

## Effect of Implementing Educational Program on Nurses' performance and Clinical Outcomes for Patients with Acute Infective Endocarditis

Amira Eldsoky Atia<sup>1</sup>, Gehan Abd El-Hakeem Younis<sup>2</sup>, Mai M.Salama<sup>3</sup>, Zeinab Faried Fouad<sup>4</sup>

<sup>1</sup>Bachelor of Nursing, Faculty of Nursing, Tanta University, Egypt.

<sup>2</sup>Assist. Prof. of Critical Care Nursing, Critical Care and Emergency Nursing Department, Faculty of Nursing, Tanta University, Egypt.

<sup>3</sup>Professor of Cardiology, Cardiovascular Department, Faculty of Medicine, Tanta University, Egypt.

<sup>4</sup>Lecturer of Medical Surgical Nursing, Medical Surgical Nursing Department, Faculty of Nursing, Tanta University, Egypt.

### Abstract

**Background:** Infective Endocarditis (IE) is an infection of the endocardia surface of the heart, including the valves. Infective endocarditis (IE) is associated with a broad array of complications and successful treatment of IE relies on microbial eradication by antimicrobial drugs. Surgery contributes by removing infected material and draining abscesses. Nurse's performance plays a role in decreasing morbidity and mortality caused by Infected Endocarditis. **The aim** of this study was to determine the effect of implementing educational program on nurses' performance and clinical outcomes of patients with acute infective endocarditis. **Research design:** A quasi- experimental design was utilized in this study. **Subjects and method:** All nurses (50) from coronary care unit at Educational Hospital Tanta University. **Three tools were used to collect data:** Nurses' Structured Interview Scheduled Sheet to assess socio-demographic characteristics of nurses, structured nurses' knowledge interview questionnaire, nurses' observational checklist about Infected Endocarditis Patients, Acute Infective Endocarditis Patients' Clinical outcomes Assessment Tool: include patients' bio-Sociodemographic Characteristics, Physiological Parameters Assessment Sheet, Self-Reported Pain Assessment and Acute Infective Endocarditis Complications Assessment. **Results:** the present study revealed that there was a significant improvement in the mean scores of the total level of knowledge and practice immediately and one-month post program implementation at  $P < 0.05$ . Less than one third of patient in control group had severe pain on admission and the majority of them had moderate pain after two weeks. **Conclusion:** Based on the findings of the present study, it can be concluded that, most of the studied nurses had high level of knowledge and majority of them had good practice one month after program than pre implementation of educational program. Also there were statistical significant improvements in physiological parameter, level of pain, length of hospital stay and progression of complications of patients in the study group than the control group. **Recommendation for nurses:** upgrading nurses' knowledge about caring of patients with acute infective endocarditis through, encouraging nurses to attend national and international congresses, seminars, symposia and workshops regularly about IE & care of patients with IE. **Recommendation for patient,** early detection of patient with IE by investigations and early treatment to prevent further complications. **Key words:** acute infective endocarditis, educational program, nurses' performance, clinical outcomes.

## Introduction

Infective Endocarditis (IE) is an infection of the endocardia surface of the heart, including the valves<sup>(1)</sup>. Endocarditis is a life-threatening and serious illness, mortality rates are 15% to 20% during the acute phase and 40% within one year<sup>(2-3)</sup>. The incidence of infective endocarditis ranges from one country to another within 3–7.5 / 100,000 person-years and its incidence is reported to be increasing in some parts of the world. The incidence and severity of IE remain unchanged or even increased despite improvements in diagnostic and therapeutic strategies<sup>(4)</sup>.

Few data are available on the characteristics of Infective Endocarditis (IE) cases in Egypt. This Egyptian registry showed high rates of culture-negative IE,

Endocarditis may develop slowly or suddenly. Common signs and symptoms include fever, dyspnea, chest pain, heart murmur, feeling tired, and low red blood cell count<sup>(5)</sup>. Other dermatological signs include osler's nodes and Janeway lesions<sup>(6)</sup>. Infective endocarditis can have a broad spectrum of neurological complications, Neurologic events occur for (20-40)% of all patients, often being the first sign of illness.

Complications of Infective Endocarditis include cardiac complications such as myocardial infarction, pericarditis, cardiac arrhythmia, valvular insufficiency, congestive heart failure, sinus of valsalva aneurysm, aortic root or myocardial abscesses, arterial emboli, infarcts, mycotic aneurysms, and arthritis, myositis<sup>(7)</sup>.

Neurologic complications such as ischemic or hemorrhagic stroke, infected intracranial aneurysm, meningitis, brain abscess, spinal

epidural abscess, encephalopathy, mononeuropathy, and seizure<sup>(8)</sup>.

Renal complications such as renal infarction, glomerulonephritis and acute interstitial nephritis<sup>(9)</sup>. Pulmonary complications such as respiratory insufficiency, destructive pneumonias, pneumonia, pleurisy, hydrothorax, lung abscess, pulmonary emboli or pneumonia are common complications of IE in intravenous drug users. Complications related to systemic infection including embolization, metastatic infection, and mycotic aneurysm<sup>(10)</sup>.

The diagnosis of Infective Endocarditis including history of intravenous drug use or structural heart disease, or a heart murmur found by auscultation on physical examination, laboratory tests include white-blood-cell count, C-reactive protein (CRP) level, erythrocyte sedimentation rate and vegetations detected by transthoracic echocardiography (TTE) or transesophageal echocardiography (TEE), and blood-culture results<sup>(11,12)</sup>.

Successful treatment of IE relies on microbial eradication by antimicrobial drugs. Surgery contributes by removing infected material and draining abscesses<sup>(13)</sup>. Cardiac surgery is required in more than 50% of patients with active infective endocarditis during the hospital course. Early surgery is indicated for management of progressive heart failure (HF) to avoid irreversible structural damage caused by severe infection and prevention of embolic events in complicated IE<sup>(14)</sup>.

Nurses play an important role in monitoring, supporting, investigating, and educating patients<sup>(15)</sup>. Contemporary approaches to the diagnosis and treatment of IE have

revolutionized the role of the coronary care nurse (CCN). Today's CCN intimately works with the physician and other health technical personnel to help stabilize patients initially by life- saving interventions for dyspnea and fever. In the process, the nurse observes patient progress and complications' occurrence and alerts others to its presence, identifies complications of antibiotics and anti-coagulant therapy<sup>(16)</sup>.

Continually check the patient's SpO<sub>2</sub>. Monitor him for a worsened or returning fever and assess for signs and symptoms of heart failure, such as dyspnea, orthopnea, and crackles. Also perform multisystem assessments to identify systemic embolization that may occur in the brain, spleen, bowel, extremities, or kidneys<sup>(17)</sup>.

### **Aim of the Study**

The aim of this study was to:-

Evaluate the effect of implementing educational program on nurses' performance and clinical outcomes of patients with acute infective endocarditis.

### **Hypothesis**

Nurses who receive educational program will exhibit improvement in their knowledge and practice mean score.

Acute infective endocarditis patients' clinical outcomes are expected to be improved after implementing of educational program.

### **Subjects**

**Research design:** a quasi-experimental research design was utilized.

**Setting:** this study was conducted at Coronary Care Unit at Educational International Hospital at Tanta University.

### **Subjects**

**The sample of the study was consisted of**

all nurses (50) who are working in the previously mentioned settings who are caring for acute infective endocarditis patients regardless of their years of experience, level of education and their ages.

A convenience sample of forty (40) adult patients with acute infective endocarditis in the previously mentioned setting at Tanta university hospital fulfilling the inclusion criteria was selected. The sample size was calculated based on Epi-info program according to the total population admitted to coronary Care Units yearly (100 patients admitted per year). The sample was divided into two equal groups 20 patients in each as follow:

**Group 1:- Control Group** consisted of 20 patients with infective endocarditis fulfilling the inclusive criteria and they were received their routine nursing care.

**Group 2:- Study Group** consisted of 20 patients with infective endocarditis fulfilling the inclusive criteria to quantify their clinical outcomes and they were received their protocol of nursing interventions and hospital routine by hospital nursing staff after implementation of educational program by the researcher.

### **Inclusion criteria**

The subjects were selected according to the following criteria:

Adult patients, of both sexes, diagnosed with acute infective endocarditis, newly admitted, conscious, able to communicate and participate, free from any other associated disorders as stroke, heart or renal failure, septic deep venous thrombosis or other systemic infection.

### **Tools of data collection**

Three tools were used in this study:-

**Tool (I): Structured Interview Schedule:** <sup>(6,13)</sup> it was including the following parts

**Part (1): Socio-demographic Characteristics of Nurses,** such as nurses' age, sex, marital status, years of experience in CCU, years of experience in other department, level of education and previous training about care of patients with acute infective endocarditis.

**Part (2): Coronary Care nurses' Knowledge Questionnaire regarding Acute Infective Endocarditis** <sup>(6,13)</sup> to assess nurses' knowledge related to simple anatomy of heart, acute infective endocarditis (definition, types, causes, risk factors, clinical manifestations, diagnostic and lab investigations, management and complications).

**Tool (II): Coronary Care nurses' practice Observational Checklist** <sup>(14-15)</sup> to assess the actual nursing practice provided for acute infective endocarditis patients before and after implementation of educational program that included using of different nursing measures to decrease body temperature, relieve dyspnea, measures for safe medication administration, and nursing preventive measures for complications as deep venous thrombosis, systemic infection and other complications.

**Tool (III): Acute Infective Endocarditis Patients' Clinical outcomes Assessment Tool** <sup>(16,17)</sup> it included the following parts:-

**Part (1) patients' Bio-Sociodemographic Characteristics:** This part included, patient's age, sex, marital status, educational level, duration of hospitalization, past and present medical history, family history, history of invasive procedures, cause of infective endocarditis, history of dental procedures, and clinical manifestations on admission.

**Part (2) Self-Reported Pain Assessment**

Visual analogue scale was used to measure severity of pain. It is a horizontal line, 10 cm in length, the patient marked on the line the point that they felt represents their perception of their current state. The amount of pain that a patient felt ranges across a continuum from none to an extreme amount of pain.

**The study was accomplished through the following steps**

An official permission for data collection was obtained from the Faculty of Nursing and was submitted to responsible authorities of the selected settings for permission to carry out the study.

Ethical and legal consideration: ethical committee of the faculty of nursing at Tanta University approval was obtained. Nature of the study didn't cause any harm or pain to the entire subjects. Confidentiality and privacy was taken into consideration regarding data collection. Patient's and nurses' written informed consent to participate in this study was obtained after explaining the aim of the study.

Tools of the study were developed by the researcher after reviewing recent related literature.

**Tool development:** Four tools with all predetermined parts were developed by the researcher.

**Tool validity:** The content validity of the developed tools was tested for clarity and applicability by seven experts in Critical Care Nursing and Biostatistics to ensure their validity and modifications was done. Reliability of the developed tools (I-III) were done by using appropriate test analysis. Reliability of tool IV part (3) was 0.90. A pilot study was carried out on 10% of the study sample from the previously mentioned setting

to test the feasibility and applicability of the tools. Pilot study was excluded from the study sample. **Duration of data collection:** - Data collections took in over 6 months.

**This study was conducted on four phases:-**

#### **Phase 1:-Assessment phase**

It was carried out by the researcher to collect data by using tools (I, II) to assess nurses' knowledge and practice regarding acute infective endocarditis care. The researcher met each nurse individually to answer the knowledge questionnaire sheet. Also, the researcher observed each nurse individually during her work in morning and afternoon shift during the daily work in CCU to assess their practice.

Also during this phase, the researcher full the patient assessment sheet (tool III (part 1, 2,3) from the patients' medical record. Tool III part 4 was used by the research before implementation of educational program to assess infective endocarditis related complications.

#### **Phase 2:-Planning phase**

Acute infective endocarditis educational program was planned according to nurses' educational needs assessment and based on literature review

#### **Phase 3:-Implementation phase**

Educational program was implemented by the researcher for nurses using interactive lectures, video presentations, and booklet. The researcher implemented the educational program for all study nurses as the following:

**For theoretical part:** two sessions was used for two consecutive days 30 minutes for each one.

**First session:** Focused on simple information about anatomy of the heart and knowledge about acute infective endocarditis (definition,

types, risk factors, causes and clinical manifestations).

**Second session:** Focused on common laboratory investigations, diagnostic procedures and complications of acute infective endocarditis.

**For practical part:** Two sessions was used for two consecutive days 30 minutes for each one.

**First session:** Focused on: Providing life-saving emergency nursing care, nursing measures to reduce dyspnea, emergency nursing measures to reduce fever, safety practice during medication administration

**Second session:** Focused on: nursing measures for immobilization, nursing measures for systematic embolism, preventive nursing practice to reduce complications of infective endocarditis (IE), nursing measures to prevent deep vein thrombosis

#### **4. Evaluation phase**

Nurses' knowledge and practice was evaluated by the researcher before, immediately and one month after implementation of educational program by using tool (I ) part (2) and tool (II). Also, the researcher used tool III to evaluate critically ill patient's clinical outcomes before and after implementation of educational program. A comparison between pre and post educational program had done to determine effect of implementing educational program.

#### **Statistical analysis:**

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 26. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison was done using Chi-square test ( $\chi^2$ ). For comparison between

means of two variables in a group, paired samples t-test was used. For comparison between means for variables during three periods of intervention in a group, or for more than two variables, the F-value of analysis of variance (ANOVA) was calculated.

Correlation between variables was evaluated using Pearson and Spearman's correlation coefficient  $r$ . A significance was adopted at  $P < 0.05$  for interpretation of results of tests of significance (\*). Also, a highly significance was adopted at  $P < 0.01$  for interpretation of results of tests of significance <sup>(24)</sup>.

### Results

**Table (1) Distribution of the studied nurses regarding their socio demographic characteristics** illustrates that the most (78%) of the total nurse were in the age group from (21-<30) years. Regarding gender and marital status, about two-third (62%, 66%) of the studied nurses were female and married respectively. Moreover, the table illustrates that less than two third (60%) of the studied nurses had technical institute.

In addition, two third (66%) of the studied nurses had years of experience in CCU from 5-10 years. All (100%) of sample had not previous training about acute infective endocarditis patient care.

**Table (2) Total means scores of knowledge domains of the studied nurses regarding acute infective endocarditis throughout periods of study.** In this table, significant differences were observed in the mean score of nurses 'knowledge, in relation to anatomy of the heart, acute infective endocarditis (definition, types, causes, risk factors, clinical manifestation, diagnosis and lab investigation, immediate nursing care in acute phase of endocarditis) and complications throughout

periods of the study ( $P = 0.000^*$ ). Also, it was observed that the mean score increased immediately after program compared to preprogram and decreased gradually after 1 month of the study.

**Table (3) Total means scores of nurses' practice related Infective Endocarditis throughout periods of study.** In this table, significant differences were observed in the mean score of nursing measures before dealing with patient, nursing measures to reduce fever, dyspnea, pain, safety practice during medication administration, and nursing measures to prevent Deep vein thrombosis with ( $P = 0.000^*$ ) throughout periods of the study. Also it was observed that the mean score increased immediately after program compared to preprogram and decreased gradually after 1 month of the study where  $P = 0.047^*$ .

**Table (4) Correlation between total knowledge level of the studied nurses and their practice level throughout periods of study** in this table, positive correlation was observed between total knowledge level and total practice level, both immediately and one month after session with  $r$  (0.549 ,0.444) and  $P = (0.000 ,0.001)$  respectively.

**Table (5) Distribution of the studied patients regarding their sociodemographic characteristics** in relation to age, less than half (40%) of the control group were in the age group from (30-<40) years and more than one third (35%) of the study group were in the age group from (21-<30) years. **Regarding to gender and marital status**, less than two-thirds (65%) and more than half (55%) of the control group and more than two-thirds (75%) and half (50%) of the study group were male and married respectively.

**Regarding educational level**, less than half (40%) of the control group and less than third-quarter (70%) in the study group had secondary education. In addition, the majority (85%) of control group and more than two-third (70%) of the study patient stayed in the hospital  $\geq 15$  days.

**Table (6) Distribution of the studied patients in relation to severity of pain among the studied groups pre and post intervention.** In this table, it was observed that less than one third (30%) of patient in the control group had severe pain on admission

and the majority (90%) of them had moderate pain after two weeks with  $P= 0.014$ , on the other hand, the majority (90%) of the study group had mild pain after two weeks of implementation of educational program with  $P= 0.000$ .

The mean score of pain in the control group was  $6.25 \pm 0.55$  on admission compared to  $4.10 \pm 0.53$  after two weeks, while, the mean score of pain in the study group was  $6.25 \pm 0.786$  on admission and was improved and decreased to  $2.55 \pm 0.510$  after two weeks.

**Table (1): Distribution of the studied nurses regarding their sociodemographic characteristics.**

Characteristics	The studied nurses (n=50)	
	N	%
<b>Age (in years)</b>		
▪ (21-<30)	39	78.0
▪ (30-<40)	9	18.0
▪ (40-<50)	2	4.0
<b>Range</b>	<b>(21-45)</b>	
<b>Mean <math>\pm</math> SD</b>	<b>27.94<math>\pm</math>4.410</b>	
<b>Gender</b>		
▪ Male	19	38.0
▪ Female	31	62.0
<b>Marital status</b>		
▪ Single	16	32.0
▪ Married	33	66.0
▪ Divorced	1	2.0
<b>Educational level</b>		
▪ Diplome	1	2.0
▪ Technical institute	30	60.0
▪ Bachelor	18	36.0
▪ Post studies	1	2.0

<b>Experience in CCU (in years)</b>		
▪ <5	16	32.0
▪ (5-<10)	33	66.0
▪ ≥10	1	2.0
<b>Range</b>	<b>(1-12)</b>	
<b>Mean ± SD</b>	<b>5.40±2.907</b>	
<b>Experience in general (in years)</b>		
▪ 0	49	98.0
▪ 6	1	2.0
<b>Previous training about care for patient with acute infective endocarditis</b>		
▪ No	50	100.0

**Table (2): Total mean scores of the knowledge domains of the studied nurses regarding acute infective endocarditis throughout periods of study.**

Domains	The studied nurses (n=50)			F P
	Pre	Immediate	Post 1 month	
1) Anatomy of the heart	(3-10) 5.58±2.001	(6-10) 9.64±0.802	(7-10) 9.26±1.065	<b>130.44</b> <b>0.000*</b>
2) Acute infective endocarditis definition, types, causes and risk factors	(2-13) 7.12±2.076	(11-16) 14.66±1.118	(9-15) 12.14±1.325	<b>302.05</b> <b>0.000*</b>
3) Clinical manifestation, diagnosis and lab investigation	(0-5) 0.56±1.264	(10-12) 11.36±0.851	(10-12) 11.30±0.814	<b>194.97</b> <b>0.000*</b>
4) Immediate nursing care in acute phase of endocarditis	(0-7) 4.22±1.475	(5-8) 6.78±0.864	(5-8) 6.70±0.735	<b>91.77</b> <b>0.000*</b>
5) Complications	(0-6) 2.22±0.864	(7-10) 8.54±0.930	(5-10) 7.38±1.354	<b>192.91</b> <b>0.000*</b>
<b>Total knowledge score</b>	<b>(11-27)</b> <b>19.70±3.352</b>	<b>(46-56)</b> <b>50.98±2.559</b>	<b>(40-53)</b> <b>46.78±3.576</b>	<b>141.17</b> <b>0.000*</b>

\* Significant at level  $P < 0.05$



**Table (3): Total means scores of nurse's practice related Infective Endocarditis throughout periods of study.**

Practice domains	The studied nurses (n=50)			F P
	Range Mean ± SD			
	Pre	Immediate	Post 1 month	
1. Nursing measures before dealing with patient	(2-5) 3.98±0.428	(4-5) 4.98±0.141	(4-5) 4.64±0.485	<b>88.46</b> <b>0.000*</b>
2. Immediate nursing intervention after admission	(9-10) 9.94±0.240	(10-10) 10.00±0.000	(10-10) 10.00±0.000	<b>13.12</b> <b>0.047*</b>
3. Nursing measures to reduce fever	(3-8) 6.04±1.124	(8-10) 9.50±0.580	(8-9) 8.30±0.463	<b>255.12</b> <b>0.000*</b>
4. Nursing measures to reduce dyspnea	(2-5) 2.94±0.793	(6-9) 8.16±0.766	(5-7) 6.32±0.587	<b>674.18</b> <b>0.000*</b>
5. Nursing measures to relieve pain	(1-4) 2.80±0.756	(5-7) 6.46±0.542	(4-6) 5.24±0.476	<b>476.76</b> <b>0.000*</b>
6. safety practice during medication administration	(8-11) 9.92±0.922	(14-16) 15.04±0.638	(12-14) 13.02±0.589	<b>622.08</b> <b>0.000*</b>
7. Nursing measures to prevent deep vein thrombosis	(1-4) 1.64±0.749	(6-9) 8.22±0.864	(6-8) 6.76±0.591	<b>108.54</b> <b>0.000*</b>
<b>Total practice score</b>	<b>(30-42)</b> <b>37.26±2.805</b>	<b>(59-66)</b> <b>62.36±2.546</b>	<b>(51-57)</b> <b>54.28±1.773</b>	<b>147.56</b> <b>0.000*</b>

\* Significant at level P&lt;0.05

**Table (4): Correlation between total knowledge and practice level of the studied nurses throughout periods of study.**

Total knowledge level	The studied nurses (n=50)				$\chi^2$ P
	Total practice level				
	Unsatisfactory		Satisfactory		
	N	%	N	%	
<b>Pre</b>					
- Low	50	100.0	0	0.0	-
<b>r , P</b>	0.182 206				
<b>Immediate</b>					
- High	0	0.0	50	100.0	-
<b>r , P</b>	<b>0.549</b> <b>.000**</b>				

<b>Post one month</b>					
- Moderate	0	0.0	14	28.0	<b>FE</b> <b>0.047*</b>
- High	9	18.0	27	54.0	
<b>r , P</b>	<b>0.444 , 0.001**</b>				

r: Pearson / Spearman' correlation coefficient

\* Significant at level P&lt;0.05

\*\* Highly significant at level P&lt;0.01

**Table (5): Distribution of the studied patients regarding their sociodemographic characteristics.**

Characteristics	The studied patients (n=40)				$\chi^2$ P
	Control group (n=20)		Study group (n=20)		
	N	%	N	%	
<b>Age (in years)</b>					
▪ (21-<30)	4	20.0	7	<b>35.0</b>	2.577 0.462
▪ (30-<40)	8	<b>40.0</b>	5	25.0	
▪ (40-<50)	6	30.0	4	20.0	
▪ (50-60)	2	10.0	4	20.0	
<b>Range</b>	<b>(28-55)</b>		<b>(22-52)</b>		t=0.269
<b>Mean ± SD</b>	<b>37.80±7.592</b>		<b>36.35±9.928</b>		P=0.607
<b>Gender</b>					
▪ Male	13	<b>65.0</b>	15	<b>75.0</b>	FE 0.731
▪ Female	7	35.0	5	25.0	
<b>Marital status</b>					
▪ Married	11	<b>55.0</b>	10	<b>50.0</b>	0.106 0.948
▪ Single	8	40.0	9	45.0	
▪ Widow	1	5.0	1	5.0	
<b>Educational level</b>					
▪ Illiterate	2	10.0	0	0.0	4.703 0.195
▪ Read and write	4	20.0	2	10.0	
▪ Secondary school	8	<b>40.0</b>	14	<b>70.0</b>	
▪ University	6	30.0	4	20.0	
<b>Duration of stay in the hospital (in days)</b>					
▪ (5-<10)	0	0.0	3	15.0	3.290 0.193
▪ (10-<15)	3	15.0	3	15.0	
▪ ≥15	17	<b>85.0</b>	14	<b>70.0</b>	
<b>Range</b>	<b>(10-30)</b>		<b>(5-35)</b>		t=0.287
<b>Mean ± SD</b>	<b>19.20±5.248</b>		<b>18.00±8.535</b>		P=0.595

FE: Fisher's Exact test

**Table (6): Distribution of the studied patients in relation to severity of pain among the studied groups pre and post intervention.**

Pain level	The studied patients (n=40)									
	Control group (n=20)				$\chi^2$ P	Study group (n=20)				$\chi^2$ P
	On Admission		Post 2 weeks			On admission		Post 2 weeks		
	N	%	N	%		N	%	N	%	
▪ Mild	0	0.0	2	10.0	8.501 0.014*	0	0.0	20	100.0	40.00 0.000*
▪ Moderate	14	70.0	18	90.0		11	55.0	0	0.0	
▪ Severe	6	30.0	0	0.0		9	45.0	0	0.0	
<b>Range</b>	<b>(5-7)</b>		<b>(3-5)</b>		<b>t=12.33</b>	<b>(5-7)</b>		<b>(2-3)</b>		<b>F=17.65</b>
<b>Mean ± SD</b>	<b>6.25±0.55</b>		<b>4.10±0.53</b>		<b>P=0.000*</b>	<b>6.25±0.78</b>		<b>2.55±0.51</b>		<b>P=0.000*</b>

(0) No pain    (1-3) Mild pain    (4-6) Moderate pain    (7-10) Severe pain

### Discussion

Infective Endocarditis (IE) is an infection of the endocardial surface of the heart, including the valves<sup>(1)</sup>. Infective Endocarditis (IE) is a life-threatening serious illness and may develop slowly or suddenly<sup>(2)</sup>. regarding the findings of sociodemographic characteristics of the studied nurses; the finding of the present study revealed that more than two third of the total nurses in the age group from (21-<30) years. In this regard, this finding is justified that new graduate nurses were appointed to work in CCU unit. Because this age considered the effective time to learn and modify their practice through training and education to improve the sense of identity and develop successful intimate relations. This finding was matched with **Kendrea et al (2021)**<sup>(18)</sup>, who found that most of the studied nurses were <30years old. Also, this finding was similar with **Elana et al (2016)**<sup>(19)</sup>, who stated that the predominant age group of the studied nurses was between 20-30 years old,

on the other hand this finding was in contrast with **E Havers et al (2018)**<sup>(20)</sup>, who reported that two-thirds of the studied subjects were more than 30 years.

**Regarding sex**, the findings of the present study showed that the majority of the studied nurses were female, this due to the female are dominant for this occupation and a little number of men occupying this job in Egypt. This result was in line with **Ian et al (2022)**<sup>(21)</sup>, who found that the majority of the studied sample was female. Also, this finding was accepted with **Olufolahan et al (2018)**<sup>(22)</sup>, who found that near two-thirds of nurses were females. On the other hand, this finding was contraindicated with **Rajiv et al (2012)**<sup>(23)</sup>, who mentioned that most of the professional nurses were male.

**As regards marital status** the majority of the studied nurses were married. From the researcher's point of view, this might because most of the studied sample ranged between 21-30 years old. This result was in line with

**Kanksha et al (2019)** <sup>(24)</sup>, who reported that about two-thirds of the studied nurses were married. Also, this finding was similar to **Ying Chen et al (2022)** <sup>(25)</sup>, who delineate that the majority of the studied nurses were married.

**Concerning educational level**, the result of the current study showed that more than half were nursing technicians. This finding was matched with **Aniket et al (2019)** <sup>(26)</sup>, in a study entitled “The Full Spectrum of Infective Endocarditis” who found that the highest percentage of studied nurses was graduated from nursing institutes. This result was contradicted with **Soumik et al (2014)** <sup>(27)</sup>, who concluded that most of the studied sample had bachelor degree.

**As regard years of experience in the CCU unit**, the findings of the current study illustrated that the highest proportion of the studied nurses had experienced (5-<10) years. This finding was in line with **Ranjan et al (2015)** <sup>(28)</sup>, who revealed that most of the studied sample was more than 10 years of experience. Also, this finding was in similar with **Xiao et al (2015)** <sup>(29)</sup>, who reported that the majority of the studied nurses had more than 10 years of experience.

**Concerning the acquisition of knowledge domains** of the studied nurses regarding acute Infective Endocarditis throughout periods of study, it was observed that the mean score increased immediately after program compared to pre-program and decreased gradually after 1 month of the study. This finding was in line with **Muhannad et al (2020)** <sup>(30)</sup>, who showed that increase nurses score after training course, on the other hand, this finding was contraindicated with **De Silva et al (2014)** <sup>(31)</sup>, and **Tan et al (2021)** <sup>(32)</sup>, who

showed that most of the studied sample did not attend any program.

Additionally, implementation of the educational program led to significant improvements in nurses' knowledge with a good level of knowledge immediately and one-month post-program implementation. Also, this finding showed that the educational program had a good impact on improving nurses' knowledge, which could be due to the concise presentation of each session using simple Arabic language, clear educational methods, instructional media, and the availability of researcher in the field for more clarification, and frequent repetition to fix the knowledge. The study was in line with **Dylan et al (2021)** <sup>(33)</sup>, who showed that the educational program improves nurses' knowledge and performance, but this finding disagreed with **David et al (2015)** <sup>(34)</sup>, who revealed that critical care nurses perceive various barriers to successfully implementing evidence-based emergency interventions for critically ill patients, as well as the educational needs necessary to overcome such challenges.

**Regarding the acquisition of nursing performance**, the current study showed that that none of nurses had good practice scores about acute Infective Endocarditis in the pre-test, while the majority of nurses had good practice score immediately and after one month of program respectively. A statically significant difference was observed in the score of total nurses ‘practice before, immediately and after one month of program. These results were congruent with **Bshara et al (2016)** <sup>(35)</sup>, in a study entitled “A Case of Infective Endocarditis and Pulmonary Septic Emboli Caused by *Lactococcus lactis*”, who noticed that the nurses in the acute and

Emergency Department nurses had unsatisfactory practical about initial management for acute infective cases. Also, a study done by **K.Taniguchi et al (2016)**<sup>(36)</sup>, entitled “Sudden infant death due to Lactococcal infective endocarditis” revealed that continuing professional development programs, which aim to enhance health professionals’ practice and improve patient outcomes. This result was supported by **Susanna et al (2021)**<sup>(37)</sup>, who reported that the application of the guiding program has a positive effect to improve the practice of the studied sample. As well, this finding was similar with **Mary et al (2022)**<sup>(38)</sup>, who conducted a study to determine the impact of the educational program on nurses. Also, this finding was in accordance with **Kendrea et al (2021)**<sup>(18)</sup>, who reported a continuous need for educational sessions about IE to improve care delivery and improve patient outcomes.

**Regarding duration of stay in the hospital**, the majority of control group and more than two-third of study group stayed in the hospital 15 days or more this may be due to the long course of treatment, this study was in line with **Van J. et al (2021)**<sup>(39)</sup>, who reported that intravenous antibiotic endocarditis using a standardized protocol is effective in reduced length of hospital stay for endocarditis.

**Regarding severity of pain**, all patients among study group post two weeks from admission had mild pain level compared with the majority of control group had moderate pain after two weeks from admission . This study is in line with **Aaron et al (2021)**<sup>(41)</sup>, who revealed that symptoms that localize to the cardiopulmonary system occur less commonly for underlying aortic or mitral valve insufficiency. Also, this finding was

similar with **Gilbert et al (2015)**<sup>(40)</sup>, who reported that atypical chest pain presentation is common in immune compromised patients. Also, this study in line with **Kenji et al (2016)**<sup>(42)</sup>, reported that a 43-year-old presented with severe pain and a body temperature of 38°C.

### **Conclusion**

Based on the findings of the present study, it can be concluded that, most of the studied nurses had high level of knowledge and majority of them had good practice one month after program than pre implementation of educational program.

There were statistical significant improvement in physiological parameter, level of pain, length of hospital stay and progression of complications of patients in the study group than the control group.

### **Recommendation**

**Based on the finding of the current study, it can be recommended that:**  
**Recommendation for nurses:**

Upgrading nurses' knowledge about caring of patients with acute infective endocarditis through:

Encouraging nurses to attend national and international congresses, seminars, symposia and workshops regularly about IE & care of patients with IE. Regular continuous in-service educational program plan about IE & its management should be designed to nurses working in CCU at least every six months for enhancing nurses' knowledge and practice to achieve high quality of care.

### **Recommendation for patient**

Early detection of patient with IE by investigations and early treatment to prevent further complications.

### **Recommendation for further studies**

Studying the impact of educational programs on IE continuously using a wide probability sample in different areas to monitor improvement in nurses' performance and points of weakness for developing more educational program to nurses dealing with patients with IE.

### References

1. Urden L, Stacy K, Lough M. Critical care nursing book. Diagnosis and management. 8th ed. California. Mosby.2018; 2: 328-56.
2. Thuny F, Giorgi R, Habachi R, Ansaldi S, Le Dolley Y, Casalta JP. Excess mortality and morbidity in patients surviving infective endocarditis. *Am Heart J.* 2012; 164:94-101.
3. Gomes A, Paul P. Imaging infective endocarditis: Adherence to a diagnostic flowchart and direct comparison of imaging techniques. *Nuclear Cardiology J.* 2020; 27: 592–608.
4. Habib G, Anna P, Iung B. Clinical presentation, etiology and outcome of infective endocarditis. Results of the ESC-EORP EURO-ENDO(European infective endocarditis) registry: a prospective cohort study. *European Heart J.* 2019; 40( 3): 3222-32.
5. Rizk A. Clinical features and outcomes of infective endocarditis in Egypt: an 11-year experience at a tertiary care facility. *The Egyptian Heart J.* 2019; 71:17
6. Sadaka M, ElSharkawy E, Soliman M. Study of infective endocarditis in Alexandria main university hospitals. *The Egyptian Heart J.* 2013;65, 307–17.
7. Alexandru C. Clinical and epidemiological features of infective endocarditis: an observational retrospective study. *Acta Medica Marisiensis.* 2019; 65: 1-10.
8. Tomaz R. Dermatologic manifestations of infective endocarditis. *An. Bras. Dermatol.* 2016. 91; 5:85-92.
9. Dumitrescu C, Badea A, Ioana P. neurologic manifestations of infective endocarditis. *Internal Medicine J.* 2019; 3 :63-68.
10. Spelman D. Complications and outcome of infective endocarditis. 2018 Dec; 6(6): 139–141.
11. Cahill T, Prendergast B. Infective endocarditis. *Lancet.* 2016; 387: 882-93.
12. Marie C Neurologic Complications of Infective Endocarditis: A Joint Model for a Septic Thromboembolism and Inflammatory Small Vessel Disease. *Critical Care Medicine.* 2019; 47 (8): 685-92.
13. Daniel J and Spelman D .Current best practices and guidelines. Assessment and management of complications in infective endocarditis. *Cardiol Clin J.*2003; 21:273-82.
14. David T .Approach to diagnosis of infective endocarditis. *Clin Microbiol Infect J.* 2008; 4: 33-39
15. Jingush N, Iwata M, Terasawa T. Clinical features of patients with infective endocarditis presenting to the emergency department: a retrospective case series. *Nagoya J Med Sci.* 2017; 79(4): 467–76.
16. Fiore A, Mazzola A and Grand A. Operative Techniques and Recent Advances in Acute Care and Emergency Surgery. *Emergency Management of Infective Endocarditis.* 8th ed. California. Mosby.2019; 2: 603-14.

17. Gulanick M and Myers L. Nursing care plans. 7th ed. United States of America. Elsevier Mosby. 2011; 209-10.
18. Todt K., The Lived Experience of Nurses Caring for Patients Diagnosed With Intravenous Drug Use–Associated Infective Endocarditis in Appalachia: A Phenomenological Study,2020,5,1-195.
19. Rosenthal E., Karchmer A., Toupal J., Castillo R., Rowley C., Suboptimal Addiction Interventions for Patients Hospitalized with Injection Drug Use-Associated Infective Endocarditis, The American Journal of Medicine, May 2016, 129, 5, 481-85.
20. Borgersen E., Fosboel E., Roerth R., Kragholm K., Oestergaard L., Aslam M., Infective endocarditis is associated with an increased risk of nursing home admission and initiation of domiciliary care. European Heart Journal, August2018,39,1, 563.P3534.
21. Lancaster I., Patel D., Tamboli C., ChunP., Sethi V., Namey J, Abiotrophia defectiva Infective Endocarditis. Mar,2022, 7050-69.
22. Carrena O., Oluoha O., Wahba A., Eshun D., Endsley M., Okafor H., Complicated Infective Endocarditis. Limited to a Chiari Network, National Library Of Medicine, 2018 ;, 3837-825.
23. Ananthakrishna R., Shankarappa R., Jagadeesan N., Math R., Karur S., Nanjappa M., Infective Endocarditis: A Rare Organism in an Uncommon Setting, 2012;: 307852.
24. Peddi K., Hsu A., Ayala2 T., Infective Aortic Valve Endocarditis Causing Embolic Consecutive ST-Elevation Myocardial Infarctions. 2019,2487616.
25. Chen Y., Liu J., Qiao T., Xie M., Cai Z., Zhou J., Prognostic Value of a Novel Parameter in Patients with Infective Endocarditis, BioMed Research International J, 2022;:,1042780.
26. Rali A., Al-Kofahi M., Patel N., Wiele B., Shah Z., Nath J., The Full Spectrum of Infective Endocarditis ,2019;7257401.
27. Ghosh S., Sahoo R., Nath R., Duggal N., Gadpayle A., A Study of Clinical, Microbiological, and Echocardiographic Profile of Patients of Infective Endocarditis, 2014 ;, 340601.
28. Ranjan R., Lawrence T., Cardiac Tamponade following Mitral Valve Replacement for Active Infective Endocarditis with Ring Abscess.;2015,790213.
29. Huang X., He J., Qu W., Tian D., A Case of Sub acute Combined Degeneration of the Spinal Cord with Infective Endocarditis. 2015 ; 327046.
30. Antoun M., Hattab Y., Al Akhrass F., Hamilton L., Uncommon Pathogen, Lactobacillus, Causing Infective Endocarditis. 2020 ; 8833948.
31. Silva A., Stephens T., Welch J., Sigera C., Alwis S., Athapattu P., Dharmagunawardene D., Olupeliyawa A., Abrew A., peiris I., Siriwardana S., Nursing intensive care skills training: A nurse led, short, structured, and practical training program, developed and tested in a resource-limited setting. J of Critical Care, 2015; 30(2):438-7.
32. Le T., Graham N., Naeem A., Clemence J., Caceres J., et al., Aortic valve endocarditis in patients with bicuspid and

- tricuspid aortic valves. December 2021, 8,1, 228-36.
33. Rajaratnam D., Rajaratnam R., Outpatient Antimicrobial Therapy for Infective Endocarditis is Safe. *Heart, Lung and Circulation*, February 2021,30, 2, 207-15.
  34. Lash D., Joson J., Heidari A., Differences in Method-Specific Vancomycin MICs and Induced Daptomycin Resistance in an Infective Endocarditis Patient. 2015; 175810.
  35. Mansour B., Habib A., Asli N., Geffen Y., Miron D., Elias N., A Case of Infective Endocarditis and Pulmonary Septic Emboli Caused by *Lactococcus lactis*. 2016 ; 1024054.
  36. Taniguchi K., Nakayama M., Nakahira K., Kanagawa N., Yanagihara I., Miyaishi S., Sudden infant death due to Lactococcal infective endocarditis. *Legal Medicine*, March 2016, 19, 1, 107-111.
  37. Cooper S., Westaby J., Griffin K., Sheppard M. The role of endocarditis in sudden cardiac death: highlighting the value of the autopsy, pathological features and cardiac complications, *Cardiovascular Pathology*, February 2021 50, 107292. doi: 10.1016.
  38. Sheppard M., Infective endocarditis. *Diagnostic Histopathology*, April 2022,28, 4, 199-208.
  39. Ramshorst V., Duffels M., Schaap A., Drexhage O., Walburg S., de Beij J., et al., Connected care for endocarditis and heart failure patients a hospital-at-home programme. *Netherlands Heart Journal*, 2022, 30, 1,319–27.
  40. Habib G, Hoen B, Tornos P, Thuny F, Prendergast B, Vilacosta I. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC) Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J*. 2015.36 (44); 2369-413.
  41. Yallowitz A., Decker L., Infectious Endocarditis. Treasure Island (FL), NCBI Bookshelf , 2022 Jan, PMID: 32491573.
  42. Mizokami K., Gotoh M., Mitsui Y., Yoshikawa I., Uryu T., Shirahama M., Okawa T., Higuchi F., Shiba N., Infective Endocarditis Presenting as Right Shoulder Pain: A Case Report, *Kurume Med J*,2016;62(1-2):33-6,doi: 10.2739.