: A state of awareness or understanding with conscious mind. In this study, the investigator assesses the knowledge on safe practices of nurses after cardiac catheterizations.

1.7 Methodology:

Descriptive survey approach was used for the study .The investigator also assesses the knowledge of nurses in cardiac unit about safety after cardiac catheterizations using a checklist.

1.8 Limits of the study:

This study is limited to cardiac nurses working in coronary care unit and cardiology medical ward in SCC.

1.9 Organization of the report:

This report is divided into five chapters. The first chapter is the introduction. In this chapter, the background of the study is outlined, the subject of assessing the nurse knowledge about safety practices after cardiac catheterization procedures is briefed, the need and significance of the research problem is stressed, and the problem and objectives are stated. An attempt is made to operationally define the terms, so as to clarify a brief discussion on methodology adopted for the study .The delimitations are specified.

Chapter Two

Literature Review

Chapter Two

Literature Review

2.1 Introduction

Literature review is an essential activity of scientific research projects, which provides a basis for future investigation, justify feasibility of the study, indicate constraints of data collection and helps to relate findings from one study to another with a view to establish a comprehensive body of scientific knowledge in a professional discipline from which valid and pertinent theories may be developed. (Fay.A1979). The literature review relevant for the study is presented on the following sections:

- Studies on the nursing care in patients undergone cardiac catheterization procedures.
- Performance evaluation of cardiac nurses.
- Studies on detection and management of complications after cardiac catheterization.

2.2 Studies on the nursing care in patients undergone cardiac catheterization procedures.

(Juran, et al, 1999) conducted a study on the nursing interventions to decrease bleeding at the femoral access site after PCI. The investigators aim to measure the relationship between nursing interventions and complications at the arterial access site in patients undergoing PCI and to recommend a standard of care to minimize

bleeding complications. In a descriptive, correlational 4010-patient study, nursing care interventions after coronary procedures were measured.

Observed standards of care were assessed, and regression techniques were used to evaluate nursing interventions and the effect of the interventions on bleeding at the access site after percutaneous coronary procedures. Several significant correlations between nursing interventions and the occurrences of moderate to severe bleeding at the access site were found. The most significant factors in decreasing complications at the access site were early removal of the arterial sheath, the type of pressure mechanism used to achieve arterial hemostasis, staffing allocation, and the person and method used to remove the sheath. Most nursing interventions aimed at decreasing bleeding at the vascular access site increase nursing workload but do not significantly affect bleeding in the groin. These results underscore the importance of continued clinical research studies to validate nursing practice on the basis of patients' outcomes.

(Rolley, et al 2010) developed a study on nursing care practices following a percutaneous coronary intervention. The authors describe the practice standards and priorities of care of cardiovascular nurses in Australia and New Zealand. Item generation for the survey was informed by an integrative literature review and existing clinical guidelines. A 116-item Web-based survey was administered to cardiovascular nurses, via electronic mail lists of professional cardiovascular nursing organizations,

using a secure online data collection system. Data were collected from March 2008 to March 2009. A total of 148 respondents attempted the survey, with 110 (74.3%) completing all items. All respondents were registered nurses with an average of 12.3 (SD 7.61) years of clinical experience in the cardiovascular setting. A range of practice patterns was evident in ambulation time after percutaneous coronary intervention, methods of sheath removal, pain relief, and patient positioning. Respondents consistently rated psychosocial care a power priority than other tasks and also identified a knowledge deficit in this area. The survey identified diversity of practice patterns and a range of educational needs.

(Heintzen and Straur, 1998) conducted a study on peripheral arterial complications after heart catheterization .The investigators found out that currently, incidences of 0.1 to 2% for significant local vascular complications after diagnostic transfemoral catheterization are reported, after interventional transfemoral treatment 0.5 to 5% and after complex procedures using large sheath sizes with peri procedural anticoagulation up to 14%. Following transbrachial and transradial catheterization, local vascular complications at the entry site amount to 1 to 3% after diagnostic and 1 to 5% after interventional procedures. Local vascular complications may be diminished by a cautious and sensitive puncture technique with additional care in patients at higher risk for vascular complications (females, prediagnosed peripheral vascular disease, mandatory anticoagulation, necessity for large sheaths). By using smaller sized

catheters and an adequate, defensive anticoagulation regimen, the rate of arterial access site complications may be reduced. The study concluded that proper methods for achievement of homeostasis as well as a close and careful observation after sheath withdrawal are required.

(Nasser et al., 1995) conducted a study on peripheral vascular complications following interventional procedures. According to the investigators, peripheral vascular complications include hematomas, pseudo aneurysms, arteriovenous fistulae, acute arterial occlusions, cholesterol emboli, and infections that occur with an overall incidence of 1.5-9%. Major predictors of such complications following coronary interventional procedures include advanced age, repeat percutaneous transluminal coronary angioplasty, female gender, and peripheral vascular disease. Minor predictors include level of anticoagulation, use of thrombolytic agents, elevated creatinine levels, low platelet counts, longer periods of anticoagulation, and use of increased sheath size. Ultrasound-guided compression repair of pseudoaneurysms and arteriovenous fistulae are discussed, as are newer methods of treatment such as hemostatic puncture closure devices. The study concluded that anticipation and early recognition of possible peripheral vascular complications in conjunction with careful attention to the optimal activated clotting time for sheath removal following coronary interventional procedures may translate into fewer vascular complications as well as into shorter and less costly hospital stays.

(Best et al., 2010) conducted a prospective study of early ambulation 90 minutes post left heart catheterization using a retrospective comparison group. The investigators studied on a prospective non-concurrent design with a retrospective control. Retrospective data from the APPROACH database and chart reviews were analyzed for a period of six months for the control group on the traditional three- to four-hour ambulation protocol (n = 402). Prospective data were gathered for six months for the experimental group (n = 193). The result suggested that early ambulation for selected patients at 90 minutes is safe and has the potential to increase both patient comfort and quality of care.

(Liew, R, et al 2007) developed a study on how to minimize complications with a manual, nurse- led protocol for femoral sheath removal following coronary angiography. The investigators aimed to provide contemporary information on the complication rates after femoral artery sheath removal using a specific, nurse-led protocol, which is universally applicable and can be readily adopted by other units.

Data were collected prospectively on patients undergoing diagnostic coronary angiography via the transfemoral route in a single centre. Sheaths were removed by trained cardiac nurses with direct application of manual pressure over the femoral artery in accordance with a specific protocol. The investigators also investigated the same endpoints in patients who received an arteriotomy closure device (ACD) during the study period. None of the 516 patients who had their femoral.

(Nasser, et al, 1995) sheaths removed with manual compression developed a major haematoma or complication. A minor haematoma developed in 1.6% of patients. Similarly, none of the 484 patients who received an ACD developed a major haematoma and 0.8% developed a minor haematoma. Mean arterial blood pressures were higher in patients that developed a haematoma. They concluded that a manual, nurse-led system of femoral sheath removal following diagnostic coronary angiography is very safe and effective and that this remains a viable method of access site management.

2.3 Performance evaluation of cardiac nurses

(Yan, et al, 2011) conducted a study on continuous quality improvement of nursing care. The authors investigated the outcome of management participation in work to revise cardiac catheterization clinical pathway operating procedures. BNHI- qualified cases for Tw-DRGs 125 payment principles were recruited as study subjects to revise the cardiac catheterization clinical pathway. Researchers compared pre- and post revision values in terms of mean medical care fees, patient volumes, health scare quality, and length of hospital stay, as well as financial risk. Significant differences were observed in precordia catheterization nursing care completion rates, mean lengths of hospital stay, diagnosis numbers, surgical treatment numbers, and numbers of complications or co-morbidities. Medical utilization was also significantly lower ($p < .05$) after revision implementation.

(Schiksl Schoonhoven L. V. et al, 2007) carried out a study on the performance evaluation of arterial femoral sheath removal by registered nurses after PCI. The aim of the investigators was to check if nurses' performance in 1999 and 2005 was in accordance with the protocol for arterial sheath removal and to compare both measurements to explore differences in performance over time. They trained registered nurses in sheath removal and observed them during sheath removal in elective uncomplicated PCI- patients. They developed and used a checklist, including 10 elements and 65 items. The result showed that both in 1999 (n=43 observations with 13 nurses) and 2005 (n=42 observations with 16 nurses) the norm of more than 90% for the total score was not achieved: they found 82% and 80%, respectively.

(Sangkachand P; Sorosario B, Funk M. 2011) investigated the continuous ST segment monitoring, nurse's attitudes, practices and quality of patient care. The investigators conducted their study on 61 nurses and 202 patients with acute coronary syndrome in a cardiac intensive care unit. Baseline data on nurses' use of and attitude toward ischemia monitoring and quality of care were obtained. Education was then provided and ST Map software was installed on all monitors. Follow-up data were obtained 4 months later. The percentage of nurses who had ever used ischemia monitoring was 13% before ST Map and 90% afterward (P <.001).

The most common reason for not using ischemia monitoring before ST Map was inadequate knowledge (62%). The most common reason for liking ischemia monitoring after ST Map was knowing when a patient has ischemia (80%). Time to acquisition of a 12-lead electrocardiogram in response to symptoms or ST-segment changes was 5 to 15 minutes before ST Map and always less than 5 minutes afterward ($P < .001$). Time to return to the catheterization laboratory did not differ before and after ST Map. The study concluded that ST Map was associated with more frequent use of ischemia monitoring, improved attitudes of nurses toward ischemia monitoring, and shorter time to obtaining 12-lead electrocardiograms.

2.4 Studies on detection and management of complications after cardiac catheterization

(Ron Waksman, et al, 1995) conducted a study on predictors of groin complications after balloon and new-device coronary intervention. The investigators reviewed the clinical course of 5,042 patients who underwent percutaneous transluminal coronary angioplasty (PTCA) using balloons or new devices: (stent, laser, directional and rotational atherectomy). A vascular complication was defined as the formation of a groin hematoma, bleeding, pseudoaneurysm, fistula, or the need for surgical repair. Vascular complications occurred in 309 (6.1%) patients, and 117 (2.3%) required vascular repair; among these patients, surgery was performed for correction of an arteriovenous fistula in 12%, repair of

pseudoaneurysm in 72%, repair for expanding hematoma and femoral artery lacerations in 10%, and retroperitoneal bleeding in 6%.

The correlates of vascular complications were older age (66.8 vs 62.1 years; $p < 0.0001$), female gender (43% vs 26%; $p < 0.0001$), and increased weight (82.1 ± 16.46 vs 78.0 ± 16.6 kg; $p < 0.001$), higher systolic blood pressure (140 ± 25 vs 134 ± 20 mm Hg; $p < 0.001$), increased heparin dose during the procedure ($14,352 \pm 3,879$ vs $13,599 \pm 3,508$ IU; $p = 0.001$), administration of heparin after the procedure (232 vs 2,985 patients; $p < 0.0001$) and intracoronary stenting (14.9% vs 3.5%; $p < 0.0001$). Fifteen patients of 214 (7.0%) who underwent stent implantation had surgical repair. The study concluded that vascular complications were not related to the size of the arterial sheath (8.11 ± 0.8 vs 8.8 ± 0.7 Fr; $p = 0.11$) and the use of devices other than stents (laser, atherectomy) did not increase the rate of vascular complications.

(Dumont CJ, Keeling AW, Bourguignon C, Sarembock 1J, Turner M 2006) conducted a study on predictors of vascular complications post diagnostic cardiac catheterization and percutaneous coronary interventions. The investigators describe a retrospective, descriptive, and correlational study of 11,119 patients who underwent cardiac catheterization and/or percutaneous intervention, with femoral artery access, in the years 2001 to 2003. The study concluded that increased risk for vascular complications was found in patients who were older than 70

years, were female, had renal failure, underwent percutaneous intervention, and had a venous heath.

(Best DG, Pike R, Grainger P, Eastwood CA, Carroll K (2010). conducted a prospective study of early ambulation 90 minutes post-left heart catheterization using a retrospective comparison group. The investigators aim to determine the safety of ambulating patients at 90 minutes post-LHC sheath removal compared to the current practice of ambulation at three to four hours post-sheath removal. The study was a prospective non-concurrent design with a retrospective control. Retrospective data from the Approach database and chart reviews were analyzed for a period of six months for the control group on the traditional three- to four-hour ambulation protocol (n = 402). Prospective data were gathered for six months for the experimental group (n = 193).The study concluded that early ambulation for selected patients at 90 minutes is safe and has the potential to increase both patient comfort and quality of care.

(Eidt et al., 1999) conducted a study on surgical complications from hemostatic puncture closure devices. A retrospective, single-center, nonrandomized observational study was made of all vascular complications following femoral cardiac catheterization by the investigators. An immediate mechanical failure of the device was experienced in 34 (8%) patients. Surgical repair was required in 1 .6% (7 of 425) of patients following Angio-Seal versus 0.3% (5 of 1662)

following routine manual compression (P 0.004). In 5 patients, the device caused either complete occlusion or stenosis of the femoral artery. The polymer anchor embolized in 1 patient and was retrieved with a balloon catheter at surgery. The study concluded that during the first year of utilization of a percutaneous hemostatic closure device following cardiac catheterization, a marked increase was observed in arterial occlusive complications requiring surgical repair.

(U Gerckens, N Cattelaens, E G Lampe, E Grube, 1999) conducted a study on management of arterial puncture site after catheterization procedures: evaluating a suture-mediated closure device. The investigators aim to overcome the challenge associated with achievement in hemostasis after a catheterization procedure, a suture-based closure device was compared with manual compression in a 600-patient randomized trial. The major study end points included the incidence of vascular complications and the time to ambulation after the procedure. The study included diagnostic or interventional procedures. The suture-mediated closure was performed immediately after the procedure independent of the anticoagulation level, whereas manual compression was performed per hospital protocol with sheath removal relying on normalization of patient's anticoagulation status. A significant reduction in time to achieve hemostasis (7.8 4.8 vs 19.6 13.2 minutes, $p < 0.0001$) and time to ambulation (4.5 6.5 vs 17.8 5 hours, $p < 0.0001$) was associated with use of the suture-mediated closure device. The incidence of vascular

complications was similar in the overall population (5.7% for suturing device vs 11.3% for compression) or in the interventional patient subset (8.4% for suturing device vs 9.6% for compression). There was a significant reduction in the incidence of vascular complications in the diagnostic procedure subset (4.4% for suturing device vs 12.1% for compression, $p < 0.05$). The study concluded that the use of a suture-mediated closure device represents a safe alternative to manual compression.

(Duffin, et al, 2001) conducted a study on femoral arterial puncture management after percutaneous coronary procedures: a comparison of clinical outcomes and patient satisfaction between manual compression and two different vascular closure devices. The investigators compared Perclose and Angio-Seal, two devices and tested them in reference to standard MC for safety, effectiveness and patient preference. Prospective demographic, per-procedural, and late follow-up data for 1,500 patients undergoing percutaneous coronary procedures were collected from patients receiving femoral artery closure by MC ($n = 469$), Perclose ($n = 492$), or Angio-Seal ($n = 539$). Per-procedural, post-procedural, and post-hospitalization endpoints were: 1) safety of closure method; 2) efficacy of closure method; and 3) patient satisfaction. Patients treated with Angio-Seal experienced shorter times to hemostasis ($p < 0.0001$, diagnostic and interventional) and ambulation (diagnostic, $p = 0.05$; interventional, $p < 0.0001$) than those treated with Perclose. Those treated with Perclose

experienced greater access site complications (Perclose vs. Angio-Seal, $p = 0.008$; Perclose vs. MC, $p = 0.06$). Patients treated with Angio-Seal reported greater overall satisfaction, better wound healing and lower discomfort (each vs. Perclose or vs. MC, all $p < 0.0001$). For diagnostic catheterizations only, median post-procedural length of stay was reduced by Angio-Seal (Angio-Seal vs. MC, $p < 0.0001$; Angio-Seal vs. Perclose, $p = 0.009$). The study concluded that no indifference was seen in length of stay for interventional cases.

(FilisK ,et al, 2007) conducted a study on management of early and late detected vascular complications following femoral arterial puncture for cardiac catheterization. The investigators considered on when and whether conservative, urgent surgical or elective surgical treatment is appropriate. A retrospective analysis was made of 45 consecutive iatrogenic vascular trauma patients, among 10,450 cardiac diagnostic or therapeutic catheterizations. Patients' demographics, type of catheterization, time from catheterization to initial diagnosis, the type of complication (thrombosis, infection, bleeding, pseudoaneurysm, etc.), time from presentation of the complication to definite treatment, diagnostic imaging and decision making, the surgical or conservative management, the length of stay and the clinical outcome were determined and analyzed.

The investigators identified and treated 30 early and 15 late (after patient's discharge) arterial complications: 18 pseudo aneurysms, 6

bleedings, 9 hematomas, 5 deep vein thromboses, 3 arteriovenous fistulas, 2 arterial embolisms and 2 arterial thromboses. Eight patients underwent emergency surgical repair, three elective surgical repair and 31 were managed conservatively. The study concluded that bleeding and acute leg ischemia were the most frequent indication for emergency surgical treatment, whereas the majority of pseudo aneurysms, fistulas and vein thrombosis were successfully treated conservatively.

Chapter Three
METHODOLOGY

Chapter Three

METHODOLOGY

3.1 Introduction

This chapter contains research approach, study design, the sampling technique, development and description of the tool, pilot study, data collection and plan of analysis.

3.2 Study Design:

It's a descriptive cross sectional done in Sudan Cardiac Center to assess the knowledge and practices among cardiac nurses about patient safety after cardiac catheterization from April to August 2017.

3.3 Study Area:

The research was carried out in Khartoum which is the capital of Sudan and it is located in Arkweet neighborhood.

3.4 Study setting: Sudan Cardiac Center.

The Cardiac Center is one of the specialized hospitals .which has 4 specializations namely CU, CCU, ER, LC. The total number of the staff is about 70 plus Head Nurse and 2 medical officers, social worker, medical director in addition to cardiac medicine consultant.

3.5 study population:

The Populations of the study consisted of the staff nurses in CW and CCU who are entrusted with the caring for the patients after cardiac catheterization.

3.6 Sample and sampling technique

Random sampling is done for this study; 30 samples were collected. The pilot study was carried out for 5 staff nurses. The total period of study is one month in August 2017.

3.7 Data collection:

A specific type of questionnaire was distributed. A number of 30 questionnaires were distributed to CW and CCU. Descriptive statistical methods including frequencies were used to analyze the data gathered from the questionnaires.

3.8 Data collection technique:

Data was collected in two weeks during morning shift

3.9 Data analysis:

The investigator conducted the testing of the level of knowledge and practice in order to find out whether it's good or moderate or scarce.

The data was manually coded through a statistical techniques then using computerized software.

A different statistical measure was used then the data were presented in tables.

3.10 Ethical considerations:

- The proposal was approved by the Ethical Scientists Committee.
- Permission was obtained from the Director of the Hospital and the Head Nurse.
- Verbal permission was obtained from the participants who were given the free option either to agree or to decline.

Chapter Four
Analysis and Interpretation

Chapter Four

ANALYSIS AND INTERPRETATION

4.1 Introduction

Analysis is the categorizing, ordering, manipulating and summarizing the data to an intelligible and interpretable form so that the research problem can be studied and tested including relationship between variables. Interpretation refers to the process of making sense of the results and examining the implications of the findings within a broad context.

4.2 Distribution of samples

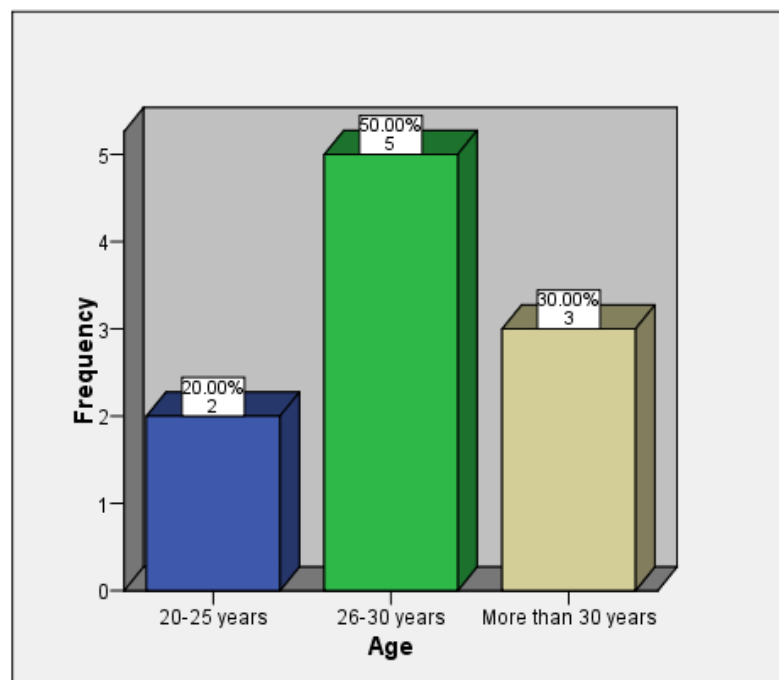


Figure 4.1: distribution of participants with respect to age

From figure (4.1), show that (20%) of participants were (20-25 years old), while most (50%) of them were (26-30 years old), (30%) of them were (more than 30 years old).

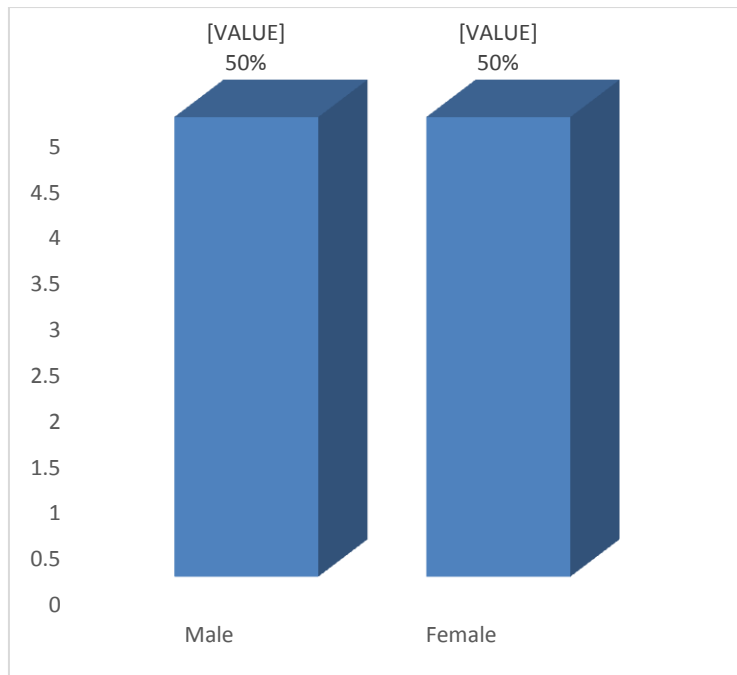


Figure 4.2: distribution of participants with respect to gender

Figure (4.1) show that most (50%) of participants were males and the same of females.

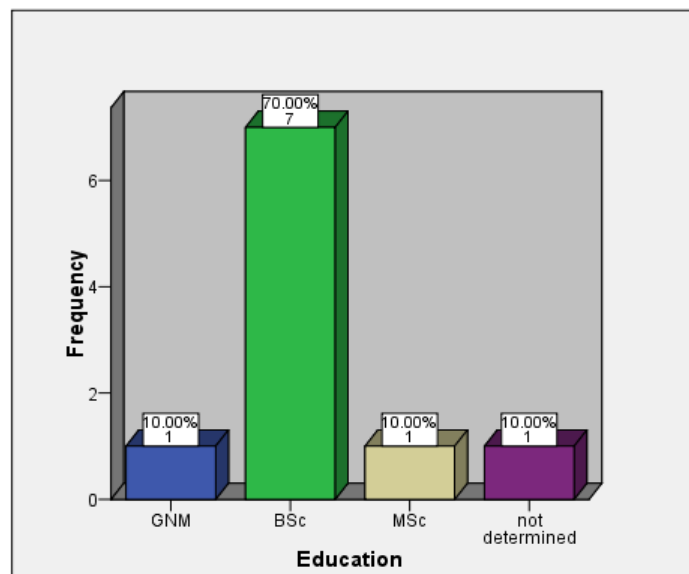


Figure 4.3: distribution of participants with respect to qualification

From figure (4.3), show that only (10%) of participants their qualifications were GNM or MSc, while the most (70%) of them were have BSc, since (10%) did not determine their qualifications.

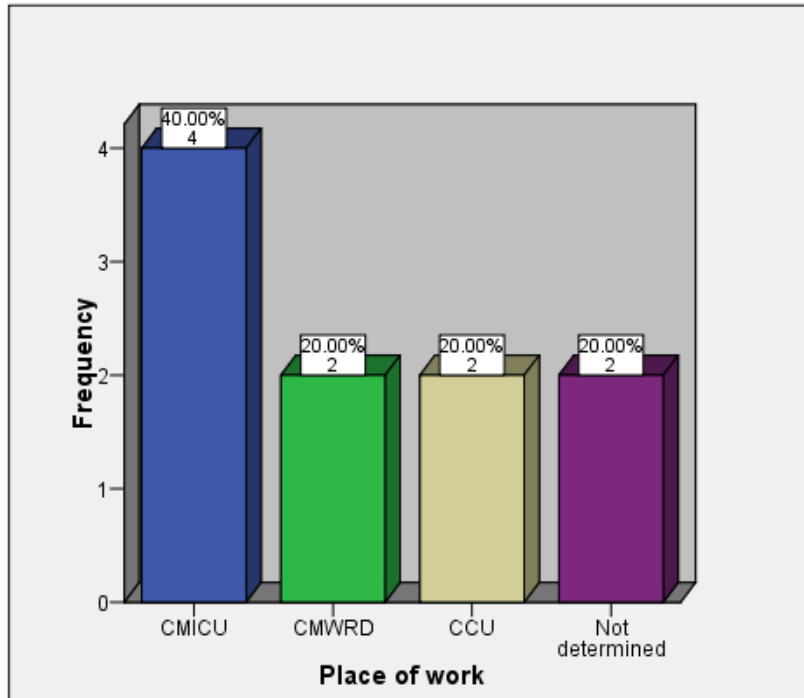


Figure 4.4: distribution of participants with respect to place of work
 From figure (4.4), show that most (40%) of participants worked in CMICU, while (20%) of them worked in CMWRD or CCU, since (20%) did not determine their qualifications.

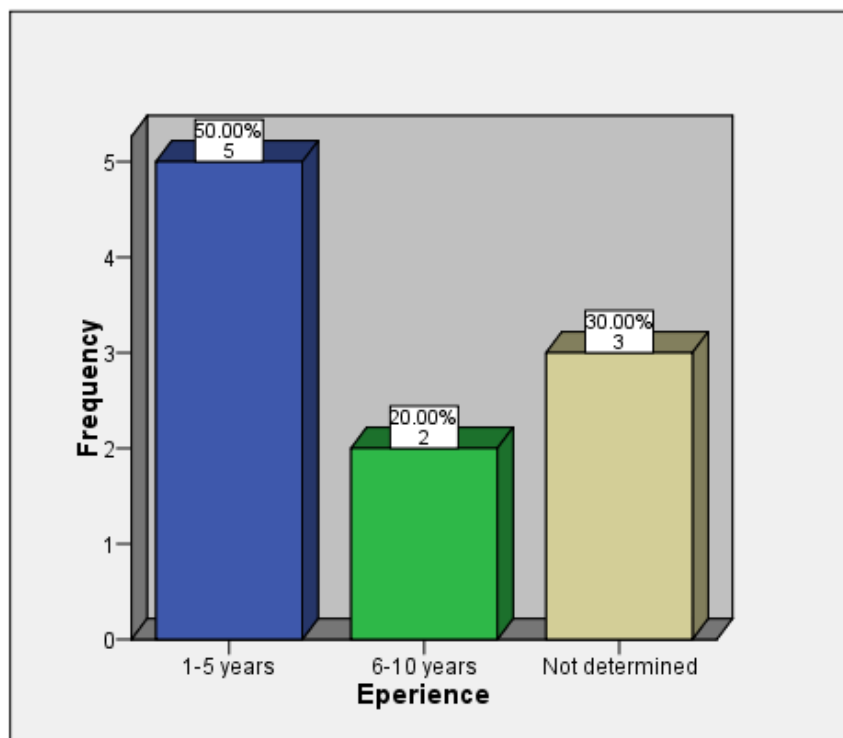
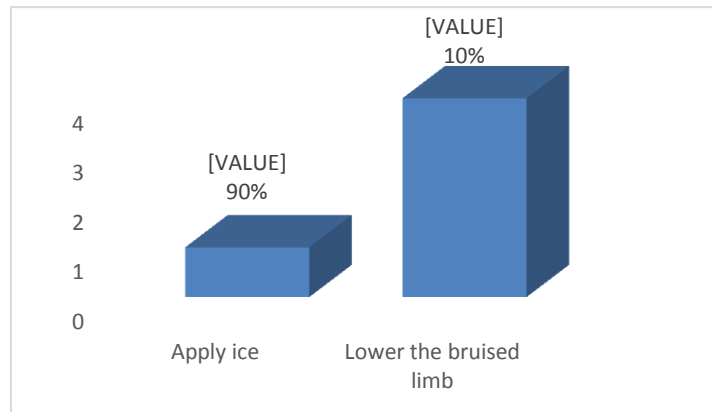


Figure 4.5: distribution of participants with respect to place of experience

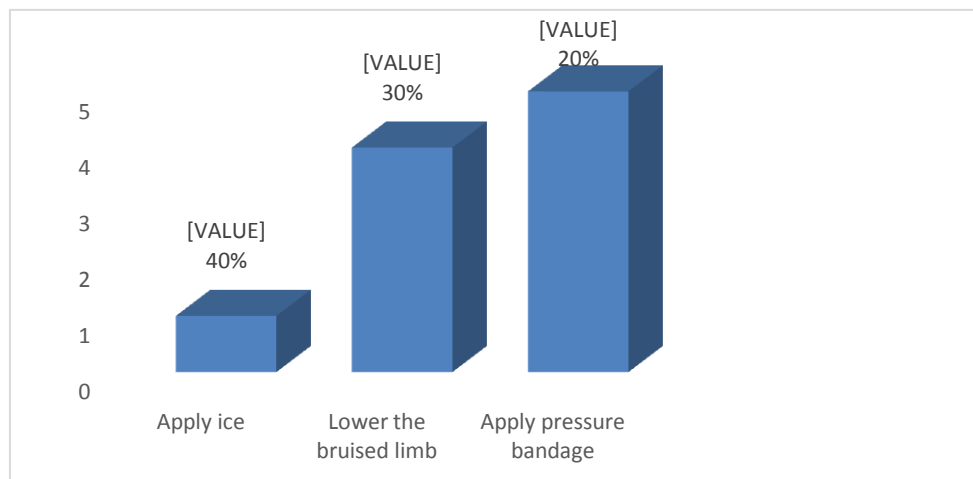
From figure (4.5), show that most (50%) of participants have 1-5 years of work experience, while (20%) of them have 6-10 years of work experience, since (30%) did not determine their qualifications.

Figure 4.6: distribution of participants about the local complications occurring in patients after cardiac catheterization:



From Figure (4.6), shows that for majority (90%) of participants, the local complications occurring in patients after cardiac catheterization was Hematoma, while for only (10%) of them was Renal failure.

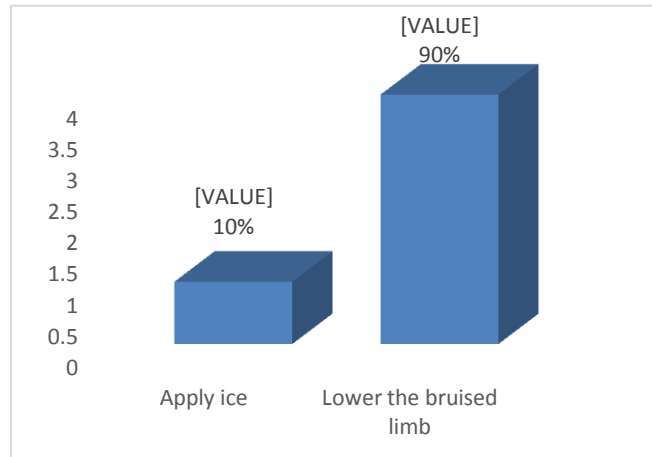
Figure 4.7: distribution of participants about how they detect pseudo aneurysm after catheterization:



From Figure (4.7), shows that (40%) of participants detect pseudo aneurysm after catheterization by pain at the puncture site, since (30%) of them detected by severe bleeding from the puncture site, (20%) of them

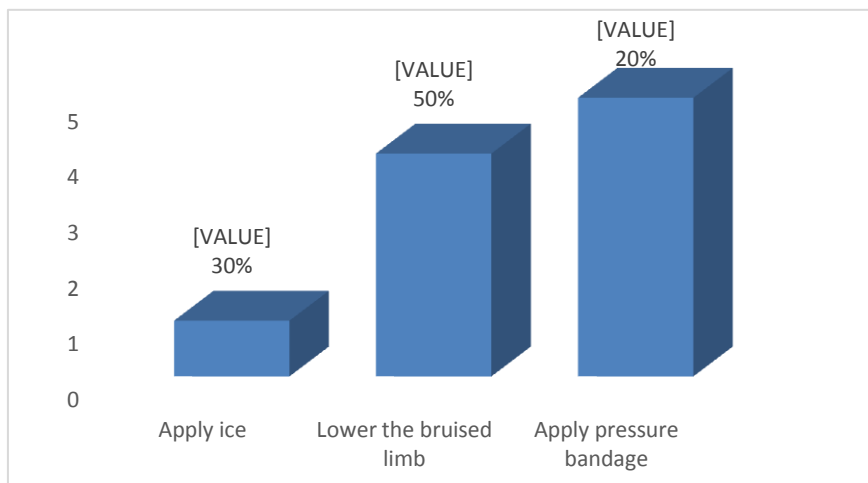
detected by pulsatile swelling and bruit, while (10%) of them detect pseudo aneurysm after catheterization by fever.

Figure 4.8: distribution of participants about when they check the serum creative level of patients after cardiac catheterization:



From Figure (4.8), shows that only (10%) of participants check the serum creatinine level of patients immediately after cardiac catheterization procedure, while the majority (90%) of them check after one day of the procedure.

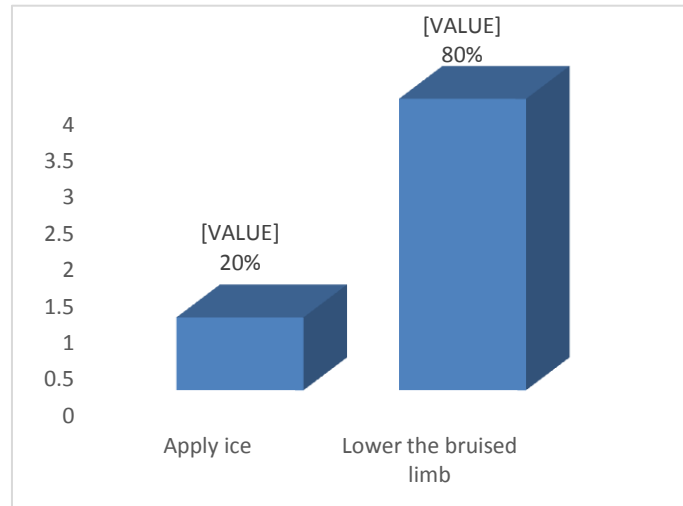
Figure 4.9: distribution of participants about the complication of delayed sheath removal:



From Figure (4.9), shows that (30%) of participants bleeding is the complication that delayed sheath removal, since the most (50%) of them

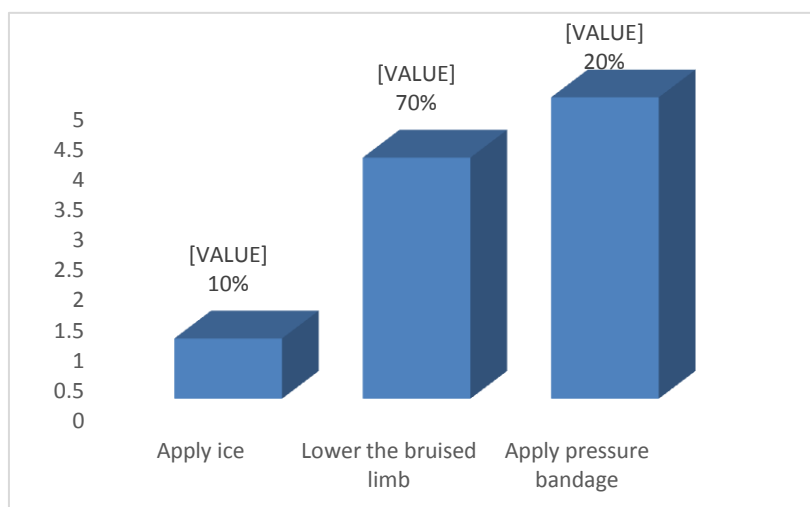
the complication of delayed their sheath removal is thrombus formation, while for (20%) of them is air embolism.

Figure 4.10: distribution of participants about development of contrast-induced nephropathy:



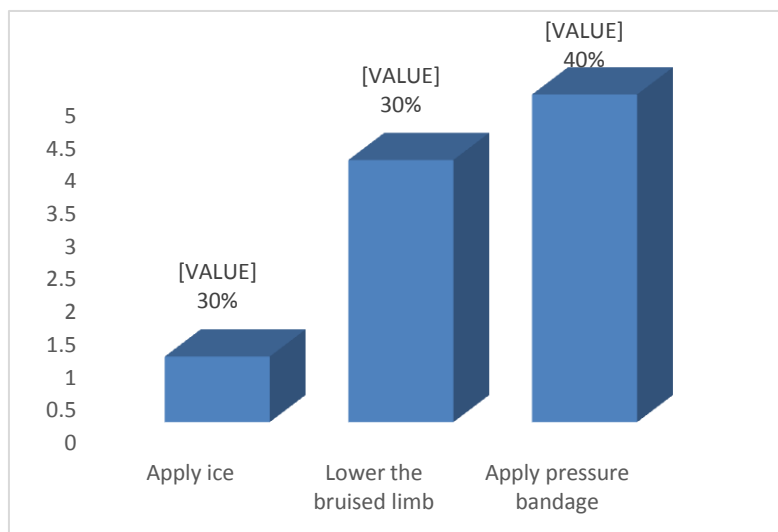
From Figure (4.10), shows that only (20%) of participants the development of their contrast-induced nephropathy is 2-3 days after the procedure, while the most for (80%) of them is on the day of the procedure.

Figure 4.11: distribution of participants about who is at risk for developing renal failure after cardiac catheterization:



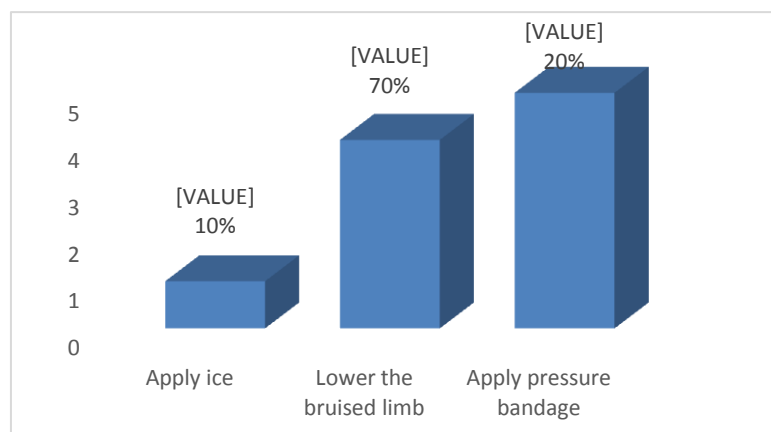
From Figure (4.11), shows that (10%) of participants think young adults be at risk for developing renal failure after cardiac catheterization, since the most (70%) of them think are hypertensive patients, while (20%) of them think elderly be at risk for developing renal failure after cardiac catheterization.

Figure 4.12: distribution of participants about the sign of thrombus formation after cardiac catheterization:



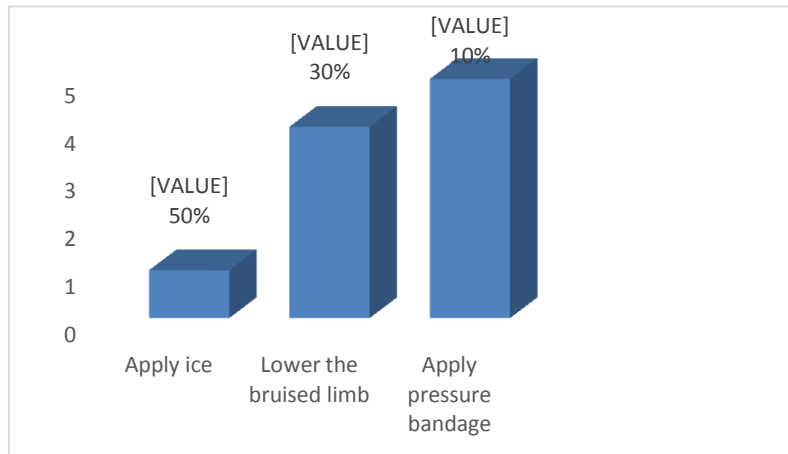
From Figure (4.12), shows that for (30%) of participants the sign of thrombus formation after cardiac catheterization is absence of distal pulse, since for (30%) of them is pain at the puncture site, while for (40%) of them is swelling at the puncture site.

Figure 4.13: distribution of participants about how patient's extremely to be kept immobilized after cardiac catheterization:



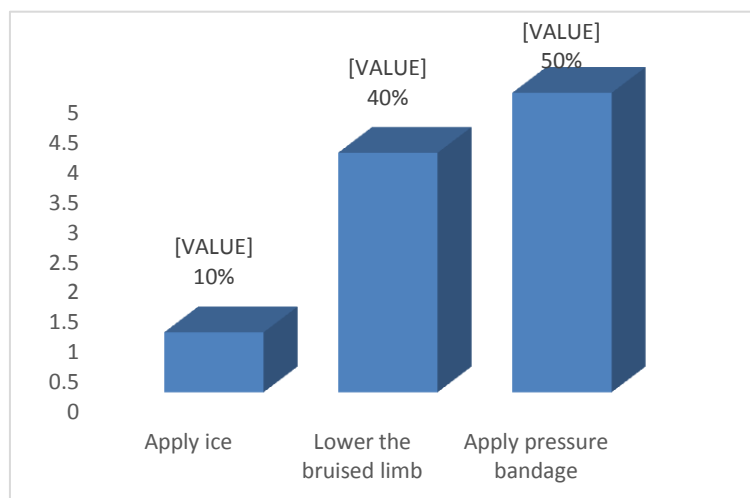
From Figure (4.13), shows that for (10%) of participants think patient's should be kept extremely to immobilized for 1-3 hours, since the most (70%) of them think that should be for 4-6 hours, while (20%) of them think it is 7-8 hours.

Figure 4.14: distribution of participants about who is at risk for developing pulmonary edema after cardiac catheterization:



From Figure (4.14), shows that for the most (50%) of participants think LV failure be at risk for developing pulmonary edema after cardiac catheterization, since for (30%) of them are RV failure, while for (10%) of them are AORTIC regurgitation or pulmonary AV fistula.

Figure 4.15: distribution of participants about how they detect a hematoma at the puncture site after cardiac catheterization:



From Figure (4.15), shows that for only (10%) of participants detect a hematoma at the puncture site after cardiac catheterization by apply ice, since (40%) of them detect by lower the bruised limb, while (50%) of them detect a hematoma at the puncture site by apply pressure bandage.

Chapter Five
Summary, Conclusion, Discussion,
Limitations, Recommendations,

Chapter Five

Summary, Conclusion, Discussion,

Limitations, Recommendations

5.1 Introduction

This chapter gives a brief account of the present study including conclusions drawn from the findings and possible applications of the result. A recommendation for future research and suggestions for improving the present study is also included.

5.2 Discussion

Nursing care is important in the patient's safety and survival after cardiac catheterization. The knowledge and competence of the nurse in charge is very crucial in such patient care.

Socio-demographic data

The study showed that nurses with age 30 years or less represent the vast majority of participants (70%), indicating that most nurses were juniors. Moreover, (80%) of the investigated participants had an experience of 5 years or less versus (20%) who had an experience for more than 5 years. We can, then, infer from these data that the high availability of nurses in young age is advantageous in fulfilling the hyperactivity required from the nurses in such critical departments and unit, in addition to the possibility of their modification to the ideally required performance. Furthermore, experienced nurses, with their current skills and knowledge, may help in decision making, guidance and supervision of

junior nurses. Similar findings were reported in other studies; for instance a study in Iraq showed that ,the majority of nurses (36.8%)were between the ages (22 – 27) years ,and those with an experience from (1 -9) years constituted (57.9%),while nurses between the ages of (10 - 19) years were (15.8%), and nurses of (20 -29) years of age were (26.3%).

As to the gender distribution the study revealed that most participants were females (70 %).The history of nursing in the Sudan indicates that, since the inception of this profession in the country ,it had been associated with females in different levels of nursing . With the recent application of the (BSc.degree) for the professional qualification of males ,the profession gradually became appealing to them .To corroborate the fact of females predominance in the nursing profession ,figures from Al Bashir Hospital indicated that females represented (84%) while males represented (16 %). Nevertheless, in contrast a study which was conducted in Iraq by Al- Ftlawy D. M. showed different results where males (52.6%) outnumbered females who represented (47.4%).

As to the level of qualification distribution showed that a high majority of the interviewees (87%) have a BSc. In Nursing while only (13%) have a MSc . in Nursing .This result indicates that a relatively high percentage of nurses didn't attempt to takeadvanced courses and degrees of learning in this field . The distribution of the sample according to the place of work showed that (80%) of the interviewees are working in the Cardiac Cra Unit while the remaining (20%)are working in the Cardiac Ward .

Nurses knowledge regarding patient safety after cardiac catheterization :Generally ,the assessment of the nurses knowledge regarding patient safety after cardiac catheterization indicated that staff nurses with experiences of more than 5 years have more knowledge than those whose experience level is less than 5 years .Nevertheless , on assessing the practical level ,there is no significant difference in giving care to the patients . Hence ,according to the researcher observations ,there is no development of complications which might be attributed to poor nursing care in Ward as well as ICU .The assessment of nurses' knowledge about the occurrence of local complications in the current study revealed that they had good knowledge regarding the Hematoma (76.7%)but had low knowledge of (16.6%)and (6.7%)regarding Aortic dissection and renal failure respectively .

Nurses knowledge with regard to how they detect pseudoaneurysm was found moderate (46.6%),

With approximately one quarter of them (23.4%)are able to detect the pulsatile swelling and bruit ,with decreasing percentages of (20%) and (10%) who know how to detect the complication of severe bleeding from the puncture site and to detect fever,respectively.

The participants were assessed for the correct time to check the serum creative level and most of them(90%) answered that there is no need to check the serum creative level.A low percentage of only (10%)answered for an immediate check of the serum creative level .The other two

answers ,that is “checking one week after the procedure “.and “checking one day after the procedure “got zeros .However , this result indicates the nurses good knowledge in this respect .

The participants were assessed about their knowledge of the complications of delayed sheath removal ,where half of them (50%)indicated the complication of Thrombus formation ,two fifths indicated bleeding and air embolism respectively ,while a low percentage of (10%)indicated the complication of Tachypnea .However ,these results showed that nurses were well acquainted with all the complications of the delayed sheath removal .

With regard to the knowledge of the time of occurrence of the development of contrast –induced nephropathy nurses showed a very good knowledge (80%)by answering for the time of one week after procedure and only (20%)answered for the time of 2-3 days after procedure. No nurse indicated the time of one day or five days after the procedure .This results indicated the nurses good knowledge concerning the time for the development of contrast- induced nephropathy occurrence.

With regard to the knowledge of the groups who are the most at risk for developing renal failure ,nurses showed good knowledge (60%)in indicating the hypertensive patients ,followed by (30%)indicating the elderly and (10%)indicating the young adults .However, no nurse

indicated the Dyslipidemia as a group which might be at risk for developing renal failure .

As to the knowledge of the signs of the Thrombus formation, the results showed that the knowledge of the nurses was equally distributed by (40%) for both the knowledge of the sign of pain at the puncture site and the swelling at the puncture site .only one fifth of the sample indicated the knowledge of the sign of the absence of the distal pulse . The fairly good knowledge of the nurses to know such signs demonstrates that they were quite knowledgeable about potential complications and hence such knowledge will be a positive asset in initiating emergency treatment and prevention.

Regarding the knowledge of the period of time for the patient affected to be kept immobilized a good majority of the nurses (80%) indicated 4-6 hours ,and (10%)indicated between 1-3 hours and another (10% indicated between 7-8 hours and no nurse indicated more than 8 hours .This higher score shows the nurses good knowledge of the detailed steps related to caring for the patient and his/her safety after cardiac catheterization .

With regard to the knowledge of those at risk for developing pulmonary edema, half of the nurses indicated their knowledge of the LV failure while the RV failure was indicated by only (20%) and the same percentage (20%) indicated the Pulmonary AV fistula, while only (10%) indicated the Aortic regurgitation .These results indicate that in their

caring for cardiac catheterization ,nurses were able to recognize the patients' developing complications .

With regard to the detection of the Hematoma at the puncture site , which is a potentially serious complication after cardiac catheterization ,half of the nurses (50%)indicated the application of the pressure bandage ,and almost less than half of the nurses (40%)indicated the lowering of the bruised limb,while a low score of (10%)indicated the application of ice ,and no nurse indicated the elevation of the bruised extremity .These results showed the nurses 'good knowledge regarding the early detection of the hematoma at the puncture site .

5.3 Conclusion:

In this study which is conducted among cardiac nurses of at Sudan Cardiac Center –Khartoum, it is found that the development of o complications of in patients after cardiac catheterization is minimal. This is attributed to the adequate knowledge of staff nurses and the comprehensive nursing care .This is specially demonstrated in the result of the local complication occurring where most of nurses identified the hematoma iatrogenic complication .However ,other nurses’ knowledge regarding the detection of the complication of pseudo aneurysm , the complications of delayed sheath removal and the sign s for thrombus formation is relatively moderate.The study concluded that nurses were well acquainted with the keeping of the atient immobilized after the catheterization .

5.4 Recommendations:

Based on the above results the study recommends the following:

- To update the nurses ' knowledge and practice in ICU and WARD so as to enable the staff nurses to utilize the most up-to-date approaches in the profession and to remain current in new scientific advances ,techniques and equipment in this field .
- To provide the nurses with a continuous education for the promotion of high standard of nursing knowledge and practice.
- The competent and concerned authorities should support generalists nurses to pursue further speciality they desire after graduation .This will ensure the realization of job satisfaction for the nurses with a long and successful career.
- To increase the number of training sessions to nurses in general and to conduct special training sessions to nurses who are working in cardiac units, and to encourage nurses with good level knowledge to join the cardiac units .

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Appendix

Knowledge assessment of cardiac nurses in providing safety to patients after cardiac catheterization

Socio-demographic data

Age:-.....

Years Sex::

.....M. F

Qualification:-..... .GNM.B. Sc

(N).M. Sc (N) Additional

Qualification, if any:.....

Place of work:

CMICU/CMWRD Total

Years of experience:

Signature of the staff nurse:

Note: Place a tick (√) mark on the most appropriate answer. Total ten questions.

1) What are the local complications occurring in patients after cardiac catheterization? Mark all that apply.

2) Hematoma 2) AVfistula 3) Thrombusfbrmation 4) Stroke5)Renal failure

6) Aortic dissection.

II) How will you detect pseudo aneurysm after cardiac catheterization?

1) Pain at the puncture site 2) Severe bleeding from the puncture site

3) Pulsatile swelling and bruit 4) Fever

III) When should you check the serum creatinine level of patients after cardiac catheterization?

- 1) Immediately after the procedure.
- 2) One day after the procedure.
- 3) One week after the procedure.
- 4) No need to check.

IV) What is the complication of delayed sheath removal?

- 1) Bleeding.
- 2) Thrombus formation.
- 3) Air embolism.
- 4) Tachypnoea.

V) Development of contrast-induced nephropathy occurs.

- 1) One week after the procedure.
- 2) 5 days after the procedure.
- 3) 2-3 days after the procedure.
- 4) On the day of procedure.

VI) Who is at risk for developing renal failure after cardiac catheterization?

- 1) Young adults 2) Hypertensive patients 3) Elderly 4) Dyslipidemia.

VII) What is the sign of thrombus formation after cardiac catheterization?

- 1) Absence of distal pulse 2) Pain at the puncture site 3) Swelling at the puncture site.

VIII) How should the patient have affected extremity to be kept immobilized after cardiac catheterization?

1) 1-3 hours 2) 4-6 hours 3) 6-8 hours 4) Above 8 hours IX) Who is at risk for developing pulmonary edema after cardiac catheterization?

1) LV failure 2) RV failure 3) AORTIC Regurgitation 4) Pulmonary AV fistula

X) When you detect a hematoma at the puncture site after cardiac catheterization, you should not.

1) Elevate the bruised extremity 2) Apply ice 3) Lower the bruised limb 4) Apply pressure bandage.

Answer Key

(i) 1, 2, 3 (ii) 3 (iii) 2 (iv) 2 (v) 3 (vi) 3 (vii) 1 (viii) 3 (ix) 1 (x)