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Cardiac Electrophysiology Study: Critical Care Nurses' Knowledge, Practices and Patients' State-Trait Anxiety Level at a Selected Hospital in Cairo

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Abstract: **The invasive cardiac procedure as electrophysiology study (EPS) can be anxiety provoking for many patients so, critical care nurses must understand the technical and psychosocial aspects of an electrophysiology study, be knowledgeable and skilled to ensure adequate care. Aim of the study: 1- to assess critical care nurses' knowledge and practices regarding electrophysiology study. 2- to assess patients' level of anxiety before and after the electrophysiology study and 3- to investigate the relationship between nurses' knowledge and practices and patient state-trait anxiety level concerning electrophysiology study. Research questions: Q1- What is the level of critical care nurses' knowledge about electrophysiology study? Q2- What is the level of critical care nurses' practice about electrophysiology study? Q3-What is the state-trait anxiety level of patients undergoing electrophysiology study? Q4-Is there a relationship between the critical care nurses' knowledge and practices concerning electrophysiology study and the patient state-trait anxiety level? Research design: Descriptive correlational research design was utilized in this study. Setting: This study was carried out at a selected cardiac care unit affiliated to Cairo University Hospital, in Cairo governorate. Subjects: Convenient sample of 40 adult male and female patients undergoing electrophysiology study were recruited in the study. In addition to all critical care nurses working in the selected cardiac care unit affiliated to Cairo University Hospital, in Cairo governorate who agreed to participate in the study (50). Tools: Personal characteristics and background data sheet for nurses, knowledge assessment questionnaire, Observational checklist and Patient state-trait anxiety level assessment sheet; composed of two parts part A-Personal characteristics and medical data of the patient and Part B: Patient state-trait anxiety inventory. Results: 76 % of the nurses' age ranged between 20-30 with a mean of 28.3 ± 5.4, 92 % of them were females; majority of the nurses had unsatisfactory level of total knowledge about EPS and about nursing care after the procedure. Total mean practice scores of critical care nurses regarding EPS was 12.79 + 2.03 out of 24 indicating low total practice level. 55% of the patients underwent electrophysiology study were having severe anxiety level before the procedure of the EPS while, 77.5% of them were having moderate anxiety level after the procedure of the EPS with mean score of (61.36 ± 9.8 & 47.8 ± 4.2) respectively with significant statistical difference between the two readings. there is a highly significant statistical correlation between critical care nurses' total knowledge scores , critical care nurses' total practice scores and the patient's total anxiety scores before and after the procedure. Recommendations: Specific educational program can be designed and presented to critical care nurses in order to improve their level of knowledge and practice toward EPS and Individualized psychological preparation should become a routine part of patient care before EPS.**

Keywords: **Critical care nurse, Electrophysiology study, invasive cardiac procedure, nurses' knowledge, nurses' practice *and* state- trait anxiety.**

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1. INTRODUCTION

Electrophysiology is a cardiology field that deals with the electrical conduction problems of the heart. It is a highly specialized area that requires technical expertise and an in-depth knowledge of the electrical conduction activities of the heart. The electrophysiology nurse, will be required to offer critical care to patients before, during and after electorphysiology procedures. Cardiac electrophysiology (EP) is a collection of clinical techniques for the diagnosis and treatment of cardiac arrhythmias. These techniques allow a detailed analysis of the mechanism(s) underlying these arrhythmia, exact location of the site of origin, and, when applicable, definitive treatment via catheter-based ablation techniques. Thus, EP studies can accomplish the following aims; definitive diagnosis of an arrhythmia (supraventricular or ventricular tachyarrhythmias or a bradyarrhythmia), establish the etiology for syncope, stratification for risk of sudden cardiac death and evaluate the feasibility or outcome of nonpharmacologic therapy (eg, radiofrequency ablation or implantable cardioverter/defibrillator therapy) (Homoud, 2019).

Before the EP study, the patient may be scheduled for several tests. These tests provide basic information about the heart function. These tests will include; blood tests, an electrocardiogram (ECG), an echocardiogram, a24-hour Holter monitor and an exercise stress test. The patient will be placed on a heart monitor during the hospital stay. Medications as antiarrhythmics may be stopped before the EP study. The doctor will decide if this is needed. The patient will be asked to sign a consent form. The night before the test, the patient will be fasting after midnight. Any medications ordered by the doctor may be taken by sips of water. Just before the test, the patient will be asked to empty his/her bladder. Underwear and pajama bottoms must be removed. Glasses, dentures or hearing aids may be worn during the procedure (Northwestern Medicine, 2016).

Electrophysiology studies are performed in the Electrophysiology (EP) or catheterization lab in the hospital. An intravenous line will be inserted and a mild sedative will be given to help the patient to relax. A portion of both groin areas, and possibly the right side of the neck, will be cleaned and shaved in preparation for insertion of the catheters. A local anaesthetic will be given to numb the insertion site. Then the patient will be covered from the neck to the toes with large sterile sheet. Small, flexible sheaths will be inserted into the blood vessels at the insertion sites. The doctor then inserts one or more catheters into the sheath. An X-Ray machine (fluoroscopy) provides images of the heart during the procedure to help the doctor accurately position the catheters. An electrical "map" of the heart is created to identify the specific area of the heart where the arrhythmia is coming from. This is done by recording the electrical activity of the heart while the arrhythmia is active. Most patients experience minimal discomfort during the EP study. Depending on the complexity of the arrhythmia, the procedure may take about one hour, or several hours. The patient will be instructed to report any chest discomfort or pressure during the procedure. When the EP study is complete, the sheath and catheters are withdrawn and pressure is applied to the insertion point to control bleeding (American Heart Association, 2016)

When the patient returns from the catheterization lab, he'll be lying flat on his back with his leg straight. The patient needs to stay in this position for 4 hours before he is allowed to sit up. This allows more time for the area to heal. One hour after the procedure, the patient will be allowed to have something to eat and drink. A nurse will check the patient's blood pressure and the pulses in the feet and will also check the area where the catheters were inserted. The patient can resume his normal daily activities (such as walking, bathing, showering) upon discharge from the hospital unless, instructed differently. The only restriction is straining or lifting heavy objects more than 10 pounds, for 5 to 7 days, so that the incision site can heal. Avoid vigorous activity such as playing football, basketball, and exercise for one week. The patient may experience some tenderness and bruising in his groin and upper leg. This is normal, but if the pain is excessive or continuous, the patient must seek medical attention. The patient can return to work in 3 to 4 days, unless his job requires him to lift heavy objects. The patient must follow the doctor's or nurse coordinator's instructions for mobility and activity levels (Gillingham, 2018).

Critical care nurses must understand the technical and psychosocial aspects of an EPS to ensure adequate care. The primary role of nurses is to maintain a safe environment for the patient in the electrophysiology laboratory (i.e., maintain aseptic techniques and intervene when complications occur). Rapid technological advances and the increasing number of well-educated patients require that nurses be knowledgeable and skilled in providing progressive care, such as developing educational programs and support groups for patients and patients' families (Attin, 2001). Critical care nurse must assess and care for 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, control of bleeding and maintenance of haemostatis. This will help in minimizing the vascular complications in patient (Arathy, 2011). Nurse must be able to do accurate patients' education, physical assessment, monitoring and nursing care of patients' pre-, and post-EP procedure. In depth understanding of interventional procedures, recognises unexpected events and anticipates solutions focused options (Bryson, etal, 2018).

The invasive cardiac procedures as electrophysiology study (EPS) can be anxiety provoking for many patients (Nekouei, Yousefy, Manshaee, & Nikneshan, (2011). Trotter, Gallagher, & Donoghue, (2011) Display of such emotion is commonly referred to as state anxiety, an emotional condition where feelings of tension, fear and worry induce increased autonomic nervous system activity in response to situational circumstance (Ayers, Joekes & Copland, (2010) Sympathetic response to stress promotes increased plasma adrenaline levels with subsequent increase in heart rate and blood pressure. Additionally, reduced serum potassium levels, cardiac arrhythmias and alterations in mental state, with potentially compromised capacity to make suitable treatment decisions, have also been identified as adverse events for patients and important considerations for nursing staff providing care for anxious patients (Chan & Cheung, 2003; Frazier et al., 2003; Astin, Jones & Thompson, 2005 and Pritchard, 2011).

Psychological assessments are an integral part of patients' preparation before an EPS. Common reactions of patients and their families to cardiac arrhythmias are anxiety, loss of control, denial, depression, and disruption in family functioning (Attin, 2001). Anxiety is a common psychological response (60%) in patients with cardiovascular disease, can cause unwanted clinical responses such as arrhythmias and ischemia that can lead to poor cardiovascular patient outcomes during cardiac catheterization (Carroll, Malecki-Ketchell & Astin, 2016). Therefore, the aim of this study is three folds; 1- to assess critical care nurses' knowledge and practices regarding electrophysiology study. 2- To assess patients' level of anxiety before and after the electrophysiology study and 3- to investigate the relationship between nurses' knowledge and practices and patient state-trait anxiety level concerning electrophysiology study.

Significance of the study:

Critical care nurses practice in settings where patients require complex assessment, high-intensity therapies and interventions and continuous nursing vigilance. Critical care nurses rely upon a specialized body of knowledge, skills and experience to provide care to patients and families and create environments that are healing, humane and caring (American Association of Critical-Care Nurses, 2015).

From clinical experience within the critical care unit, it was observed that, patient who undergoing invasive cardiac investigations and interventions as EPS expressed feelings and displayed behaviors associated with anxiety pre and post procedure. Some patients expressed verbally their concerns and worries of undergoing such an invasive procedure. Others also displayed behaviors which varied from withdrawal to more overt behaviors such as crying or complaining or even aggressive behaviors, creating subsequent barriers to communication and care. Therefore, this study was designed in an attempt to assess nurses' knowledge, practices and patients' anxiety level before and after the electrophysiology study. Also, this study might generate attention and motivation for further investigations into this area.

2. SUBJECTS AND METHODS

2.1. Aim of the study:

The aim of this study was three folds; 1- to assess critical care nurses' knowledge and practices regarding electrophysiology study. 2- To assess patients' level of anxiety before and after the electrophysiology study and 3- to investigate the relationship between nurses' knowledge and practices and patient state-trait anxiety level concerning electrophysiology study.

2.2. Research questions:

1- What is the level of critical care nurses' knowledge about electrophysiology study?

2- What is the level of critical care nurses' practice about electrophysiology study?

3- What is the state-trait anxiety level of patients undergoing electrophysiology study?

4- Is there a relationship between the critical care nurses' knowledge and practices concerning electrophysiology study and the patient state-trait anxiety level?

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2.3. Research design:

Descriptive correlational research design was utilized in this study. Descriptive correlational research is used to describe the relationship among variables rather than to infer cause-and-effect relationships. Describe the variables and the relationships that occur naturally between and among them (Burns & Grove 2005).

The independent variable in this study is the nurses' knowledge and practice concerning electrophysiology study and the dependent variable is the patient state-trait anxiety level.

2.4. Setting

This study was carried out at a selected cardiac care unit affiliated to Cairo University Hospital, in Cairo governorate. It is one of the largest educational university hospitals in Egypt in this field. It receives the cardiac patients all over the day. It receives more than 150 patients per year for EPS.

2.5. Subjects:

Convenient sample of 40 adult male and female patients undergoing electrophysiology study were recruited in the study. In addition to all critical care nurses working in the selected cardiac care unit affiliated to Cairo University Hospital, in Cairo governorate who agreed to participate in the study (50).

2.6. Tools:

Four tools were utilized to collect data pertinent to the current study; three of them were constructed and tested by the researcher, fourth tool which was patient state-trait anxiety level assessment sheet to assess patients' anxiety level was developed and tested by Spielberger, Gorsuch, and Lushene (1970) and these tools were piloted on 5 nurses and 4 patients to ensure clarity, objectivity, relevance and feasibility of the study tools. Needed modifications were done accordingly &these data were excluded from the actual study. These tools were:

Tool 1: Personal characteristics and background data sheet for nurses:

Include age, gender, educational level, and years of experience in ICU.

Tool 2: Knowledge assessment questionnaire:

To assess nurses' knowledge about electrophysiology study (EPS). This questionnaire involved 31 questions covering the following areas; general knowledge about EPS as definition, indications and procedure duration, patient preparation for EPS, nursing care before, during and after EPS, complications of EPS, and follow up appointments. This questionnaire was developed in Arabic language.

Scoring system:

Each right answer scored with one grade with a total scores of 31, less than 25 scores (< 80 %) was considered unsatisfactory, equal to or more than 25(> 80%) was considered satisfactory

Tool 3: Observational checklist:

To assess the nurses' practices concerning patient care before electrophysiology study as; connecting the patient to ICU monitor, measuring vital signs, obtaining 12 lead ECG, and care after electrophysiology study as; observing the puncture site, assessing peripheral circulation….etc. this sheet included 24 items.

Scoring system:

Each correct step counted by 1 score with total scores of 24, satisfactory level of practice was considered on 90% (22) score.

Tool 4: Patient state- trait anxiety level assessment sheet:

Composed of two parts part A-Personal characteristics and medical data of the patient including age, gender, place of residence, education level, marital status, diagnosis smoking habit, co-morbidity diseases. Part B: Patient state-trait anxiety inventory (STAI) to assess patients' anxiety level regarding electrophysiology study. This sheet was developed

and tested by Spielberger, Gorsuch, and Lushene (1970) is a self report scale on which subjects rate themselves on a four point scale of increasing intensity. The STAI scale asks people to describe how they feel generally. The STAI scale requires people to indicate how they feel at the present moment and is a sensitive indicator for the level of transitory anxiety. The STAI scale evaluates qualities of tension, nervousness, worry and apprehension.The range of possible scores for the STAI varies from a minimum of 20 to a maximum score of 80.

Scoring system:

- Scores from 20 - 39 are considered mild anxiety level.
- Scores from 40 - 59 are considered moderate anxiety level.
- Scores from 60 - 80 are considered severe anxiety level.

2.8. Tools validity and reliability:

Content validity was done to identify the degree to which the used tools measure what was supposed to be measured. Tools developed by the investigator were examined by a panel of three critical care nursing experts to determine whether the included items are clear and suitable to achieve the aim of the current study. For patient state-trait anxiety inventory; according to studies by Spielberger et al., (1983), internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from .65 to .75 over a 2-month interval.

2.9. Techniques for data collection:

Structured interview was utilized to fill out the Personal characteristics and background data sheet for nurses (tool 1), also, the patient state –trait anxiety assessment sheet (tool 4), and knowledge assessment questionnaire for nurses (tool 2). Direct observation was used to fill out the observational checklist (tool 3).

3. ETHICAL CONSIDERATION

An official permission was obtained from hospital administrators to conduct the proposed study. Participation in this study is entirely voluntary; each patient /nurse has the right to accept participation in the study or no. Informed consent was obtained from all subjects (nurses and patients). Anonymity and confidentiality were assured through coding the data, every participant has the right to withdraw from the study at any time; subjects were assured that this data will not be reused in another research without permission.

4. PROCEDURE

The study was conducted on two phases; preparation phase, and implementation phase. The preparation phase involved construction of the different study tools, obtaining the official permission to conduct the study and ended by conduction of the pilot study. Once the official permission is granted to proceed with the proposed study, implementation phase was initiated; the purpose and nature of the study was explained to all subjects (nurses and patients). Then the Personal characteristics and background data sheet (tool 1) was filled out for nurses who agreed to participate in the study then knowledge assessment questionnaire (tool 2) was submitted to nurses to fill it as well as the observational checklist (tool 3) was filled out for nurses during provision of care for patients undergoing the electrophysiology study. After explanation of the research purpose for patients, patients who agreed to participate in the study were interviewed by researcher to obtain personal characteristics and medical data (part A tool 4). Anxiety was assessed by using the S-Anxiety inventory. The researcher briefly explained the STAI to each subject (part B tool 4). This part was completed 1-2 hours before and after the procedure of EPS.

5. STATISTICAL ANALYSIS

The collected data scored, tabulated and analyzed by personal computer using statistical package for the social science (SPSS) program version 20. Descriptive as well as inferential statistics was utilized to analyze data pertinent to the study. Level of significant was at $p \leq 0.05$.

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6. RESULTS AND DATA ANALYSIS

The findings of the current study are presented in three main sections; section one is concerned with critical care nurses' personal characteristics and background data, knowledge and practices regarding electrophysiology study (EPS) (tables 1-4 and figures 1&2), section two is devoted to patients' personal characteristics, medical data, and level of anxiety before and after EPS procedure (tables 5 -8 and figure 3), and the third section is related to correlation between nurses' knowledge and practices and patient anxiety level (table 9).

Table (1): Distribution of Critical Care Nurses' Personal Characteristics and Background Data n= 50

Variables	No.	%
Age 20-30	38	**76**
31-40	7	14
>40 years	5	10
Mean ± SD	28.3 ± 5.4	
Gender		
Male	4	8
Female	46	92
Educational Level		
Bachelor	15	30
Technical Institute	10	20
Diploma	25	50
Years of experience in ICU		
< 5	38	76
5 – 10	7	14
>10 years	5	10
Mean ± SD	3.90 ± 2.74	

This table showed that, 76 % of the study age ranged between 20-30 with a mean of 28.3 ± 5.4, 92 % of them were females, 50% of them were diploma nursing and 76% of them their years of experience was less than 5 years with a mean of 3.90 ± 2.74

Table (2): Critical Care Nurses' Total and Subtotal Mean Knowledge Scores Regarding Electrophysiology Study (EPS) n= 50

Variables	Score	Mean + SD
General Knowledge about electrophysiology study	4	3.7 ± 0.53
Knowledge about patient preparation before EPS	6	4.1 ± 1.03
Knowledge about nursing care during EPS	5	2.90±0.88
Knowledge about nursing care after the procedure	9	3.16 ± 0.79
Knowledge about complications	4	2.00± 0.52
Knowledge about follow up appointments	3	1.13± 0.81
Total mean knowledge scores	31	16.99± 3.09

This table illustrates that, total mean knowledge scores of the nurses regarding EPS was 16.79± 3.09 out of 31 indicating low total knowledge levels and their mean knowledge scores about nursing care after the procedure was 3.16 + 0.79 out of 9.

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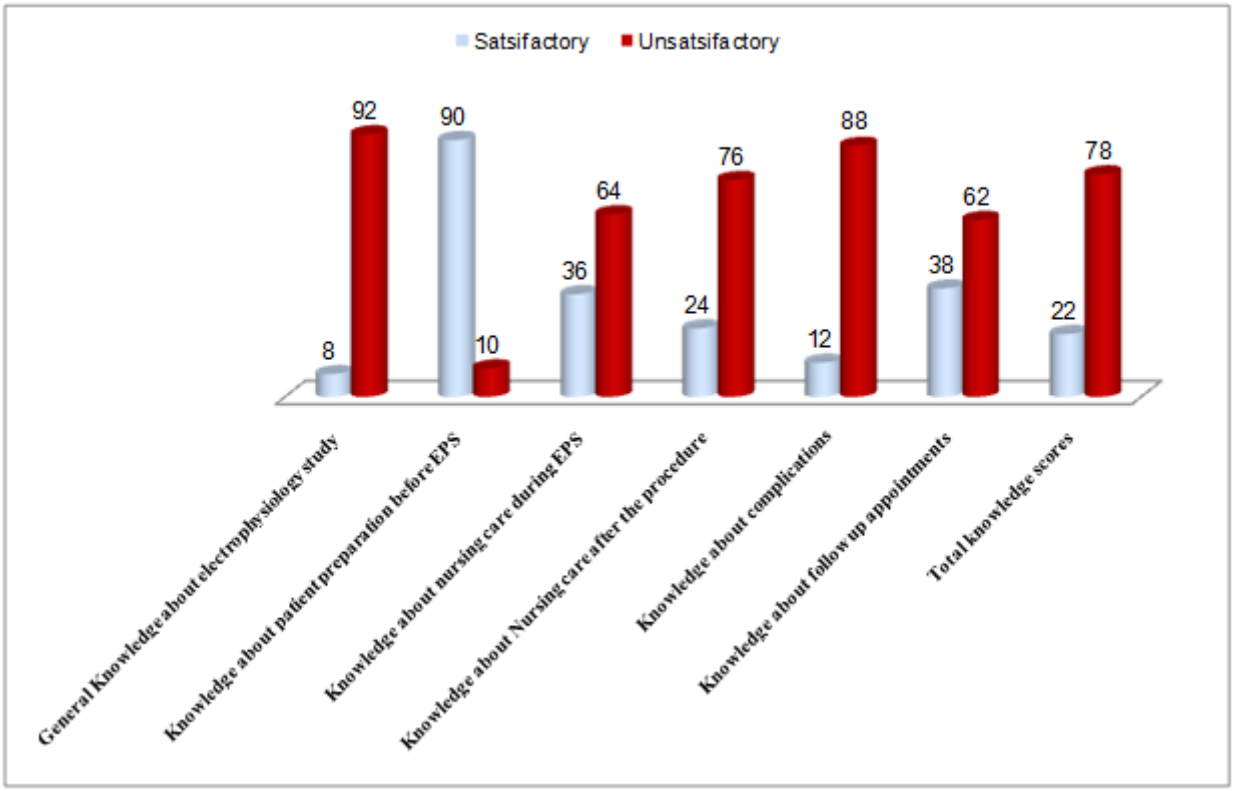

Figure 1: Critical Care Nurses' Total and Subtotal Knowledge Score Levels as Regards to Electrophysiology Study (EPS) n= 50

This figure reveals that, majority (92%) of the nurses had unsatisfactory level of total knowledge about EPS. Also, majority (88%) of them had unsatisfactory knowledge about nursing care after the procedure while 90 % of them had satisfactory knowledge level regarding the general knowledge about EPS.

Table (3): Critical Care Nurses' Total and Subtotal Mean Practice Scores about Electrophysiology Study (EPS) n=50

Variables	Total score	Mean + SD
Nurses' practices scores before the procedure	10	4.96 ± 1.26
Nurses' practices scores after the procedure	14	7.83 ± 1.16
Total mean practice scores	24	12.79 + 2.03

This table shows that, total mean practice scores of critical care nurses regarding EPS was 12.79 + 2.03 out of 24 indicating low total practice level. With the lowest mean of practice score before the procedure 4.96 out of 10.

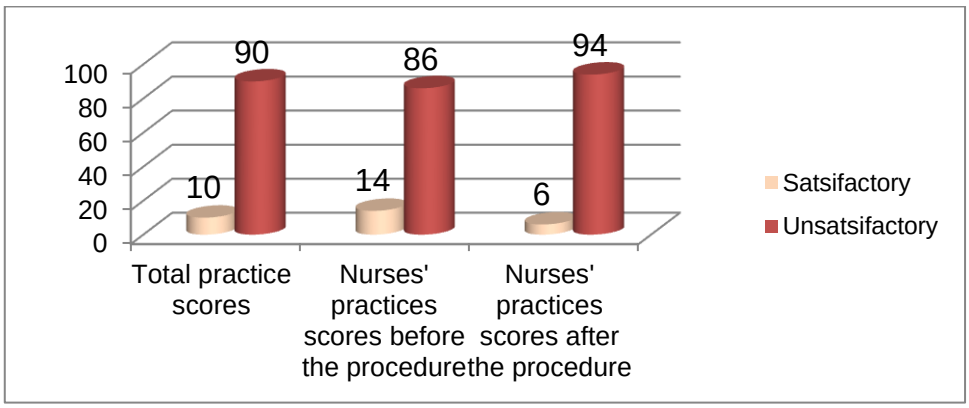

Figure 2: Critical Care Nurses' Total and Subtotal Practice Score Levels about Electrophysiology Study (EPS) n=50

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This figure reveals that majority (86% & 94%) of the nurses had unsatisfactory practice level regarding care for patient undergoing the EPS before and after the procedure respectively.

Table (4): Correlation between personal characteristics and background data of critical care nurses and the total knowledge and total practice scores n= 50

Variables	r	X^2	P value
Age with total knowledge scores	0.34		0. 01*
Gender with total knowledge scores		3.74	0.13 NS
Educational level with total knowledge scores		7.35	0.02*
Years of experience in ICU with total knowledge scores	0.32		0.01*
Age with total practice scores	0.21		0.00*
Gender with total practice scores		1.97	0.26 NS
Educational level with total practice scores		9.15	0.02*
Years of experience in ICU with total practice scores	0.41		0.00*

This table reveals that, there is a highly significant statistical correlation between nurses' total knowledge and practice score and their age, educational level and years of experience in ICU

Table (5): Distribution of the Personal Characteristics of Patients Underwent Electrophysiology Study n=40

Variables	No.	%
• **Age**		
20:<35 years	1	2.5
35:50 years	21	**52.5**
>50:65 years	15	37.5
>65 years	3	7.5
Mean± SD	51.8±8.8	
• **Gender**		
Male	32	**80**
Female	8	20
• **Marital status**		
Married	40	**100**
Unmarried	0	0
• **Educational level**		
Illiterate	8	20
Can read and write	12	30
Secondary education	15	**37.5**
High education	5	12.5
• **Place of residence**		
Rural	12	30
Urban	28	**70**
Smoking habit		
Smoker	30	**75**
Nonsmoker	10	25

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This table shows that, (52.5%) of the patients' age ranged between 35:50 years, with a mean age of (51.8± 8.8) years, (80%) were males. Moreover, all of the patients were married, (37.5%) had secondary school education, the majority of them (70%) came from urban areas and 75% of them were smokers.

Table (6): Distribution of Patients Underwent EPS According to Diagnosis and Co-morbidity n=40

Variables	No.	%
Diagnosis		
Atrial fibrillation	3	7.5
Sick Sinus Syndrome	5	12.5
Ventricualor Tachycardia	14	35
Paroxysmal Superaventricualr Tachycardia	10	**25**
Atrial Flutter	5	12.5
Wolff Parkinson white syndrome	3	7.5
Co-morbidity		
Diabetes Mellitus	8	20
Hypertension	9	22.5
Coronary Artery Disease	20	**50**
Rheumatic Heart Disease	3	7.5

This table showed that, 35% of patients diagnosed as ventricular tachycardia and 50 % of them had coronary artery disease as a co -morbid disease.

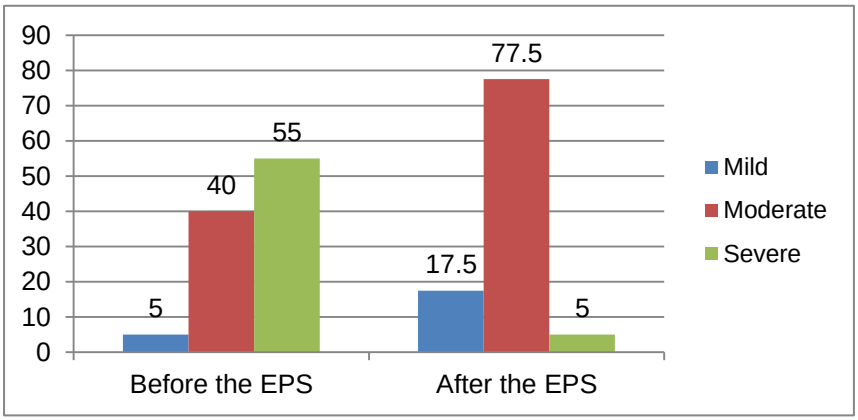

Figure 3: STAI Levels among patients before and after the EPS (n=40)

Table (7): t test of Total Anxiety (STAI) Mean Scores before and after the EPS (n=40):

Assessment period / Mean anxiety score	Before the EPS	After the EPS	t/ p value
Total mean anxiety scores	61.36 ± 9.8	47.8 ± 4.2	4.75 / 0.021

Significance level ≤ 0.05

Figure 3 and Table 7 show that, 55% of the patients had severe anxiety level before the EPS procedure this percent decreased to 5% after the EPS procedure with mean score of (61.36 ± 9.8 & 47.8 ± 4.2) respectively with significant statistical difference between before and after the EPS.

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Table (8): Correlation between patients' personal characteristics and level of anxiety (before and after the EPS) n= 40

Variables	Before the EPS		After the EPS	
	X^2	P value	X^2	P value
Age	0.143	0.37	0.142	038
Gender	2.5	0.11	2.6	0.13
Level of education	2.06	.15	2.071	0.12
Place of residence	3.15	0.076	3.13	0.066
Marital status	1.07	0.35	1.26	0.31
Smoking habit	3.23	0.15	3.24	0.13
Comorbidity disease	3.3	0.34	3.2	0.35

This table shows that, there is no significant statistical correlation between patient's age, gender, level of education, place of residence, marital status, smoking habit and comorbidity disease and their level of anxiety either before or after the EPS.

Table (9): Correlation between critical care nurses' total knowledge, critical care nurses' total practice scores and patient's total anxiety scores (before and after the EPS)

Variables	r	P value
Nurses' total knowledge scores and patients' total anxiety scores (before EPS)	- 0.52	0.01
Nurses' total knowledge scores and patients' total anxiety scores (after EPS)	-0.38	0.02
Nurses' total practice scores and patients' total anxiety scores (before EPS)	- 0.47	0.001
Nurses' total practice scores and patients' total anxiety scores (after EPS)	- 0.81	0.001

Significance level at $p \leq o.o5$

This table illustrates that, there is a highly significant statistical correlation between critical care nurses' total knowledge scores , critical care nurses' total practice scores and the patient's total anxiety scores before and after the EPS.

7. DISCUSSION

Fifty staff nurses comprised the sample for this study. Demographic variables included gender, age, educational levels and years of experience in ICU. The majority of participants were females. This high percent of female nurses may be because of the fact that the study of nursing in the Egyptian society was exclusive for females only till few years ago, so the profession of nursing in Egypt was mostly feminine. Also, it is worth mentioning that females comprised 90.78% of the graduated nursing personnel in Egypt while males comprised 9.22% (Ministry of Health and Population, 2013). Regarding age of the studied nurses, more than two thirds of them ranged between 20-30 years with a mean of 28.3 $\pm$ 5.4, half of them were diploma nursing and more than two thirds of their years of experience was less than 5 years with a mean of 3.90 ± 2.74.

This result is congruent with Ibrahim, (2015) in a study of Nurses' Knowledge, Attitude and Practice of Oral Care for Intensive Care Unit Patients found that, female outnumbered males five times, the mean age of nurses was 27.95 ± 4.51 years, the median of their working experience in the ICU was 4 years. Similar to this result, Abd Elbaky, Mohamed & Nagib (2018) in a study to evaluate the impact of simulated education on nurses' knowledge and performance about invasive procedure at Intensive Care Units: evidence based practice. Found that, more than half of subjects (61.5%) were female and (38.5 %) male. The majority of them were new graduated with less than 5 years of experience (81.6%).

In relation to nurses' level of knowledge about the Electrophysiology study, the study results revealed that, majority of the study subjects had unsatisfactory level of total knowledge about EPS. Unsatisfactory level of knowledge was found in the following areas; nursing care before, during, after, complications of the procedure and follow up appointments. The

researcher believe that, the reason of this result may be the lack of knowledge pertinent to management of patient undergoing EPS because of lack of continuing education courses related to EPS management for nurses in their clinical practice settings, lack of protocols, and guidelines for patient assessment and management.

These results were consistent with Noorjahan, (2012) in a study entitled "The effectiveness of structured teaching program on level of knowledge of interpretation and management of arrhythmias among staff nurses in selected Hospitals, Bangalore" found that, the nurses were having less knowledge in interpretation and management of arrhythmias. Also, Rolley, et al (2010) developed a survey study on nursing care practices following a percutaneous coronary intervention. A total of 148 respondents attempted the survey, identified a knowledge deficit in this area. The survey identified also diversity of practice patterns and a range of educational needs. Similar to these results, Rushdy, Youssef & Elfeky, (2015) and Hassan & Hassan, (2018) found that, the majority of nurses' had unsatisfactory knowledge toward arrhythmia before implementation of educational program and about intra-aortic balloon pump regarding patient care. This was also a cardiac procedure and results were very unsatisfactory about nurses knowledge.

Contradicting these results Al-Ftlawy, (2014) in a study was done in Al-Najaf City to determine the nurses' knowledge about cardiac patient care, Atiyah, (2016) in a study conducted in cardiac unit to determine the nurses' knowledge about pacemaker implantation and Feroze, Afzal, Sarwar, Galani, & Afshan, (2017) in a study to assess nurse's knowledge about post cardiac catheterization complications found that, Nurses knowledge was good and sufficient about cardiac catheterization procedure and post cardiac catheterization complications.

In the current study nurses' practices was assessed through two main areas, and their practice was unsatisfactory regarding care for patient underwent the EPS before and after the procedure. This result may be related to lack of regular training for nurses and the lack of the standard of nursing care or practicing protocols related to EPS. In the same line, Noorjahan, (2012) found that, the majority of nurses' had unsatisfactory practice toward arrhythmia before implementation of the educational program and after applying the education program, there were improvement. Feroze, Afzal, Sarwar, Galani, & Afshan, (2017) mentioned that, nurses' practice was poor 25.74%. Also, Rushdy, Youssef & Elfeky, (2015) in a study conducted in Cairo university hospitals to determine the nurses' practice about patient care connected with intra-aortic balloon pump and result was very unsatisfactory about nurses' practice.

These findings were In contrast with the findings of Arathy, (2011) in a study to assess the knowledge and practices of cardiac nurses about patient safety after cardiac catheterization found that, on observing the practices; quality of care is adequate. Aziz, (2014) in a study conducted in Sulaimani City and found that nurses had good practice about post cardiac procedure.

The study results delineated that, there is a highly significant statistical correlation between nurses' age, educational level and years of experience in ICU and their total knowledge and practice scores. Similar to these results, Sharif, Salih, Sailh & Salim (2018) in a study to assess nurse's knowledge regarding cardiac catheterization at General Hospital in Rania city the results showed that there are significant relationship among age, gender, years of employement and number of training course with nurse's knowledge except level of education. Also, Feroze, Afzal, Sarwar, Galani, & Afshan, (2017) stated that, there was a significant relationship between knowledge and practice, knowledge and qualification, this result showed that qualification has great effect on the nurses' knowledge and nurses can develop their knowledge through experience.

In contrast to these findings, Shaaban, Youssef, Abdo & Hussein (2015) in a study conducted in Egypt found that, there is no correlation existed between gender, age, and nurses' levels of knowledge and practice, while there were significant statistical differences between their level of education and their levels of knowledge and practice. Also, Hassan, (2017) in a descriptive study conducted in Baghdad reported that, there is no association between nurses' knowledge and age, gender and years of work in cardiac care unit.

Forty patients underwent the EPS procedure comprised the study sample, regarding demographic characteristics of them; the current study revealed that, more than half of the studied subjects' ages ranged between 35:50 years, with a mean age of (51.8+ 8.8) years, majority of them were males. Moreover, all of the studied subjects were married, more than one third of them had secondary school education, the majority of them came from urban areas were smokers.

These results was in accordance with results of Nekouei, Yousefy, Manshaee & Nikneshan, (2011) in a study to compare the anxiety of cardiac patients candidate for angiography with normal population in Isfahan province found that, the majority of study subjects were males, married, and aged between 40-65 years old. Their educational level was mostly associate degree (26.4%) or secondary school grade (25.5%). Also, El-Medany & Grubb, (2014) found that, out of 141 patients in a tertiary centre in Scotland who underwent an electrophysiological study between 2009 and 2012, 59 (41.8%) were male; mean age at follow-up was 50 years.

Regarding medical data of the patients, the study revealed that, more than one third of patients diagnosed as ventricular tachycardia and half of them had coronary artery disease as a co -morbid disease. Congruently with these findings, Marai et al, (2010) in as a study of clinical and electrophysiologic outcomes of patients undergoing percutaneous endocardial ablation of scar- related ventricular tachycardia stated that, the entire study sample (11 patients with recurrent unstable ventricular tachycardia) had ischemic heart disease as a risk factor. Contradicting this, Vasheghani-Farahani, etal (2018) in a study entitled as "Acute Complications in Cardiac Electrophysiology Procedures: A Prospective Study in a High-volume Tertiary Heart Center" found that, the most common arrhythmia (28.2%) was AV nodal reentrant tachycardia (AVNRT) and the most common comorbid disease was hypertension. Also, Kesek (2009) In the Sweden registry, stated that, atrial fibrillation ablation was the most commonly treated substrate followed by AVNRT and atrial flutter ablation.

In relation to, anxiety level among the patients underwent the EPS, the study revealed that, more than half of the study subjects had severe anxiety level before implementation of the EPS, this percent decreased to 5 percent only after implementation of the EPS with significant statistical difference between before and after the procedure. There is no significant statistical correlation between patient's age, gender, level of education, place of residence, marital status, smoking habit and comorbidity disease and their level of anxiety. From the researcher point of view, high level of anxiety before the procedure may be because of the following, lack of knowledge about the EPS, uncertainty about the future, fear of complications and anticipation of pain during the procedure.

These results were similar to the results of Moser, (2007) and Ketterer, Bekkouche, Goldberg, Krantz, & McMahon, (2011) and Nekouei, Yousefy, Manshaee & Nikneshan, (2011) who reported that many cardiac patients experience elevated levels of anxiety, with levels commonly peaking after an acute cardiac event. Also, Trotter, Gallagher & Donoghue, (2011) in a study to determine the patterns of anxiety and concerns experienced by patients undergoing PCI stated that, anxiety scores were highest pre-procedure (35.72, standard deviation [SD] 11.75), decreasing significantly by the post procedure time (31.8, SD 10.20) and further still by the post discharge time (28.79, SD 9.78) (repeated-measures analysis of variance: $F = 39.72$, $P < .001$). In addition, El-Medany & Grubb (2014) who studied supraventricular tachycardia and catheter ablation: anxiety levels and patient perceptions found that, (52.5%) of patients experienced severe anxiety, with a reported anxiety level at index episode of 8 or above. Anxiety levels were not affected by gender ($p = 0.07$ and there was a significant association between age and anxiety level.

The pervious result was contradicted with, Cupples, Paige-Dobson& Armstrong (1998) in a study, to measure state anxiety and related physiological correlates at 3 selected times when patient education regarding electrophysiology (EP) studies is likely to occur: 24 hours before the EP study (pre-procedure teaching), 1 hour before the EP study (reinforcement of pre-procedure teaching), and 3 hours after the EP study (explanation of results; reinforcement of post-procedure instructions) mentioned that, patients undergoing initial EP studies experience moderate state anxiety and manifest a paradoxical pattern of autonomic responses over time.

The study results appeared that, there is a highly significant statistical correlation between critical care nurses' total knowledge scores , critical care nurses' total practice scores and the patient's total anxiety scores before and after the EPS. In the same line with this, Webster et al., (2012) and Estes et al., (2013) who stated that, nurse experience may influence their approach to health assessment, more experienced nurses will draw on knowledge gained from previous experiences to help decision making and guide assessment processes, the less experienced nurse may need guidance in the absence of the more developed clinical reasoning and critical thinking applied by the more experienced nurse. Also, Buzatto & Viski Zanei, (2010) mentioned that, anxiety is reduced when better quality information and more con tents are provided. This happens when nurses are able to clear patients' doubts, joining technical information to sensory-perceptive explanation. When the nurse explains theoretical issues, adapting them to patients' level of understanding and using one or more illustration strategies to make patients understand what are the stages of the procedure, results are better.

8. CONCLUSION

The study concluded that the majority of critical care nurses had unsatisfactory knowledge and practice toward management of patients undergoing EPS. So, all nurses working in critical care units need specific educational program and training session to improve their knowledge and practice regarding this issue. Also, anxiety is a common accompaniment to invasive cardiac procedures as EPS that may lead to greater pre-procedural anxiety. It is vital that critical care nurses understand the importance of anxiety to patients' condition and outcome and use a systematic and comprehensive method of assessing anxiety in these patients. Exploring this may help in reduction of anxiety via better psychopharmacological intervention and preprocedural teaching.

9. RECOMMENDATIONS

[1] Replication of the study on a larger probability sample to obtain more generalizable data.

[2] Specific educational program can be designed and presented to critical care nurses in order to improve their level of knowledge and practice toward EPS.

[3] Written standards for patient monitoring in Arabic language for nurses should be available in all coronary care units to be followed by them and should be up dated periodically.

[4] Individualized psychological preparation should become a routine part of patient care before EPS.

[5] Development of standards of care and practice guidelines and inclusion of formal anxiety assessment within these guidelines to facilitate identification of patient anxiety and provide a focused approach to support standardised clinical practice by nursing staff.

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