

## Effect of Educational Guidelines on the Level of Knowledge and Practice of Patients Undergoing Cardiac Catheterization

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**Abstract: Background:** Coronary artery diseases (CAD) are the most common type of heart disease. Patients undergoing CC, can be extremely intimidating, adequate knowledge and practice about the procedure is critical. Benefit of knowledge and practice acquisition, enhanced self-care, reduced anxiety, increased satisfaction with care and improved pain.

**Aim of the study:** The aim of the present study is to determine the effect of educational guidelines on the level of knowledge and practice of patients undergoing cardiac catheterization.

**Research methods:** A quasi-experimental design was used in this study. And it was conducted at the Cardiac Catheterization Unit, affiliated to Suez Canal University Hospitals in Ismailia. A random sample of 100 patients undergoing cardiac catheterization, were assigned. Three tools were used. Tool one: Patients' Interview questionnaire was used to assess patients' knowledge designed by the researcher based on relevant literature review. Tool two: Patient's observational checklists were used to assess patients' practice adapted by the researchers based on relevant literature review. Tool three: Patients' questionnaire satisfaction questionnaire tool was used to assess patients' satisfaction toward educational guidelines.

**Results:** There was a statistically improvement in patients' level of knowledge after implementation of educational guidelines with  $p$  value  $< 0.001$  and there was a statistically improvement in patients' level of practice after implementation of educational guidelines with  $p$  value  $< 0.001$ .

**Conclusion:** There was a highly statistically positive effect of educational guidelines on patients' level of knowledge and practice.

**Recommendation:** Application of educational guidelines into training for patients undergoing cardiac catheterization to support knowledge and practice and increase perception and intellectual patients' skills.

**Keywords:** "Educational guidelines", "knowledge", "practice" and "cardiac catheterization"

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### I. Introduction

Coronary artery disease (CAD) is the most common type of heart disease and constitutes the most important health problem affecting people of productive age (Tillmann, etal 2018). In 2006, more than 1,115,000 angiograms were performed in the USA to diagnose and treat patients with vascular diseases (Mohammady, etal, 2013 & Mauro, 2014). Worldwide in 2007, one-quarter of all deaths (616,000) were from diseases of the heart (Amin, 2015). In 2008, 405,309 people died from coronary heart disease. In USA approximately every 25 seconds, an American will have a coronary event, and approximately every minute, someone will die of CAD (Minino, etal 2012).

In the developing world, CA diseases tend to affect people at a younger age and thus could negatively affect the workforce and economic productivity (Wells & Möller, 2015). In Egypt, according to the latest WHO data published in April 2011 coronary heart disease deaths in Egypt reached 78,897 (21.73%) of total deaths. The age adjusted Death Rate is 173.98 per 100,000 of population ranks Egypt 33 in the world. (Amin, 2015).

There are two methods of revascularization are well established for CAD: coronary artery bypass graft surgery CABG and percutaneous coronary intervention PCI. Percutaneous coronary intervention includes percutaneous balloon angioplasty, stenting with bare metal stents (BMSS) or drug-eluting stents (DESS) and atherectomy (Gaziano, etal 2012 and Amin, 2015).

Cardiac catheterization (CC) is the gold standard diagnostic test for coronary heart diseases (Mauro, etal 2014). Cardiac catheterization has evolved over the last six decades to a highly specialized discipline for

diagnostic purposes and an expanding repertoire of therapeutic advances to treat many problems (Rashad, 2011; Robert, 2012; Mukherjee, et al 2017). Femoral arterial puncture is the standard technique used to access the coronary arteries during coronary angiography, electrophysiological studies and diagnostic catheterization of the aorta, renal, mesenteric, carotid and upper extremity arteries. (Mohammed, 2014 and Amin, 2015).

Educational guidelines relevant to the patient's level of understanding, comprehensive, delivered at the appropriate time, as well as designed to understand can be one of the prerequisites for the patient to increase knowledge, practice, motivation and awareness of the importance of co-responsibility to make decisions about medical treatment and improving the patient's outcomes (Bēta, 2014 ; Koren & Sharaf, 2016). Longer education plays a causal role in lowering the risk of coronary heart disease. In conjunction with the results from other study designs, increasing education is likely to lead to health benefits (Mauro, et al 2014 & Tillmann, et al 2018).

Knowledge and technological advancement give rise to further challenges for nurses caring for these patients. Benefit in terms of knowledge and practice acquisition, enhanced self-care, reduced anxiety, increased satisfaction with care, improved pain control, and a reduced disruption in daily functioning. Finally, Patient education guidelines and programs attract patients to the provider and increase their satisfaction with their care. (Koren & Sharaf, 2016 & Parker & Joanne, 2017).

The role of the professional nurse in the care of the patient undergoing cardiac catheterization is beneficial for obtaining a positive outcome for the patients throughout an era of increasing competition in health care (Mohammed, et al & Marcus, 2014). Because of the increasing numbers of outpatient heart catheterizations, nurses play a pivotal role in patient assessment, safety, support, and education. To deliver optimal care, nurses need to prepare the patient adequately both physically and emotionally. Adequate assessment and monitoring throughout the pre catheterization, intra catheterization, and post catheterization experience are paramount in avoiding complications and ensuring successful outcomes (Moser, & Riegel, 2012).

People who were provided educational guidelines subsequently developed less coronary heart disease. Increasing the number of years that people spend in the educational system may lower their risk of subsequently developing coronary heart disease by a substantial degree. These findings should stimulate policy discussions about increasing educational attainment in the general population to improve population health. (Bēta, 2014; Parker & Joanne, 2017).

A patient must be adequately prepared intellectually and practically to manage their disease, instructions from their physician, most important practices needed and potential complications of any interventions as the more clearly a disease is understood, the more likely it is that an individual will be comfortable with their care. (Bēta, 2014 & Tillmann, et al 2018).

Previous studies showed that cardiac surgeries' patients had deficit level of knowledge and practice before implementation of educational guidelines and most of these studies were conducted for cardiac patients as general but not specific to patients undergoing CC. (Koren & Sharaf, 2016; Parker & Joanne, 2017).

Hence, Patients' undergoing CC, can be extremely intimidating. Adequate knowledge about what can be expected pre, during and after the procedure is critical. So nurse should provide the CC patients all knowledge about CC procedure and practices needed as breathing exercise, feet exercise and back massage and oral medication practice as it is the most method of drug administration used for them and also prevention of cardiac attacks. And this is the aim of the present study.

## **II. Subject And Methods**

### **Aim of the study**

The aim of the present study was to determine the effect of educational guidelines on the level of knowledge and practice of patients undergoing cardiac catheterization in Suez Canal University Hospitals in Ismailia.

To fulfill the aim of the study, the following research hypothesis was formulated: There will be a statistically improvement in patients' level of knowledge and practice after implementation of educational guidelines.

The study was portrayed under the four main designs as follows:

- A- Technical design.
- B- Operational design.
- C- Administrative design.
- D- Statistical design.
- A) **Technical design**

### **III. Research Design**

A quasi-experimental research design was used in this study which was utilized to investigate the research hypothesis.

#### **Setting:**

The study was carried out in the Cardiac catheterization Unit in the Suez Canal University Hospitals in Ismailia.

### **IV. Subjects**

The simple random sample included 100 adult male and female patients undergoing cardiac catheterization in the Cardiac catheterization Units of Suez Canal University Hospitals with different educational and experience level who are willing to participate in the study. Patients were selected randomly from the daily list in the cardiac catheterization unit during the period of data collection and were included in the study after obtaining their informed consent.

#### **Tools for data collection:**

##### **Tool I:**

##### **Patients' Interview questionnaire:**

This tool was prepared by the researcher, and it was written in Arabic language and composed of three parts:

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##### **❖ Part 1:**

It was used to assess patients' demographic characteristics: It included the patients' age, sex, residence, level of education and occupation.

❖ **Part 2:** This part was used to collect patients' related medical data: it included date and time of admission, no. of previous CC, type of current CC, smoking, associated medical diseases and allergies. Also it include weight in kg and height in centimeter then body mass index (BMI) was calculated according to the law; weight in relation to height, calculated mathematically by dividing weight in kilograms by the square of height in meters (**National Center for Health Statistics 2011; Mohammed, 2014 & Douglas, etal 2015** )

**Part 3:** This part was concerned with patients' knowledge assessment: It was prepared by the researchers based on relevant literature review (**Douglas, etal 2013; WHO, and Amin, 2015 & Hardin & Kaplow 2016**) and it was in the form of multiple choice questions (MCQ) and true and false questions.

One grade was given when the answer was correct and zero was given when the answer was incorrect. It was considered that Total knowledge scoring system were 44 grade and it was considered that  $\geq 75\%$  was satisfactory level of knowledge ( $\geq 33$  grade ) but  $< 75\%$  was un satisfactory level of knowledge ( $< 33$  grade).

##### **Tool II:**

**Patient's practice observational checklists tool:** It was adapted by the researchers based on relevant literature review **Abdelmonem, (2010), W. H. O (2015), Kerry, (2014), Lynda, (2014) and Hardin & Kaplow, (2016),** and included two parts: **Part I:** for self-management practices for pain management including, Breathing exercise, Feet Exercises, Back message and Oral administering medications

One grade was given when the answer was correct and zero was given when the answer was incorrect. So the total score was 66 grades and it was considered that  $\geq 75\%$  was satisfactory level of practice ( $\geq 49.5$  grades ) but  $< 75\%$  was un satisfactory level of practice ( $< 49.5$  grades).

##### **Tool III:**

**Patients' questionnaire satisfaction:** the patient's satisfaction "questionnaire" adopted to measure the level of patient's satisfaction regarding the educational guidelines. It includes 14 questions with scoring system ranged from one to three, as one is for option no, two for nearly, and three for yes which means best satisfaction of the patient, as theses scores based on summative scale like likert scale which assumed that the first two scores mean that the patient dissatisfied, and more than two considered as satisfied. (**Abdlmonem, 2010**)

##### **B) Operational design:**

The operational design includes preparatory phase, tools validity, reliability, pilot study and field work.

##### **B.1-Preparatory phase:**

It includes reviewing of recent literature, different studies and theoretical knowledge of various aspects of the research topic using books, articles, internet, periodicals and magazines.

##### **B.2-Tools validity:**

Content validity (or logical validity) was performed to measure the extent to which the tools represent all facets of the social psychometrics construction. The method of measuring content validity was performed by gauging agreement among raters/judges regarding how essential of a particular item of the tools is.

The developed tools were submitted to 7 experts in the field of cardiology, and medical surgical nursing for content validity and the necessary modifications were done.

### **B.3-Content reliability:**

Coefficient of reliability of the developed tools for knowledge and practice was measured by Cronbach's  $\alpha$ . The reliability scores of the previous tools as above were (0.866 and 0.901) consequently, which indicate high tool internal consistency of the used tools.

### **B.4 -Pilot study**

A pilot study was carried out on 10% of the study sample to check and ensure clarity, applicability, and feasibility of the tools and to identify the difficulties that may be faced during the application. Suggested changes were done then it was put into its final form, and they were not included in the study sample.

### **B.5 –Field work:**

Data was collected from the selected setting by the researcher using the pre-constructed tools. Through three phases: Assessment phase, Educational guidelines implementation phase (Theoretical & practical stage) and Evaluation Phase.

#### **C) Administrative design:**

An official permission was obtained using proper channels of communication. Official letters were sent from the Faculty of Nursing, Suez Canal University to the director of each study setting, explaining the aim of the study and its expected outcome to take their permission to carry out the study. Acceptance of directors of Suez Canal University Hospitals in Ismailia was also obtained.

#### **D) Statistical design:**

Upon completion of data collection variable included in each data collection sheet were organized and tabulated then coded prior to computerized data entry. The data were then imported into Statistical Package for the Social Sciences (SPSS version 22) software for statistical analysis.

The quantitative data were presented as means and standard deviation (SD) and the qualitative data were presented as frequency and percentage. According to the type of data, the following tests were used to test differences for significance; Unpaired Student T-test was used to compare between related samples, Chi-square the hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. Pearson chi-square and likelihood-ratio chi-square. T-test and Yates' corrected chi-square are computed for 2x2 tables. Linear Correlation coefficient was used for detection of correlation between two quantitative variables in one group. ANOVA test was used for comparison among different times in the same group in quantitative data

## **V. Results**

### **SECTION I: Demographic characteristics and medical history:**

The study showed that showed that, 74% of the patients included in the study were aged 50->60 years old. Concerning gender, 63% were males. Regarding to residence, 71% were of the urban population. In relation to educational level, only 11% had bachelor degree, finally 46% of them were occupying professional working and 38% of them weren't working.

Regarding to medical history 85% of the patients included in the study undergoing diagnostic CC. Regarding to smoking 20% were smokers and 35% were quitter. In relation to associated medical diseases, 48% were hypertensive and 32% of them were diabetic. Finally, 100% of them had no allergy and 66% of them were obese.

### **SECTION II: patients' knowledge:-**

#### **Domain 1: Knowledge about anatomy and physiology of the heart:**

Pre guidelines intervention, the minority of the studied patients had satisfactory level of knowledge regarding structure of the heart, type of blood in right side of the heart, coronary artery diseases, the origin of aortic artery in the heart, number of heart valves and causes of heart conduction system changing in 13%, 9%, 10%, 7%, 12% and 2% respectively. While it was improved post guidelines intervention to 89%, 93%, 96%, 82%, 89% and 93% respectively related to the previous items.

#### **Domain 2: Knowledge about basics of cardiac catheterization pre & post guidelines intervention including (purposes and types; preparation; complications of CC and post cardiac catheterization instructions)**

Pre guidelines intervention, the minority of the studied patients had satisfactory level of knowledge regarding basics of cardiac catheterization, while the majority of the studied patients had satisfactory level of knowledge

regarding basics of cardiac post guidelines intervention. Also there were high statistically significant differences between pre and post patients' knowledge as p value is < 0.001.

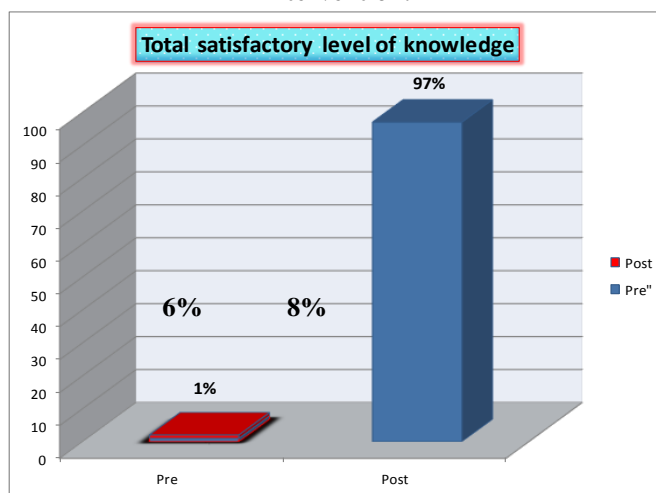
**Domain 3: Knowledge about prevention of cardiac attack:**

The results showed that 4% of the studied patients had satisfactory level of knowledge about prevention of cardiac attack. While 94% of them had satisfactory level of knowledge post guidelines intervention with a high statistical significant difference between pre and post patients' knowledge as p value is < 0.001

**Domain 3: Knowledge about discharge instructions:**

The results showed that, pre guidelines intervention, the minority of the studied patients had satisfactory level of knowledge regarding suitable time for taking bath, diet, driving, returning to work and reasons for seeking medical care in 15%, 10%, 8% and 7% respectively. While it was improved post guidelines intervention to 82%, 77%, 79%, 83%, 82% and 78% respectively related to the previous items. Also there were high statistically significant differences between pre and post patients' knowledge as p value is < 0.001.

**Figure (1) percentage distribution of patients' total satisfactory level of knowledge pre and post guidelines intervention:**

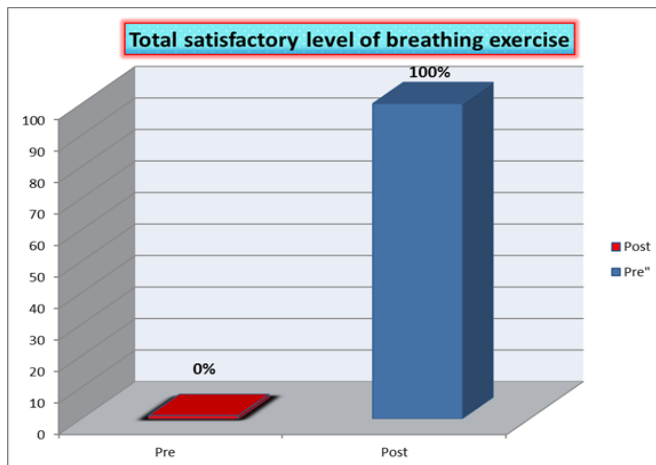


**Figure (1) percentage distribution of patients' total satisfactory level of knowledge pre and post guidelines intervention:**

Figure (1) showed that 1% of the studied patients had satisfactory level of total knowledge. While 97% of them had satisfactory level of knowledge post guidelines intervention with a high statistical significant difference between pre and post patients' total knowledge as p value is < 0.001.

**Section III: patients' undergoing cardiac catheterization practices about self-care and pain management:**

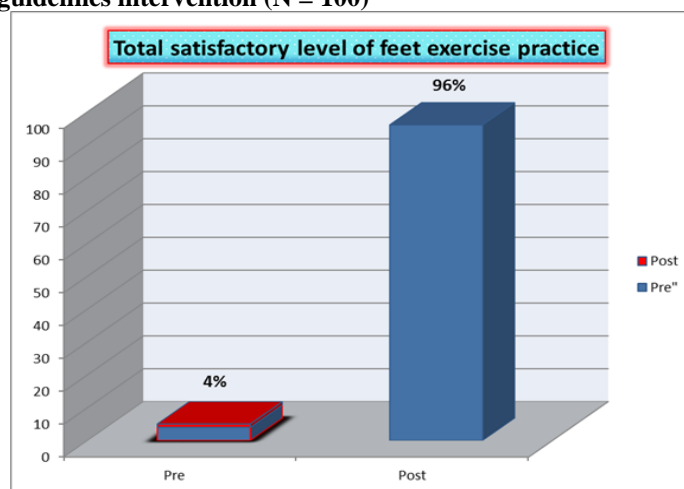
**Domain 1: Figure (2) patients' total satisfactory level of breathing exercise practice pre and post guidelines intervention**



**Figure (2) patients' total satisfactory level of breathing exercise practice pre and post guidelines intervention**

Figure (2) showed that that showed that none of the studied patients had satisfactory level of breathing exercise practice. While 100% of them had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice as p value is  $< 0.001$

▪ **Domain 2: Figure (3) percentage distribution of patients' total satisfactory level of feet exercise practice pre and post guidelines intervention (N = 100)**

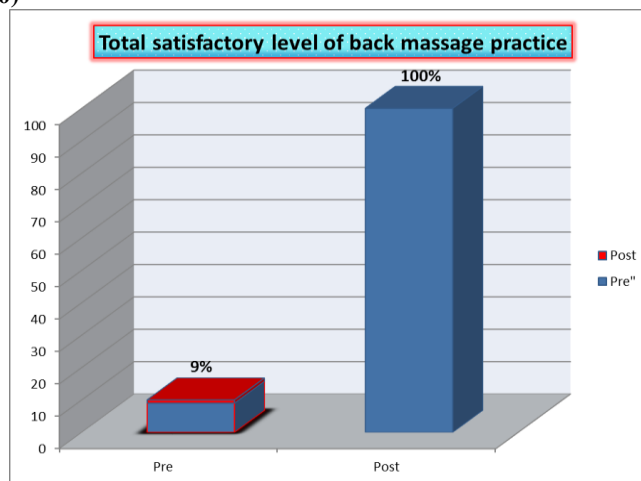


**Figure (3) percentage distribution of patients' total satisfactory level of feet exercise practice pre and post guidelines intervention (N = 100)**

Figure (3) showed that 4% of the studied patients had satisfactory level of feet exercise practice. While 96% of them had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice as p value is  $< 0.001$

**Domain 3: Figure (4) percentage distribution of patients' practice about back message after guidelines implementation (N = 100)**

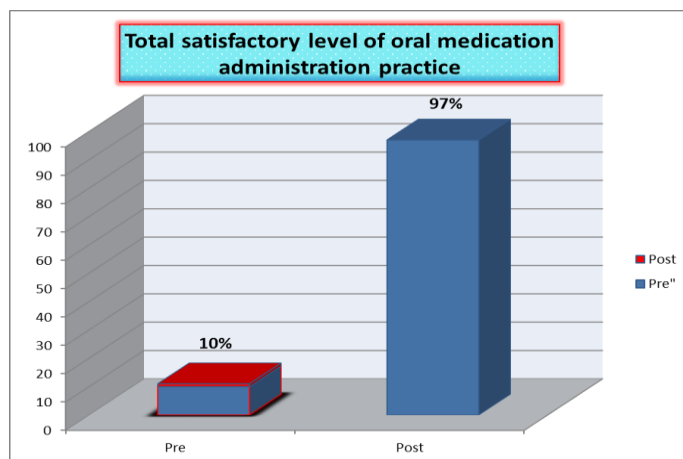
**Figure (4) percentage distribution of patients' practice about back message after guidelines implementation (N = 100)**



**Figure (4) percentage distribution of patients' practice about back message after guidelines implementation (N = 100)**

Figure (4) Showed that 9% of the studied patients had satisfactory level of back massage exercise practice. While 100% of them had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice as p value is  $< 0.001$

**Domain 4: Figure (5) percentage distribution of patients' satisfactory level of oral medication administration practice after guidelines implementation (N = 100)**

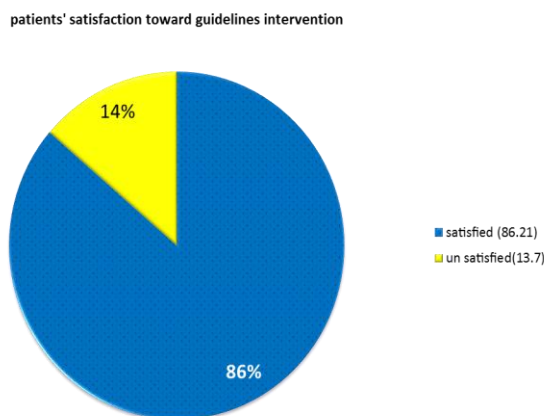


**Figure (5) percentage distribution of patients' satisfactory level of oral medication administration practice after guidelines implementation (N = 100)**

Figure (5) showed that 10% of the studied patients had satisfactory level of oral medication administration practice. While 97% of them had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice as p value is < 0.001.

**SECTION IV: Cardiac catheterization Patients satisfaction toward the guidelines intervention N (100):-**

**Figure (6) percentage distribution of cardiac catheterization patients' satisfaction toward the guidelines intervention (N = 100)**



**Figure (6) percentage distribution of cardiac catheterization patients' satisfaction toward the guidelines intervention (N = 100)**

Figure (6) showed that 14% of the studied patients were unsatisfied toward the guidelines intervention. While 86% of them were satisfied toward the guidelines intervention with a high statistical significant difference as p value is < 0.001

**SECTION V: Tables of correlations**

- Domain 1: table (1): Relation between patients' demographic characteristics and total knowledge scores (N = 100)

Demographic data		N	Total knowledge			F or T	ANOVA or T-test	
			Mean	±	SD		test value	P-value
Age	<50	26	6.4615	±	6.36384	F	1.324	0.271
	50-60	34	4.6765	±	4.70796			
	>60	40	4.3750	±	5.04181			
Gender	male	44	4.9318	±	5.09171	T	-0.146	0.884
	female	56	5.0893	±	5.55068			
Residence	Urban	71	5.6056	±	5.93170	T	1.737	0.085
	Rural	29	3.5862	±	3.06498			
Level of education	Illiterate	18	2.7222	±	1.90373	F	10.449	0.000
	Read and write	11	2.4545	±	0.93420			
	Basic education	27	2.4815	±	1.76222			

	Secondary education	33	7.3636	±	5.73813			
	University	11	10.5455	±	8.64134			
Occupation	Not working	38	2.6579	±	1.80504	F	12.946	0.000
	Manual	16	3.0625	±	3.49225			
	Professional	46	7.6522	±	6.52250			

Table (1) showed that there are highly strong significant relation between total knowledge scores and level of education and occupation of patients undergoing cardiac catheterization as p value is 0.000.

**Domain 2: table (2): Relation between demographic data and total practice of patients undergoing cardiac catheterization.**

Demographic data		N	Total practices			F or T	ANOVA or T-test	
			Mean	±	SD		test value	P-value
Age	<50	26	7.1923	±	3.82643	F	1.054	0.352
	50-60	34	6.8824	±	3.50553			
	>60	40	8.1000	±	3.88818			
Gender	male	44	7.2955	±	3.81904	T	-	0.364
	female	56	7.5714	±	3.72147			
Residence	Urban	71	7.2254	±	3.68471	T	-	0.937
	Rural	29	8.0000	±	3.90969			
Level of education	Illiterate	18	6.8333	±	3.60147	F	1.181	0.324
	Read and write	11	7.4545	±	3.83050			
	Basic education	27	7.7778	±	3.34357			
	Secondary education	33	6.8485	±	3.47420			
	University	11	9.4545	±	5.29837			
Occupation	Not working	38	7.4474	±	3.59201	F	0.251	0.778
	Manual	16	6.8750	±	3.42296			
	Professional	46	7.6522	±	4.02888			

Table (2) showed that showed that, there is no significant relation between demographic data and total practice of patients undergoing cardiac catheterization as p value is > 0.01

**Domain 3: table (3): Relation between demographic data and satisfaction of patients undergoing cardiac catheterization**

Demographic data		N	Satisfaction			F or T	ANOVA or T-test	
			Mean	±	SD		test value	P-value
Age	<50	26	25.1538	±	2.34422	F	0.915	0.404
	50-60	34	24.4412	±	1.89403			
	>60	40	25.0250	±	2.46501			
Gender	male	44	24.8409	±	2.24067	T	-	0.941
	female	56	24.8750	±	2.28085			
Residence	Urban	71	24.8451	±	2.37636	T	-	0.103
	Rural	29	24.8966	±	1.95201			
Level of education	Illiterate	18	25.5000	±	1.68907	F	0.587	0.673
	Read and write	11	24.5455	±	2.33939			
	Basic education	27	24.7407	±	2.08645			
	Secondary education	33	24.6061	±	2.60935			
	University	11	25.1818	±	2.35874			
Occupation	Not working	38	25.2105	±	1.97495	F	1.479	0.233
	Manual	16	24.0625	±	2.71953			
	Professional	46	24.8478	±	2.27027			

Table (3) showed that, there is no significant relation between demographic data and satisfaction of patients undergoing cardiac catheterization. As p value is > 0.01.



**Domain 4: table (4): Relation between patient's satisfaction and both of level of total knowledge & total practices.**

Correlations		Total knowledge	Total practices
Total practices	r	0.932	—
	P-value	0.000	—
Satisfaction	r	0.030	0.252
	P-value	0.769	0.011

Table (4) showed that, there is a positive significant correlation between total level of patients' knowledge and practice as P value is 0.000. And significant positive correlation between total level of patients' practice and satisfaction as P value is 0.011, but no significant correlation between patients' satisfaction and total level knowledge as P value is 0.769

## VI. Discussion

Coronary artery diseases touch the lives of millions of patients and their families, together with those who provide and plan care, and those responsible for planning and funding care especially in developing countries like Egypt. Indeed, the WHO estimates that 60% of the global burden of CAD occurs in developing countries (Beltrame, etal 2012; Kern, 2016 & Tillmann, etal 2018).

Cardiac catheterization (CC) is the most definitive procedure in the diagnosis, therapeutic (PCI) and evaluation of CAD, and currently it has become the routine diagnostic procedure performed in many hospitals. Femoral artery is commonly used in daily cardiology practice because of its larger diameter. (Chair, etal 2012& Tillmann 2018).

Patient educational process relevant to the patient's level of understanding, comprehensive, delivered at the appropriate time, as well as designed to understand can be one of the prerequisites for the patient to get some inspiration to change attitudes, increase knowledge, practice, motivation and awareness of the importance of co-responsibility to make decisions about medical treatment, the patient's behavior or change of habits. (Bêta, 2014 & Koren & Sharaf, 2016).

Nurses play a critical pivotal role in delivering care through patient assessment, safety, support and education. To deliver optimal care, nurses need to prepare the patient adequately both physically and emotionally. Adequate assessment and monitoring throughout the precatheterization, intracatheterization, and postcatheterization experience are paramount in avoiding complications and ensuring successful outcomes (Mohammed, 2014 & Amin, 2015).

**The aim of the present study was to** determine the effect of educational guidelines on the level of knowledge and practice of patients undergoing cardiac catheterization.

The study included 100 adult patients undergoing CC with different educational and experience level who are willing to participate in the study. Patients were selected randomly from the daily list in the cardiac catheterization unit during the period of data collection and were included in the study after obtaining their informed consent. and it was conducted in the Cardiac Catheterization care unit, affiliated to Suez Canal University Hospitals in Ismailia.

To fulfill the aim of this study, the following research hypothesis was formulated:  
There will be a statistically improvement in patients' level of knowledge and practice after implementation of educational guidelines

Interpretation and discussion of results obtained from the current study were presented in five main sections; the first section described the patients' demographic data and medical history of the study subjects. The second section was concerned with patients' level of knowledge. The third section was concerned with patients' practice. The fourth section was concerned with patients' satisfaction toward the guidelines intervention. The fourth section revealed the correlations between demographic data and both of total knowledge, total practice and patients' satisfaction.

### Section 1: socio-demographic characteristics

In our study, According to the **age**, more than two thirds of the patients included in the study were aged 50->60 years old. The result of the present study is supported by **Mohammed (2014)** who stated in her study that 56.0% and 52.0% respectively of both study and control group patients were in the age between (50-65 years) with mean age of both study and control groups were approximately equal of (53.88 years) and (52.2 years). The result of the present study is supported by **Williams, etal (2018)** where mean age of cardiac catheterization cases was 58 years old. Also this supported by **Bagnall, etal (2009)** who stated that rates of in-hospital catheterization and revascularization increased over time (p <0.001), the largest increase occurred in patients aged <65 years.

On the other hand **Chair, et al (2012)** stated that the average age the participants on his study was 63 years old. Moreover, the result of present study is far away from results of **Abdeaal, et al (2013)** who found the mean age of PCI patients was 62 years.

This mean age of the present study may be due to aging which is an un-modifiable risk factor for CAD. The WHO reports that the principal cause of death of people over 65 years is CAD, and CAD risk increase as age increases. In many develop countries, the number and proportion of older people (i.e. over 65 years) is increasing **Kucia, & Quinn, (2010), Beltrame, et al (2012), Fuster, & Kelly, (2010)**.

Regarding gender, the present study clarified that about two thirds of the study group were males. This finding is in line with **Mohammed (2014)** who found that more than half of both the study and control group patient were males. Also the result of the present study is supported by **Abdeaal, et al (2013) & Amin (2015)** who indicates that 64% of PCI cases were men. On the other hand, this result may be not in line with **Beltrame, et al (2012)** who reported that CAD is the leading cause of mortality for both adult males and females alike worldwide. Although the initial manifestation of CAD is delayed in females by about ten years compared to males, there is no abrupt increase in CAD mortality rates for females immediately following menopause but a progressive increase over subsequent years.

Regarding **residence**, the result revealed that more than two thirds of patients participating in the study were of the urban population. The present study is supported by **Sekhri (2014)** who conclude that his study demonstrated a high prevalence of CAD risk factors in the Indian urban population. Also the result of the present study is supported by **Amin (2015)** who concluded that more than three quadrant of her study patients were from urban population.

This result may ascertain that belonging to urban population may limit the time for traditional cooking and they may turn to prepared and foods that are often high in sugar, salts, saturated and trans-fats, which in turn increase the risk of CAD. Besides, restricted time rise rates of transport by car rather than transport by foot, discourage physical activity and encourage sedentary habits. Moreover.

Regarding **education and occupation** the present study revealed that the minority of study population had bachelor degree. The result of the present study is supported by **Tillmann, et al (2018)** who concluded that low education is a causal risk factor in the development of coronary heart disease. On the other hand the present study was not on same line with **Mohammed (2014)** who stated that 44.0% of her study patients were university education certificate. Also the result of present study is supported by **Chair, et al (2012)** who mentioned that 62.8% of the participants in his study received no education or were educated at a primary school level. This result may ascertain that decreasing educational level may be a cause of the unsatisfactory level of knowledge of the patients. And increasing educational level should increase satisfactory level of knowledge.

Regarding **occupation**, the result of the present study revealed that 46% of the study patients were occupying professional works. This result is supported by **Rosch & Marksberry (2017)** who mentioned in his study about Stress and Heart Disease that the relationship between job stress and cardiovascular disease was scientifically demonstrated 15 years ago also, there are certain occupations are extremely stressful and therefore more likely to cause heart disease. So the relationship between stress, heart disease and sudden death has been shown to increase significantly as a consequence of any severe stressor that evokes “fight or flight” responses.

On the other hand, this result is not on the line with **Biglari, et al (2016)** who mentioned that his study results did not suggest a considerable relationship between risk factors of cardiovascular diseases and occupational stress among intercity drivers. This result may ascertain that occupying professional works limit the time for traditional cooking and they may turn to prepared foods that are often high in sugar, salts, saturated and trans-fats. Gaining calories from sugar and fats has become cheaper and more accessible than fruits, vegetables and grains that in turn increase the rates of diabetes mellitus, hypertension and hyperlipidemia and this increase the risk of CAD.

Concerning the type of CC, the result of the present study revealed that the majority of the patients included in the study undergoing diagnostic CC. The result of the study ascertained by **Lee, et al (2017)** who concluded that the high PCI consumables cost highlighted the importance of cost-effective purchasing mechanism. Findings on the heterogeneity of the patients, treatment practice and hospitalization cost are vital for formulation of cost-saving strategies to ensure sustainable and equitable cardiac service.

Also **Ong, et al (2017)** who concluded that providing valuable guidance for service planning. Alternative procurement practices for PCI consumables may deliver cost reduction. For countries with limited data availability, costing method tailored based on country setting can be used for the purpose of economic evaluations. This may be due to two reasons toward the present result, first, medically a sum of patients suspected to have coronary artery disease and referred for angiography turned on to have normal coronaries and alternate diagnosis is sought. Second financial aspect as the patient can afford to pay for diagnostic angiography either by himself or by insurance but when there is PCI using 1 or more stent he needs to pay much more money which he cannot afford.

Concerning smoking, the result revealed that more than half of all patients had a history of smoking. The result of the present study is supported by **Mohammed (2014); Amin (2015); Byrne & Espnes (2016) & Rosch & Dimsdale (2017)**, who mentioned that Cigarette smoking pose an established and potent risk for CVD who studied "The effect of changing position and early ambulation after cardiac catheterization". Also, **Law & Wald (2013)** who studied "Environmental tobacco smoke and ischemic heart disease" and evidenced the presence of a significant effect of tobacco smoke exposure in causing ischemic heart disease. This result ascertains that smoking is a modifiable risk factor of CAD.

Concerning to associated medical diseases, the result of the present study revealed that about half of patients were hypertensive and about one third of them were diabetic. The result of the present study is supported by **Mohammed (2014) & Amin (2015)** who studied "The effect of implementing a clinical pathway on health outcomes of patients undergoing percutaneous coronary intervention (PCI)" and mentioned that 52% of her study groups were suffering from hypertension and 48% had diabetes mellitus. Also, **American Heart Association (AHA) (2017)** which reported a positive association between hypertension and insulin resistance as when patients have both hypertension and diabetes, which is a common combination, their risk for cardiovascular disease doubles. This demonstrates the importance of prevention of hypertension and diabetes occurrence, and also demonstrates the beneficial of hypertension and diabetes control in secondary prevention of CAD.

Concerning to obesity, the result of the present study revealed that more than two thirds of them were obese. This result harmonious with **Jahangir, etal (2014)** who studied " The relationship between obesity and coronary artery disease" and mentioned that there are major health implications associated with obesity, including diabetes mellitus, dyslipidemia and all independent risk factors for coronary artery disease(CAD). Also **AHA (2016)** which mentioned that Obesity is a major risk factor for cardiovascular disease. Also **Smith, etal (2012)** who concluded that obesity is associated with increased risk of cardiovascular disease (CVD) mortality. Correspondingly, **Abdeaal, etal (2013)** reported that 7% of PCI patients had dyslipidemia.

## **Section II: patients' level of knowledge**

Regarding to patients' level of knowledge about cardiovascular system and cardiac catheterization basics knowledge, the result of the present study revealed that there were high statistically significant differences between pre and post patients' knowledge as it was improved post guidelines intervention. The present result is in line with **Parker & Joanne (2017)** who studied, "Relationship of Functional Health Literacy to Patients' Knowledge of Their Chronic Disease". And concluded that inadequate functional health literacy poses a major barrier to educating patients with chronic diseases.

Also **Samira, etal (2016)** who studied "Effect of Early Nursing Preparation on Anxiety among Patients Undergoing Cardiac Catheterization", Who used cardiac catheterization knowledge assessment sheet including definition of catheterization, causes, sites of catheter entry, purpose, patient preparation, number's fasting hours before the procedure, medication, investigation before the procedure, time of the procedure, position after the procedure, movement after the procedure, nutrition and post procedure complication. And concluded that the study group had better knowledge than control group as clarified that, the early preparation and providing patients' information before cardiac catheterization improved patients' knowledge.

On the other hand, **Wilson, etal (2014)** who studied, "Advancing effective communication, cultural competence, and patient- and family-centered care: A roadmap for hospitals". And concluded that, not all patient education was successful. In reality, communication was often partially understood, misunderstood, or misinterpreted. Even with the best of intentions, patient education that failed to educate can lead to adverse events or poor outcomes.

All these may ascertain that, the early preparation and providing patients' information before cardiac catheterization improve patients' knowledge and patients' outcomes.

Concerning to patients' level of knowledge about post cardiac catheterization instructions including self-care, nutrition, positions and ambulation after CC, the result of the present study revealed that there was high statistically significant difference between pre and post patients' knowledge as satisfactory level of knowledge was improved post guidelines intervention to 71%. The present result is in line with **Samira, etal (2016)** who gave knowledge and teaching about pre, post cardiac catheterization through reading the pamphlet (brochure information) including position after the procedure, number's fasting hours before the procedure, movement after the procedure and nutrition.

Also, **Kaur, etal (2007)** who found through his study that the preoperative teaching is an extremely effective media to increase the level of performance of the subjects as information about self-care activities for patients undergoing cardiac surgery.

Regarding to patients' level of knowledge about prevention of cardiac attack, the result of the present study revealed that the majority of the studied patients had satisfactory level of knowledge post guidelines intervention with a high statistical significant difference between pre and post patients' knowledge. The present

result is in line with **Ferdinand & Patterson. (2012)** who studied "Community-Based Approaches to Prevention and Management of Hypertension and Cardiovascular Disease". And concluded that Investments in effective prevention strategies provided the best opportunity to improve the health of Americans and control health care spending. As multiple community programs have been successful, to varying degrees, in identifying and educating individuals at risk. And in his final analysis mentioned that community education and outreach supplemented standard therapy for hypertension and CVD risk.

On contrarily, the present results is not on line with **Edworthy, etal (2007)** who studied "Effects of an enhanced secondary prevention program for patients with heart disease". And concluded that the intervention program failed to improve outcomes in the study. One explanation for these results was the near optimal physician compliance with guidelines in both groups.

Regarding to patients' level of knowledge about discharge instructions, the result of the present study revealed that the majority of the studied patients had satisfactory level of knowledge post guidelines intervention with a high statistical significant difference between pre and post patients' knowledge. The present result is in line with **Mukherjee, etal (2017)** who studied, "The impact of health literacy on cardiovascular disease". And concluded that there was evidence that improved knowledge of one's condition may improve patient adherence to lifestyle changes and medication. Also showed statistically significant correlations between patients' general knowledge about coronary heart disease (CHD) risk factors and improvements in weight loss, physical activity, stress management, dietary changes, and reaching treatment goals for lipid levels. Self-knowledge was also positively related to adherence with antihypertensive drugs.

Regarding to patients' level of total knowledge. The result of the present study revealed that most of the study group patients had unsatisfactory level knowledge pre guidelines intervention. The present result is in line with **Nag & Ghosh (2014)** who mentioned that low and middle educational status urban subjects in India have greater cardiovascular risk. Uneducated and less educated people major coronary risk factors such as smoking and hypertension are more prevalent. This may make these people prone to coronary heart disease.

Also, the result of the present study is supported by **Janati, etal (2011)** who concluded that people from lower/middle social classes including low knowledge level were in greater CHD risk than higher social classes. Additionally **Phillips (2010)** who mentioned socio economic status (SES) including low knowledge level influences on CHD particularly those related to self-perception and social perception. For example, living and working in lower SES environments may contribute to diminished self-esteem, lower sense of control, and a reduced orientation toward mastery and efficacy. He mentioned also, individuals lower in SES experiencing higher rates of morbidity and mortality than higher-SES individuals. This relationship is particularly evident in the case of coronary heart disease (CHD).

### **Section III: patients' practice:**

Regarding to patients' level of practice about breathing exercise, the result of the present study revealed that all of the study group patients had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice. The result of the present study is supported by **Alkan, etal (2017)** who studied "Influence of Breathing Exercise Education Applied on Patients with Heart Failure on Dyspnea and Quality of Sleep". Breathing exercises were taught to patients in experiment group and they were told to make breathing exercises for 30minutes daily. Who indicated that exercise training programs demonstrate positive effects on exercise capacity, functional capacity, symptomatic status, quality-of-life and sleep quality in patients with cardiac failure.

In addition, **Achttien, etal (2013)** who studied "Exercise-based cardiac rehabilitation in patients with coronary heart disease": a practice guideline. And demonstrated that a relaxation program (including breathing therapy) is recommended in CHD patients. A relaxation program reduces cardiac mortality and morbidity, and has a favorable effect on physical, psychological and social parameters (including resting heart rate and fear of exercise).

Regarding to patients' level of practice about feet exercises, the result of the present study revealed that the majority of the study group patients had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice. The result of the present study is supported by **Osondu (2016)** who studied "Counseling Patient with Heart Failure" which aimed to describe how to educate patients on the health implications associated with heart failure and self-care management (including feet exercises). And to evaluate the effect of patient counseling on heart failure patient in regards to patient's quality of life, compliance (QOL). Who clarified that patient health standard and functional capacity was improved via patient counseling. Patient who participated in evidence base care programme which comprises of medication and counseling intervention show enhanced improvement in QOL.

In addition, **Tanaka, etal (2016)** who studied "The use of a novel in-bed active Leg Exercise Apparatus (LEX) for increasing venous blood flow after cardiac surgeries". Subjects performed two types of exercise; exercise 1 consisted of leg exercises using the LEX, while exercise 2 consisted of in-bed active plantar flexion/dorsiflexion exercises, results demonstrated that blood flow reached a maximum value 1 minute after

exercise for both exercise types. This ascertain that patients' education about feet exercises practice had a positive effect on patient practice improvement as evidenced by improvement of patient outcomes.

Regarding to patients' level of practice about back massage exercise, the result of the present study revealed that all of the study group patients had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice. The result of the present study is supported by **Kennedy, etal (2016)** who studied "Process for massage therapy practice and essential assessment". It was clarified that the goal of providing these models was to give best practices for massage therapy treatment of low back pain and stress to deliver the best possible care. Also this ascertain that patients' education about feet exercises practice had a positive effect on patient practice improvement as evidenced by improvement of patient outcomes.

Moreover, **Miozzo, etal (2016)** whose study aimed to "review the effects of treatment with massage therapy on the symptoms of pain and anxiety reported by patients who underwent heart surgery". Through patients, who underwent heart surgery, comparing the postoperative treatment with massage and the usual treatment, it was demonstrated that Massage therapy might be a useful method to reduce pain and anxiety in patients undergoing cardiac surgery. And this ascertain that patients' education about back massage exercises practice had a positive effect on patient practice improvement as evidenced by improvement of patient outcomes.

Regarding to patients' level of practice about oral medication administration practice, the result of the present study revealed that the majority of the study group patients had satisfactory level of practice post guidelines intervention with a high statistical significant difference between pre and post patients' practice. The result of the present study is supported by **Victor & William (2012) & Peter (2017)** who studied "A Structured Teaching and Self-management Program for Patients Receiving Oral Anticoagulation". And Hemostasis and Thrombosis: Basic Principles and Clinical Practice. Who concluded that an anticoagulation education program that includes self-management of anticoagulation therapy results in improved accuracy of anticoagulation control and in treatment-related quality-of-life measures.

Additionally, **Murray, etal (2014)** who studied "Training for patients in a randomized controlled trial of self-management of warfarin treatment". It was showed that self-management (including oral medication administration) can lead to improvements in patients' self-efficacy, closer adherence to treatment, and increased control of treatment with oral anticoagulants. This mean that patients' education about oral medication administration practice had a positive effect on patient practice improvement as evidenced by improvement of patient outcomes.

Regarding to patients' level of total practice. The result of the present study revealed that most of the study group patients had unsatisfactory level practice pre guidelines intervention. The result of the present study is supported by **Erhardt (2018)** who mentioned that for cardiovascular risk reduction, the implementation of knowledge into practice has been shown to be poor. Hence he concluded that Practice guidelines on the prevention of cardiovascular disease have been widely disseminated, but their implementation has been shown to be poor. Several reasons for this 'guidelines gap' have been identified. Physicians' and patients' perceptions of cardiovascular risk factors are highly deficient and physicians need a better understanding of the needs of their patients. Compliance programs should therefore be multidimensional, involving both the patients' and doctors' perspectives.

The result of the present study is also supported by **Oli, etal (2014)** who mentioned that earlier studies on health literacy and the behavior dimension of cardiovascular health reported a substantial gap between knowledge and practice. Hence he concluded that although better health care is important in terms of aiding patients to better understand and cope with their disease, interventions should be tailored to improve the community's cardiovascular health literacy and preventive practices.

#### **Section IV: Patients' satisfaction toward the guidelines intervention:**

Regarding to patients satisfaction level toward the guidelines intervention, the present study revealed the presence of positive strong statistical significance effect on patients' satisfaction level post guidelines intervention. The result of the present study is supported by **Berkowitz (2016)** who mentioned that patient experience is surprisingly complex and generally linked with patient satisfaction; also he concluded that patient satisfaction is related to a patient's direct and indirect experiences with the healthcare system and interaction with healthcare providers, particularly communication. We understand that the nurse's work environment can impact patient satisfaction in positive and negative ways.

In addition, **Freitas, etal (2014)** who concluded the strong correlation between the nursing care quality and the patients' satisfaction. So the nurse has a great role to include the patients' emotional and psychospiritual needs. Moreover, the result of the present study is also supported by **Andrea (2013)** who mentioned that Patient education and satisfaction are important measures in the nation's new healthcare reform that will have a financial impact on healthcare. Hence, if patient education is poor, so is patient satisfaction, which will negatively impact hospital reimbursement. Also, he emphasized the important relationship between improved

patient education, patient satisfaction, and hospital reimbursement. Additionally, **SHAWA (2012)** who concluded that, patients' perceptions were influenced by how nurses were conducting themselves towards patients. Also, he revealed that a trusting relationship between patients and healthcare providers is what improves patient satisfaction. Hence patient education has a potential impact on patient satisfaction.

These may be due to improving patients' knowledge and practice by the researcher guidelines as the satisfactory level of knowledge and practice post guidelines intervention is more than the satisfactory level of knowledge and practice pre guidelines intervention which leading to increasing patients' perception and intellectual skills. As patients' satisfaction mean, patient's feeling of contentment when their needs and expectations have been met.

#### **Section V: tables of correlations:**

Regarding to the relation between total knowledge and level of education and occupation, the result of the present study revealed that there is a highly strong significant relation between total knowledge and level of education and occupation of patients undergoing cardiac catheterization. Concerning the relation between total knowledge and level of education, the result of the present study is supported by **Tillmann, etal (2018)** who concluded that low education is a causal risk factor in the development of coronary heart disease. So increasing educational level may be a cause of increasing the satisfactory level of knowledge of the patients. Also may lead to increase patient's perception and intellectual skills knowledge about CHD.

Concerning the relation between total knowledge and occupation of patients, the result of the present study is supported by **Thellefsen; Brown & Hollis (2013)** who mentioned that Occupation consists of alternation between modes of existing, thinking, and acting, and requires a balance of these in daily life, Mind and body are inextricably linked, Idleness (lack of occupation) can result in damage to body and mind, Occupation can be used to regenerate function. Human Occupation consists of the three basic non-reducible elements: to think, to be and to act. Everyday Human Occupation is a balance between thinking, being and acting in everyday normal life.

Moreover, the result of the present study is supported by **Hansen (2016)** who mentioned that Sense of occupational coherence may affect rehabilitation outcome, since patients with weak sense of occupational coherence experience lower functioning, are less satisfied with their occupational performance, have inferior quality of life and more pain compared to patients with stronger sense of occupational coherence .

This result may ascertain that education is critical to social and economic development and has a profound impact on population health. So increasing educational level may be a cause of increasing the satisfactory level of knowledge of the patients. Concerning occupation, it is critical to social and economic development and has a profound impact on population health. As occupation plays an essential role in human life and influences each person's state of health.

Regarding to the relation between total level of patients' knowledge and practice, the result of the present study revealed that there is a highly strong significant relation between total level of patients' knowledge and practice of patients undergoing cardiac catheterization. And significant positive correlation between total level of patients' practice and satisfaction. Concerning the relation between total level of patients' knowledge and practice, the result of the present study is supported by **Feroze, etal (2017)** who concluded that, there was positive association between the knowledge and practice about patient's safety after Cardiac Catheterization. Moreover, **Ghannadi, etal (2016)** who concluded that, There was significant correlation between patients' knowledge and practice with their self-care activities.

Concerning the relation between total level of patients' practice and satisfaction, the result of the present study is supported by **Berkowitz (2016)** who mentioned that the concept of patient satisfaction is related to a patient's direct and indirect experiences with the healthcare system and interaction with healthcare providers. Then, concluded that patient experience and practice can have a positive effect on the patients' satisfaction level.

This result ascertain that, Cardiac Catheterization is a critical health status which requires standardized care policies, as well as it needs qualified and skilled health provider to educate patients most important knowledge and practices they need to obtain good outcome of management. So, the proper knowledge and practice could help in rehabilitation of patients as Professional factors such as health care professionals' awareness and skillfulness regarding patient safety has an influence on to patient safety. Hence, the more practice level the patient has, the more satisfaction level he get.

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