



# Effect of Training Program on Nurses' Performance regarding Life Threatening Cardiac Arrhythmias

Ahmed Mohamed Elmarakby Nagy<sup>1\*</sup>, Nadia Mohamed Taha<sup>2</sup>, Aida Ahmed Mohamed<sup>3</sup>, Fathia Attia Mohamed<sup>4</sup>

## Abstract

**Background:** Life threatening cardiac arrhythmias are the most prominent causes of mortality in patients with heart diseases. The critical care nurse role in life threatening cardiac arrhythmia mainly focuses on, prevention, early detection and taking emergency actions. **Aim:** The aim of the study was to evaluate the effect of training program on nurse's performance regarding life threatening cardiac arrhythmia in intensive care units (ICUs) at El\_Araby Hospital, Egypt. **Subjects and Methods:** Research design: A quazi experimental design was utilized to achieve the aim of this study. **Setting:** The study was conducted in ICUs at El\_Araby Hospital. **Sample:** a convenience sample of all available nurses working in ICUs. **Tools of data collection:** Self-administered questionnaire, observational checklists and nurse's attitude were used. **Data** were collected over a period of six months. **Results:** Slightly three quarters of the studied nurses aged less than 30yrs, more than half were female. There were statistically significant improvements in total level of nurse's knowledge, practice and attitude post program. **Conclusion:** the nursing training program had a significant positive effect on improving nurse's knowledge, practice and attitude regarding life threatening cardiac arrhythmias. **Recommendations:** It was recommended continuous in-service training programs for the purpose of refreshing, updating the nurse's knowledge and practice regarding life threatening cardiac arrhythmia.

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**Key Words:** life threatening cardiac arrhythmias, Nurses performance, Training Program

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## Introduction

A cardiac arrhythmia is an irregular heartbeat. Occur when the electrical signals that coordinate the heart's beats don't work properly, cause the heart to beat too fast (tachycardia), too slow (bradycardia) or irregularly. Cardiac arrhythmias may not cause any signs or symptoms. In general, arrhythmias can cause a fluttering in the chest or tachycardia or bradycardia, chest pain, shortness of breath. Also, anxiety, fatigue, dizziness, sweating as well as fainting or near fainting (Huang & Miller, 2020). The cardiac arrhythmias are the most frequent cause of death globally, accounting for 70,000 to 90,000 sudden cardiac deaths per year, with ventricular tachycardia and ventricular

deaths. In Egypt, approximately four million people have cardiac arrhythmias. More than 70% of ICU patients experience heart rhythm disturbances, and these patients have correspondingly higher mortality rates particularly with ventricular arrhythmias (Aro, Chugh, & ESC, 2018). Cardiac arrhythmia is grouped into bradyarrhythmias, tachyarrhythmia and life-threatening cardiac arrhythmia, the life-threatening cardiac arrhythmia include atrial fibrillation (A-fib.), atrial flutter (AF), supraventricular tachycardia (SVT), ventricular fibrillation (VF) and ventricular tachycardia (VT) and a systole (Ameen, Maarouf & Khalifa). There are many factors increase risk of cardiac arrhythmia;

fibrillation accounting for the majority of these

**Corresponding author:** Ahmed Mohamed Elmarakby Nagy

**Address:** <sup>1</sup>Master Degree of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt, <sup>2</sup>Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt, <sup>3</sup>Lecturer of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt, <sup>4</sup>Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt,



E-mail: Dr.ahmadelmarakbyn95@gmail.com

coronary artery disease, cardiac surgery, heart failure and congenital heart disease. Hypertension can cause the walls of the left ventricle to become stiff and thick, which can change electrical signals. Obstructive sleep apnea can cause pauses in breathing during sleep which lead to bradycardia and irregular heartbeats. Electrolyte imbalance; potassium, sodium, calcium and magnesium that help trigger and send electrical impulses in the heart. Certain drugs; cough and cold medications without a prescription can cause arrhythmias. Excessive alcohol can affect the electrical impulses (Chung, et; al., 2020). Mariani, et; al., (2020): illustrated that the life-threatening cardiac arrhythmia complications depend on the type of arrhythmia. In general, include stroke, sudden death and heart failure. While the prevention, depend on; lifestyle changes to reduce the risk of heart disease that help prevent cardiac arrhythmias. A cardiac healthy lifestyle includes: eating a healthy diet; low salt and low fat as well as high in fibers. Staying physically active, maintaining a healthy weight, not smoking, avoiding caffeine and alcohol and reducing stress as intense stress and anger as well as using medications as ordered. The interpretation of cardiac arrhythmias is an essential skill for nurses. The ability to rapidly analyze a rhythm disturbance as well as initiate appropriate treatment necessarily, improve patient safety and optimize successful outcomes. The critical care nurse is often the health care professional responsible for the continuous monitoring of the patient cardiac rhythm, and has opportunity to provide early intervention that can prevent an adverse effect (Khalil, Abd-Rahman & Hamouda, 2018). Ammann, Schweizer & Wyss,(2019) stated that the electrocardiogram (ECG) is a quick bedside investigation that assesses the electrical activity of the heart and is considered the most easy and useful diagnostic tool that guide the nurse to detect and determine severity of cardiac arrhythmias. The ECG is a noninvasive technique that provides critical information about heart rate and rhythm, and helps assess for cardiac disease. The ECG composed of five basic waveforms labeled alphabetically PQRSTU. The P wave represent the atrial depolarization, QRS complex represent the ventricular depolarization, T wave represent the ventricular repolarization and U wave represents the final phase of ventricular repolarization which normally not appears in the normal rhythm. Madapaddy, (2021) stated that the ECG

interpretation done by sequentially calculating six steps including; look for standardization and lead aVR, the heart rhythm; regular or irregular. Heart rate; normal, tachycardia or bradycardia. Evaluating the P wave; present, regular, morphology. Measuring cardiac intervals; PR interval. The QRS complex; present, regular, morphology Normal sinus rhythm is a regular rhythm between 60 and 100 beats/min, with a P wave before each QRS complex and a QRS after each P wave. A faster rate defines tachycardia and a slower rate is bradycardia. The term sinus indicates that the rhythm originates in the sinoatrial (SA) node, that there is atrial depolarization precedes ventricular depolarization (Yan, Kowey, & Antzelevitch, 2020). The critical care nurse role mainly focuses on symptomatic relief and promotion of comfort. Close monitoring the patient that connected with the monitor. Taking emergency actions during cardiac dysrhythmias including assessment of disturbed rhythm, obtaining 12-lead ECG to identify the type of arrhythmia, and delivering adequate oxygen to reduce heart workload. As well as, while administering medication as prescribed, the nurse should monitor the possible adverse drug reactions and be performing aimed nursing interventions (Burke, Mohan, Brown, & Eby, 2011).

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### Significance of the study

The ECG plays a crucial role in helping to diagnose, follow-up and detect any abnormalities in a patient's condition. Nurses are usually the first to conduct and monitor an ECG and therefore need to know how to interpret them. This is because a failure to detect abnormalities means that physicians will not be notified which will affect patients' care. A life-threatening cardiac arrhythmia is a medical condition that requires immediate intervention, or it can cost a patient's life (Fahad Z A., (2018). ICUs are the most departments that receive and deal with patients who suffer from arrhythmia and other heart disease the nurses had a major role in caring of these patients that depend upon their knowledge, skills and attitude (Ibrahim, et; al., 2017). Hence this study to updating nurses' knowledge and skills and improve their attitude regarding patients with life threatening cardiac arrhythmia, improve the patient care, decrease morbidity and mortality rate.



**Aim of this study**

Evaluate the effect of training program on nurses' performance regarding life threatening cardiac arrhythmia at intensive care unit at El\_Araby Hospital.

Assess knowledge, practice and attitude for nurses' regarding life threatening cardiac arrhythmia.

Design and implement training program for nurses' regarding life threatening cardiac arrhythmia.

Evaluate the effect of training program on nurses' knowledge, practices and attitude regarding life threatening cardiac arrhythmia.

**Research hypothesis**

This study based on achieving the following hypotheses:

H1: The mean knowledge level of nurses' post program will be higher than their pre-program scores.

H2: The mean practice level of nurses' postprogram will be better than their pre-program scores.

H3: The mean attitude of nurses' post program will be better than their preprogram.

**Subjects and Methods****Research design**

A quasi-experimental research design with pre- post test was conducted to achieve the aim of the study.

**Setting**

The present study was conducted at El\_Araby Hospital in medical, surgical and cardiac ICUs.

**Subject**

The study sample was convenience sample include all available Nurses' working in ICUs at El\_Araby Hospital, the total number was 50 Nurses.

**Tools for data collection**

Three tools were used to collect data pertinent to this study, these tools were:

**Nurses' Interviewing Questionnaire.**

Observational Checklist.

Likert type Rating Scale to assess Nurses' attitude.

**First Tool: Nurses' Interviewing Questionnaire**

**(appendix I)**

This tool was written in simple Arabic language, it was designed by the researcher after reviewing of related literatures to evaluate the nurses' knowledge regarding life threatening cardiac arrhythmias at ICUs pre and post program, and the questionnaire covered two parts as the following:

**Part I: Demographic characteristics**

Concerned with assessment of demographic characteristics of the nurses'; it consists of eight closed ended questions as age, gender, marital status, qualifications, years of experience in ICU, attending training programs related to life threatening cardiac arrhythmia, the benefits of training and the need for another training.

**Part II: Nurses' Knowledge regarding Life Threatening Cardiac Arrhythmias**

This tool was adapted from Autel, (2012), Madapaddy, (2014), Jones, (2020) and Baird, (2023), total questions were 58 multiple choice questions; anatomy and physiology of the heart, definition of the ECG, steps of ECG deviceconnection, components of a heartbeat, steps of ECG interpretation, life threatening cardiac arrhythmia, nursing care for patients with life threatening cardiac arrhythmia, emergency IV medications, defibrillation (DC shock), cardiopulmonary resuscitation, crash cart, interpretation of ECG.

**Scoring system for Nurses' interviewing questionnaire**

Each question was scored "zero" for the incorrect or unanswered question and "one" for the correct answer, and these points were counted for each nurse. The general nurse's knowledge was classified into satisfactory knowledge if the score  $\geq 80\%$  from the maximum score and unsatisfactory knowledge if  $< 80\%$  based in statistical analysis

**Second Tool: Observational Checklist (Appendix II)**

This tool was adapted from Geeky medics, (2021), Betty & Adrienne, (2014), WebMD LLC, (2021), to assess nurses' practice regarding life threatening cardiac arrhythmias. It was contained 3 parts; conducting 12-lead ECG procedure, emergency intravenous (IV) medication administration procedure and emergency defibrillation procedure.

**Scoring System for Observational Checklist**

Each step was scored "zero" for not done and "one"



for done with the correct way; and these points are counted for each nurse. The general nurse's practice is classified into satisfactory practice if the score is  $\geq 80\%$  from the maximum score and unsatisfactory practice if it is  $< 80\%$  based in statistical analysis

### Third Tool: Nurses Attitude toward Care for Patient with Life Threatening Cardiac Arrhythmias (Appendix III)

It was adapted from Ibrahim, et; al., (2017) and modified by the researcher to evaluate Nurses' attitude toward nursing care for patient with life threatening cardiac arrhythmia. It includes 16 point such as; good attitude of Nurses towards the patient is important, necessary to respect the privacy of the patient during the ECG procedure, necessary to explain the steps of the ECG procedure to the patient, calm atmosphere for the patient has an effective role in the progress of the patient's condition.

### Scoring System for Nurses Attitude

The Likert type rating scale include sixteen items to assess nurses' attitude toward the care of patient with life threatening cardiac arrhythmia, each point answered by selecting the number from agree, agree to somewhat and disagree. Agree and agree to somewhat equal positive and disagree equal negative. It was considered that  $\geq 70\%$  of total grades was considered positive attitude and  $< 70\%$  of total grades was considered negative attitude based in statistical analysis.

### Content validity

The tools were reviewed by a panel of five professors in nursing to ascertain their content validity. The tools were also reviewed for clarity, relevance, comprehensiveness, applicability, and understanding. According to the expertise's modifications and the results of the pilot study, some modifications were applied in the form of rephrasing or rewording accordingly.

### Tool's reliability

Nurses' knowledge questionnaire, practice and attitude was tested for reliability and showed high reliability at 0.934%, 0.924%, 0.91% respectively through measuring its alpha Cronbach coefficient, indicating high level of reliability.

### Administrative Design

To carry out this study, the necessary approvals were obtained from dean of the faculty of nursing and submitted to general director of El Araby Hospital, then permission to carry out the study was obtained from the head of chosen setting after explaining the purpose of the study and a verbal consent was obtained from nurses for participation in the study.

### Pilot study

A pilot study for data collection was carried out in order to test whether the tools are clear, understandable, feasible, applicable, and time consuming. Ten percent from the total sample size that equal five nurses were selected randomly from intensive care units to participate in testing of the tools. The time required for answer questionnaire and complete observation chart was ranged between 30 to 45 minutes. Simple modifications were done based on pilot results and the sample who shared in the pilot study excluded from study sample.

### Field work

The study was implemented from beginning of March 2021 to end of August 2021 where the researcher was available three days weekly from 9 am to 2 pm.

Assessment phase: The researcher started to recruit the sample according to eligibility criteria. Those who gave their consent were interviewed individually using the data collection form. The information obtained served as baseline data or pretest, and guided the researcher in the preparation of the educational program.

Planning phase: Using the assessment data and related literature, Doenges, et; al., (2019), Ferri, (2020), Ackley, et; al., (2020), Bittner, et; al., (2021), Bowie, (2021) & Baird, (2023), the researcher developed training program to train nurses' and improve their knowledge, practice and attitude about life threatening cardiac arrhythmia. The training program included a theoretical and a practical part. The researchers prepared an illustrated guideline booklet in English language to help nurses assimilate and refresh the information provided to achieve aim of the study.

Implementation phase: The researcher met with the nurses' and administered the training program in twelve sessions each session 30-45 min. The first five sessions were theoretical and covered anatomy and physiology of the heart, definition of ECG, ECG paper, components of the heartbeat, and steps of

ECG interpretation and definition, types of life-threatening cardiac arrhythmia (Afib., AF, SVT VT, VF, and a systole) as well as causes, clinical manifestations, complications of life-threatening cardiac arrhythmia, management and nursing care each one of them. Additionally nursing role in delivery of DC shocks, CPR, emergency IV medications administration and crash cart.

Theoretical part was followed by seven practical sessions with applied practical training in required practices include conducting 12-lead ECG, emergency IV medication administration and emergency defibrillation. During the practical sessions, each nurse was assessed whether he/she follows the program or not. The first session was for orientation about the program. A copy of the program was offered for each nurse to use it as future reference.

Evaluation phase: Each nurse in the study was evaluated two times using the same data collection

**Results**

tools. This was done upon recruitment pretest and immediately posttest.

**Statistical Design**

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA 2011)). Quantitative data were expressed as the mean ± SD, median (range) and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Mc nemar test or Marginal Homogeneity Test was used to compare between two dependent groups of categorical data. Wilcoxon signed ranks test was used to compare between two dependent groups of non-normally distributed variables. Percent of categorical variables were compared using Fisher's exact test.

**Table 1: Frequency and Percentage Distribution of Demographic Characteristics of the Studied nurse's (n=50)**

Demographic Characteristics	No.	%
Age (year)		
<30	38	76.0
≥30	12	24.0
Mean± SD	28.32±3.38	
Range	22-34	
Gender		
Male	22	44.0
Female	28	56.0
Marital status		
Single	12	24.0
Married	34	68.0
Widow	0	0.0
Devoiced	4	8.0
Academic qualifications		
Nursing technical institute	42	84.0
Bachelor of nursing	8	16.0
Years of experience in ICU		
<5	20	40.0
≥5	30	60.0
Mean± SD	5.16±1.99	
Range	2-8	
Attending ECG training courses		
Yes	24	48.0
No	26	52.0
Did you benefit from the course (n=24)		
Yes	12	50.0
No	12	50.0



Like to attend other ECG courses	50	100.0
Yes	0	0
No		

**Table 2: Total Nurse's Knowledge Level regarding Life Threatening Cardiac Arrhythmias throughout Study Phases (n= 50)**

Total Nurse's knowledge	Total Nurse's Knowledge				MC p
	Pre-Test		Post Test		
	No.	%	No.	%	
Satisfactory level $\geq$ 80%	2	4.0	35	70.0	<0.001* *
Unsatisfactory level <80%	48	96.0	15	30.0	
Mean $\pm$ SD	20.22 $\pm$ 5.03		49.36 $\pm$ 6.30		
Median (range)	19.5(12-34)		49(37-66)		

**Table 3: Total Nurse's Practice Regarding Life Threatening Cardiac Arrhythmia throughout Study Phases (n= 50)**

Nurse's Practice	Total Nurse's Practice				MC p
	Pre-Test		Post Test		
	No.	%	No.	%	
Satisfactory level > 80%	6	12.0	47	94.0	<0.001* *
Unsatisfactory level <80%	44	88.0	3	6.0	
Mean $\pm$ SD	44.16 $\pm$ 7.35		78.10 $\pm$ 3.03		
Median (range)	44(29-58)		77(72-84)		

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**Table 4: Total Nurse's Attitudes regarding the Care of Patients with Life Threatening Cardiac Arrhythmia throughout Study Phases (n= 50)**

Attitude	Total score of Nurse's Attitude				MC p
	Pre-Test		Post Test		
	No.	%	No.	%	
Negative $\geq$ 70%	20	40.0	8	16.0	0.017*
Positive > 70%	30	60.0	42	84.0	
Mean $\pm$ SD	38.84 $\pm$ 6.35		41.14 $\pm$ 5.29		
Median (range)	39.50 (29-48)		43 (30-48)		

**Table 5: Relation between Total Scores of Nurse's Knowledge, Attitude and Practice through Post Test Phase (n=50)**

	Post Test Total Nurse's Practice				fp-value
	Satisfactory (n=47)		Unsatisfactory (n=3)		
	No	%	No	%	
Posttest total nurse's knowledge					
Satisfactory (n=35)	35	74.5	0	0.0	0.023*
Unsatisfactory (n=15)	12	25.5	3	100.0	



Posttest total nurse's attitude					
Negative (n=8)	5	10.6	3	100.0	0.003**
Positive (n=42)	42	89.4	0	0.0	

**Table 6: Correlation between Total Scores of Nurse's Knowledge, Attitude and Practice through Post Test Phase (n=50)**

Items		Knowledge	Attitude	Practice
Knowledge				
Attitude	R	0.184		
	p-value	0.202		
Practice	R	0.033	0.341	
	p-value	0.820	0.015*	

\*: statistically significant (p<0.05), r: correlation coefficient

Regarding correlation between total scores of nurse's knowledge, attitude and practice through posttest was represented in table 16. It was revealed that there was statistically significant positive correlation with p. value <0.015 between total scores of nurse's attitude and practice through posttest.

**Table 7: Multiple Linear Regression for Total Practice Level Post Test Phase with different variables in the study**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	89.085	3.389		26.286	.000	82.267	95.903
Post attitude score	0.213	.075	0.373	2.832	0.007**	0.062	0.364
Years of experience	0.432	.200	0.285	2.164	0.036*	0.030	0.834

\*: statistically significant (p<0.05) R-square=0.196, ANOVA: F= 5.737, P=0.006

Variables entered and excluded: age per years, gender, marital status, academic qualifications, training, and post total knowledge level. Table 1, showed that, slightly three quarters of studied nurse's (76%) aged less than 30 years old with mean ± SD (28.32±3.38 year). More than half of studied nurses were female (56%) and more than two third (68%) was married. Majority of studied nurse's had nursing technical institute (84%). Furthermore, less than two third of studied nurse's (60%) have more than five years' experience in intensive care unit. Additionally, about half of studied nurse's (48%) attended ECG training courses. Half of studied nurse's attended these courses were reported benefits from the course. Moreover, all of studied nurse's (100%) need to attend other ECG courses. Table 2, clarified that there was highly statistically significant increase in

total satisfactory nurse's knowledge with Mean± SD 49.36±6.30 in posttest compared to pretest with 20.22±5.03. Also, there was a highly statistically significant difference posttest with P value <0.001. Table 3, displays the total level of studied nurse's practice regarding life threatening cardiac arrhythmia throughout study phases. It was found that there was highly statistically significant total level of satisfactory nurse's practice with p. value p<0.001 in posttest 94% compared to pretest 12%. Table 4, clarified that there was highly statistically significant increase in total satisfactory nurse's attitude with Mean± SD 41.14±5.29 in posttest compared to pretest with 38.84±6.35. Also, there was a highly statistically significant difference posttest with P value 0.017. Relation between total scores of nurse's knowledge, attitude and practice through posttest was demonstrated in table 5. It



was revealed that there was highly significant relation between total level of nurse's knowledge, attitude with P. value 0.023, 0.003 respectively and practice through posttest. Regarding correlation between total scores of nurse's knowledge, attitude and practice through posttest was represented in table 6. It was revealed that there was statistically significant positive correlation with P. value <0.015 between total scores of nurse's attitude and practice through posttest. Regarding multiple linear regression for total practice level posttest; Table 7 showed that, there was positive predictor relation between total practice level with positive attitude score with P value was 0.00 and years of experience with P value was 0.036. Not in relation to age, gender, marital status, academic qualifications, training, and post total knowledge level.

### Discussion

Based on the results three quarters of the studied nurses' their age < 30 years old with Mean  $\pm$ SD 28.32 $\pm$ 3.38. In the same line with Ameen, Maarouf & Khalifa, (2021) in their study in title, "cardiac dysrhythmia interpretation knowledge enhancement nursing protocol" Egypt found that, two third of the studied nurses' their age were less than 30 years old. While inconsistent with Haristian, & Tanrewali, (2021), in their study in title "Nurses' Competencies of ECG Interpretation in Emergency Settings: A Literature Review" showed that, nearly two thirds of the studied nurse  $\geq$  30 years old. The results of the present study showed that more than half of studied nurses were female, related to gender the female gender was more than male due to the long history of the feminine nature of the nursing profession. The present result is consistent with Jacob, (2018), in his thesis in title "Assess the Effect of Planned Teaching Program on Knowledge Regarding Interpretation of Cardiac Arrhythmias and its Management among Staff Nurses' in Selected Hospitals of Pune City" found that, more than half of studied nurses' were female. The present study revealed that less than two third of the studied nurses were had  $\geq$  5 years' experience in ICU. In the same line with Taha, Bayomi & Metwaly, (2021), in their study in title "Effect of Training Program on Nurse's Knowledge and Practices regarding Cardiac Arrhythmias" Egypt found that, more than half of the studied nurses' were had  $\geq$  5 years' experience in ICU. While inconsistent with, Spiva, et; al., (2021), in their study in title "the effectiveness of nurses' ability to interpret basic electrocardiogram

strips accurately using different learning modalities", found that, most of the nurses' had the working experience duration for 1-3 years. Finding of the current study reported that, a delineated higher statistically significant difference between nurse's knowledge levels compared pre and post program phases. However, most of the studied nurses were having an unsatisfactory knowledge level before receiving the designed program. This inadequacy of nurses' knowledge at this critical area preprogram might be related to nurses' exhaustion from increased work load which may hinder their ability to read and update their knowledge. There was improvement in studied nurse's knowledge post program implementation whereas less than three quarters of studied nurses had satisfactory level of knowledge. This improvement might be related to the fact that the majority of studied nurses were young and enthusiastic to learn. In addition, due to the concise presentation of each session using simple language and clear educational methods and instructional media. The finding of this result in the same line with Malk, et; al., (2018), in their study in title "Effect of an Education Program on Nurse's

Performance regarding ECG", reported that, the majority of the study nurses had unsatisfactory level of knowledge preprogram while the majority of studied nurses had satisfactory knowledge level post program regarding ECG, while contraindicated with Rajput, (2015) in his thesis in title "Knowledge of Staff Nurses' Regarding Identification and Management of Cardiac Arrhythmia" found that, near half of the studied nurses had satisfactory knowledge regarding cardiac dysrhythmias. Furthermore, disagree with, Ruhwanya, Tarimo & Ndile, (2018), in their study in title "life threatening arrhythmias: Knowledge and skills among nurses' working in critical care settings at Muhimbili National Hospital, Dar es Salaam, Tanzania" found that, the nearly two third of studied nurses' had satisfactory knowledge regarding life threatening arrhythmia. As regard the total practice of studied nurse's, the present study revealed that, high statistically significant difference between nurse's practice levels compared pre and post program phases. However, the majority of the studied nurses were having an unsatisfactory practice level before receiving the designed program. This inadequacy might be related to poor skills, this could be attributed to lack of nurses' knowledge, which reflects on their practice. But there was improved post program implementation whereas most of





studied nurses had satisfactory level of practice regarding life threatening cardiac arrhythmia. This might be reflecting the positive impact of a training program on improving nurses' practice regarding life threatening cardiac arrhythmia. These findings agreed with Malk, et; al., (2018), reported that most of the studied nurses had unsatisfactory level of practice regarding ECG preprogram but most of the studied nurses had satisfactory level of practice regarding ECG post program implementation. As regard the attitude of studied nurse's, the present study revealed that, high statistically significant difference between nurse's attitudes compared pre and post program phases. However, less than half of the studied nurses were having negative attitude before receiving the designed program. This could be attributed to lack of nurses' knowledge and practice which reflects on their attitude. But there was improved post program implementation whereas the majority of studied nurses had positive attitude regarding care of life-threatening cardiac arrhythmia patients. This might be reflecting the positive impact of a training program on improving nurses' attitude regarding life threatening cardiac arrhythmia. This result disagreed with, Buckley, (2007), in his thesis in title "The Effect of Education and Counselling on Knowledge, Attitudes and Beliefs about Responses to Acute Myocardial Infarction Symptoms" found that, the majority of studied nurses' had positive attitude regarding care of cardiac patients post program. Regarding the relation between total nurses' knowledge, attitude and total level of nurses' practice post program implementation. The current study was revealed that, significant relation between total scores of nurses' knowledge, attitude with p. value (0.023, 0.003) respectively and practice. In the same line with Malk, et; al., (2018), who found that a highly significant positive relation between nurses' knowledge and practice post program implementation. The current study showed that, there was no correlation between nurse's knowledge, practice and attitude in preprogram implementation. This study in the same line with, Bakr, Shehab & El-Zayat, (2020), in their study in title "assessment of nurses' performance regarding care of patients undergoing cardiac catheterization" found that, there were no statistically significant correlation between total nurses' knowledge, practice and attitude scores. While contraindicated with Malk, et; al., (2018), who found that a highly significant positive correlation between nurses' knowledge and practice preprogram

implementation. Furthermore, contraindicated with Jaralnabi, (2017), in his thesis in title "Effect of Education Program on Nurses' Knowledge, Attitude, and Intentions towards Myocardial Infarction Prevention and Treatment" revealed a significant correlation between knowledge and attitudes towards myocardial infarction management. This has explained as a knowledge and its implementation in clinical practice are most valuable for retention and consequently improve studied nurses' attitude. The finding of the current study revealed that, academic qualifications was statistically significant coefficient predictor of total practice level preprogram implementation while the positive attitude score and years of experience was statistically significant positive predictors of total practice level post program implementation. This result agrees with Nagy, Hussein & Taha, (2018), in their study in title "nurses' Knowledge and Practice regarding Advanced Cardiac Life Support" Helwan, Egypt, found that, the academic qualifications positively predictor of total practice level.

### Conclusion

On the light of the current study results, it can be concluded that, there was a statistically significant improvement in nurses' knowledge and practice regarding life threatening cardiac arrhythmias post program compared to preprogram, which reflected then on their attitude. The present study answered about research hypothesis, that the training program had a positive effect on improving nurse's knowledge, practice and attitude regarding life threatening cardiac arrhythmias. 41

### Recommendation

Based on results of the present study the following recommendations can be suggested  
 Continuous evaluation of nurse's knowledge and practice that essential to identify their needs.  
 Nurses attend workshops and conferences to increase their knowledge and skills.  
 Continuous in-service training programs about life threatening cardiac arrhythmias for the purpose of refreshing, updating the nurse's knowledge and practice.  
 An establishing booklet guideline for critical care nurses regarding life threatening cardiac arrhythmia.  
 Further researchers recommended for implementing the educational training program on larger sample selected from different geographical

areas of Egypt to raise the efficiency of nurse's performance regarding life threatening cardiac arrhythmia.

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