

# Effect of Early Ambulation on Post Diagnostic Cardiac Catheterization Patient's Outcomes

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**Abstract:** Cardiovascular disease (CVD) has emerged as the single most important cause of death worldwide. Coronary artery disease (CAD) is the most prevalent type of cardiovascular disease in adults. Cardiac catheterization is the gold standard diagnostic test for coronary heart diseases. **Aim:** This study aimed to determine the effect of early ambulation on post diagnostic cardiac catheterization patient's outcomes. **Design:** Quasi experimental research design was utilized in the study. **Sample:** A purposive sample of (70) adult male and female patients undergoing diagnostic cardiac catheterization, which will be divided into two equal groups study & control group 35 patients for each group. **Setting:** Data were collected from cardiology and cardiac catheterization departments at the National Heart Institute. **Tools:** Three tools were used for data collection (1) A structured interview questionnaire sheet, which included (a) socio-demographic characteristics, (b) Past and present Medical and Surgical history, (2) Pre/Post Cardiac Catheterization patient's Knowledge Questionnaire, (3) Patient's Physical Assessment Sheet. **Results:** This study revealed that, there was statistically significant difference between control and study group regarding incidence of back pain and no statistically significant difference regarding hematoma formation after the procedure, As well, there was statistically significant improvement in mean of knowledge regarding heart and cardiac catheterization among the control and study group. **Conclusion:** Early ambulation post the diagnostic cardiac catheterization is safe and has a positive effect on early complications among studied patient's regarding incidence of low back pain and increased patient's knowledge after educational session. **Recommendation:** The study recommended application of early ambulation on therapeutic cardiac catheterization with a larger sample.

**Keywords:** Cardiac catheterization, Early ambulation, Patient outcomes.

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## 1. INTRODUCTION

Over the past decade, cardiovascular disease (CVD) has emerged as the single most important cause of death worldwide. In 2010, CVD caused an estimated 16 million deaths under the age of 70 due to non-communicable diseases, 82% are in low and middle income countries and 37% are caused by CVDs. Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population-wide strategies. People with cardiovascular disease or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidemia or already established disease) need early detection and management using counseling and medicines, as appropriate (WHO, 2017).

Coronary artery disease affects about 16,300,000 people (7%) of American adults 20 years of age and older of all populations. More than the half of deaths related to cardiovascular diseases result from coronary artery disease. It is the

leading cause of death among American men and women. Coronary artery disease affects about 8.3% of Egyptian men and women and also it represents 21% of all deaths in Egypt (**Centers of Disease Control, 2014**). Coronary artery disease (CAD) is the most prevalent type of cardiovascular disease in adults. For this reason, it is important for nurses to become familiar with various manifestations of coronary artery conditions and methods for assessing, preventing, and treating these disorders medically and surgically. CVDs are the number one cause of death globally: more people die annually from CVDs than from any other causes (**Hinkle and Cheever, 2014**).

Coronary atherosclerosis is the most common cause of cardiovascular disease and is characterized by an abnormal accumulation of lipid or fatty substances and fibrous tissue in the vessel wall. These substances block or narrow the vessel, reducing blood flow to the myocardium. Atherosclerosis involves a repetitious inflammatory response to injury of the artery wall and subsequent alteration in the structural and biochemical properties of the arterial walls (**Mohammady et al, 2014**). Cardiac Catheterization is an important procedure involving insertion of a long, thin, flexible tube into a blood vessel in the groin or arm of the patient. The catheter is then threaded all the way to the heart to perform diagnosis or to provide treatment. The heart and blood vessels are monitored using special dyes injected through the catheter for X-ray imaging. Thus, narrowing or blockages of the coronary arteries can be identified and treated. Cardiac catheterization is an invasive procedure and an extremely valuable diagnostic procedure for obtaining detailed information about the structure and function of the cardiac chambers, valves, and coronary arteries (**Raghavan et al, 2010**).

Cardiac catheterization is indicated in diverse populations. Many critically ill and hemodynamically unstable patients are evaluated during acute coronary syndromes, severe heart failure, or cardiogenic shock. Cardiac catheterization is the gold standard diagnostic test for coronary heart diseases. In order to minimize the post-procedure complications, patients are restricted to prolonged bed rest that is always accompanied by fatigue and discomfort (**Rezaei, Ahmady, Mohamadi, and Jafarabady, 2009**).

Cardiac catheterization remains the most definitive procedure for diagnosis and evaluation of coronary artery disease. Currently, cardiac catheterization has become a routine diagnostic procedure performed in many hospitals. Although it can be performed through brachial, radial, or femoral arteries, the transfemoral puncture is the most common approach. However, because vascular complications occur in 0.43- 5.8% of transfemoral cardiac catheterization patients, strict bed rest and immobilization of the catheterized leg have been considered essential to reduce the risk of their development. The recommended bed rest duration after transfemoral cardiac catheterization varies from two to 24 hours. Many patients find it difficult to use the bedpan or urinal in the recumbent position during bed rest, moreover, studies reported that the back pain severity increased with longer duration of bed rest after cardiac catheterization (**Chair & Thompsons, 2007**).

#### **Significance of the study:**

Cardiac catheterization is primarily performed as a diagnostic or therapeutic procedure to diagnose any defect in the coronary arteries or in the heart. In the United States, more than a million cardiac catheterization are done each year (**Shabir Bhimjy, 2015**). In the National Heart Institute, cardiac catheterization unit estimated more than 1500 cardiac catheterization monthly either diagnostic or therapeutic. It also estimated about 20,000 procedures every year (**Statistical Cardiology Department of National Heart Institute, 2016**).

Early ambulation, changing position in bed, and reducing the length of bed rest, may decrease patients' pain, bleeding and hematoma formation and significantly decrease the nursing staff workload, reduce in-hospital stay and also enable the patients to meet self-care needs such as eating, drinking and voiding (**Rezaei et al, 2009**).

#### **Aim of the Study:**

The aim of this study was to determine the effect of early ambulation on post diagnostic cardiac catheterization patient's outcomes through the following:-

1. Assess patient's basic needs regarding cardiac catheterization.
2. Design the early ambulation intervention based on patient's basic assessment.
3. Implement the designed ambulation intervention procedure post cardiac catheterization.
4. Evaluate the effectiveness of the early ambulation intervention post cardiac catheterization.

**Research hypothesis:****At the end of the study:**

Post cardiac catheterization, patients who will receive the early ambulation intervention will have less back pain, vascular complication, length of hospital stay and more mean knowledge than those patients who will not receive the early ambulation intervention as measured by tool (III).

**2. SUBJECTS AND METHODS****Research design:**

A quasi- experimental research design was utilized in this study.

**Setting:**

The study conducted in the Cardiology departments and Cardiac Catheterization Units at National Heart Institute.

**Subjects:-**

A purposive sample of 70 adult patients from both genders undergoing diagnostic cardiac catheterization will be involved in this study from the above mentioned setting which will be divided into two equal groups study & control group 35 patients for each group throughout six months with the following criteria:-

**Inclusion criteria:**

1. Adult Patients from both gender undergoing diagnostic cardiac catheterization who agrees to participate in the study.
2. Patient's whose Active Clotting Time less than 150 seconds.
3. Trans femoral cardiac catheterization.

- **Exclusion criteria:**

1. Coagulation abnormalities.
2. Chronic lower back pain.
3. Trans radial coronary angioplasty.
4. Previous surgery in the femoral arteries.

**Tools of data collection:**

The investigator used three tools to collect the data during the study:-

**1- Structured interviewing Questionnaire:** which developed by the investigator based on literature review and divided into two parts:

**Part I: Socio Demographic Assessment Sheet** which used to assess patient's medical data as age, sex, level of education, marital status, occupation, habits as smoking, medical diagnosis and duration of disease.

**Part II: Past and present Medical and Surgical history** which used to assess bed rest following the procedure, time of compression after sheath removal, time of compression and the number of affected vessels.

**2- Pre/Post Cardiac Catheterization patient's Knowledge Questionnaire:** which adopted from (Mahgoub, 2013), consists of 26 closed ended questions (MCQ) used to assess patient's knowledge regarding the heart, heart disease, its medication, coronary arteries, signs and symptoms of heart disease, cardiac catheterization, its types, preparation before the procedure, instructions to be followed post the procedure, diet and physical exercise.

**Scoring system for tool II:** knowledge about the procedure and the disease were scored as the following: complete correct answer= 2 grades, incomplete correct answer= 1 grade and wrong answer = zero. The general patient's knowledge was classified into: satisfactory ( $\geq 60\%$  or  $\geq$  score 16 according to statistical analysis) and unsatisfactory ( $<60\%$  or a score less than 16 according to statistical analysis and the total score from 26).

**3- Patient's Physical Assessment Sheet:** which developed by the investigator based on the literature review and divided into three parts:

**Part I: Catheter Site Assessment Sheet** which used to assess patient's puncture site examination as color, peripheral pulse, temperature before and after the procedure.

**Scoring system of tool III part I:** catheter site assessment sheet was scored as the following , the color, pulse and temperature of the limb: Normal=1 grade, Abnormal= 2 grades.

**Part II: Back Pain Assessment Sheet** which developed by the investigator based on the literature review and used to assess patient's back pain after the procedure. It includes the following items such as site of pain, causes of pain and severity of pain(mild from 1-3 or moderate from 4-6 or severe from 7- 10 according to pain scale).

**Scoring system for tool III part II:** Back pain assessment sheet was scored as the following: present pain= 1 grade and no pain= zero.

**Part III: Post Cardiac Catheterization Vascular Complications Assessment Sheet** which used to assess patient's complications as hematoma, bleeding, ischemia of affected limb, ecchymosis and stroke.

**Scoring system for tool III part III:** Post cardiac catheterization vascular complications assessment were scored as the following: Yes= 1 grade and No= zero.

#### **Operational Design:**

It includes the preparatory phase, content validity, reliability, ethical consideration, pilot study and field work.

#### **Preparatory phase:**

It included reviewing of related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection.

#### **Tools validity:**

Content validity was conducted to determine whether the tool covers the aim. The tools were revised by a jury of 5 experts: Associate professors and Lecturers of medical surgical nursing from faculty of nursing, Helwan University, professors of medical surgical nursing from faculty of nursing, Zagzaig University, Lecturer of medical surgical nursing from faculty of nursing, Beni Suief university and professors of internal medicine from faculty of medicine, Helwan University who reviewed the content of the tools for comprehensiveness, accuracy, clarity, relevance and applicability, minor modification were done.

#### **Tools reliability:**

Reliability of the tools was tested to determine the extent to which the questionnaire items are related each other. The Cronbach's alpha model which is a model of internal consistency was used in the analysis(value throughout the implementation phases are (0.723, 0.835, 0.729) respectively. Statistical equation of cronbach's alpha reliability coefficient normally ranges between 0 and 1 higher values(more than 0.7) denotes acceptable reliability.

#### **Ethical Considerations:**

An approval was obtained from the study subjects individually and scientific ethical committee of the faculty of nursing at Helwan University using a written informed consent obtained from each participant prior to data collection. They have been assured that anonymity and confidentiality was guaranteed and the right to withdraw from the study at any time. Ethics, values, culture and beliefs was respected.

#### **Pilot study:**

A Pilot study was carried out with 10% (not less than 10 patients) of the sample under study to test the applicability, clarity and efficiency of the tools. The modifications were done for used tool, then final form was developed. Patients in the pilot study were excluded from the study group.

**Field work:**

An approval was obtained from a scientific, ethical committee of the faculty of nursing at Helwan university and the study subjects individually using a written informed consent obtained from each participant prior to data collection. Sampling was started and completed within six months from May (2017) until the end of October (2017). Data collection was done 2 days/week by the investigator in the morning and afternoon shifts. The patients filled the cardiac catheterization knowledge questionnaire in the presence of the investigator or it was filled by the investigator for illiterate patients before the procedure. Application of early ambulation intervention for the study group while the control group receives the routine hospital care. Posttest was completed by both two groups after 2 days post catheterization.

**Field work will include four phases:**

**Assessment Phase:** the investigator interviewed with available patients before the procedure to explain the aim of the study and take their approval to participate in the study, then the basic assessment was done and data was collected from both groups. Also assessment of patient's knowledge regarding diagnostic cardiac catheterization procedure and importance of early ambulation following the procedure was done.

**Planning Phase:** the educational session was designed based on analysis of the actual patients' needs in pre assessment by using the pre constructed tools. The content was written in a simple Arabic language and consistent with the related literatures. Moreover, met patients' needs and their level of understanding.

**Implementation Phase:** during this phase the investigator work with each patient throughout two sessions: first session concerned with theoretical part and took around 60 minutes to improve patient's knowledge regarding cardiac catheterization procedure throughout. The investigator gave the study group the booklet and explained all its contents to the patient after the procedure. Second session, practical session to improve patient's outcomes by helping patient's to ambulate early after the sheath removed after the procedure and take about 35 minutes. Post test was completed from both groups after 7 days post catheterization by the investigator.

**Evaluation Phase:** each patient evaluated by the investigator for three times using tool II and III. Evaluate vascular complication and back pain by using patient assessment sheet (Tool III) after the procedure before and after ambulation and in the next morning. Assessment of patient knowledge after one week of discharge from hospital by using post test (Tool II).

**Administrative Design:**

An official permission was obtained from the dean of the National Heart Institute and Head of the cardiology department at the National Heart Institute in which the study was conducted. A letter was issued to them from the faculty of nursing; Helwan University explains the aim of the study to obtain the permission for data collection.

**Statistical Design:**

Qualitative data were presented as frequencies (n) and percentages (%). Chi-square test (or Fissure's Exact test when applicable) were used for comparisons between the two groups. McNemar's test was used to study the change at the end of treatment for binary variables. Friedman's test and Wilcoxon signed-rank test were used to study the change at the end of treatment for other qualitative variables. Numerical data were presented as mean, median, standard deviation (SD) and range values. Student's t-test was used to compare between mean age values in the two groups. Mann-Whitney U test was used to compare between two groups.

The significance level was set at  $P \leq 0.05$ . Statistical analysis was performed with IBM SPSS Statistics Version 20 for Windows.

### 3. RESULTS

**Table (1)** shows that, 71.4% of both control and study group were male, 28.6 % of both groups were female. The mean  $\pm$  standard deviation values of age in the study group were  $53.17 \pm 10.16$  years old, mean  $\pm$  standard deviation values of age in the control group were  $55.65 \pm 10.63$  years old. More than half of the control group (60.0%) had secondary education, 45.7% of the study group had secondary education. In relation to marital status, the majority of the sample in

both study and control group were married 82.9%, 88.6. From the above data, there were no any statistically significant difference regarding socio-demographic characteristics among both study and control group.

**Table (2)** showed that, there was highly statistically significant difference between bed rest and hospital stay after the procedure in the two groups ( $P$ -value  $<0.000$ ). Study group patients takes less time in bed rest after the procedure and also decrease time of hospital stay than the control group. There was no statistically significant difference between the two groups regarding, pulse( $P$ - value= 0.307) as well as Blood pressure( $P$ - value= 0.567) and there was no statistically significant difference between the two groups regarding the current medication history of anti- hypertensive( $P$ - value= 0.151). Ca channel blocker( $P$ - value= 0.500), vasodilators( $P$ - value= 0.500), antiplatelets ( $P$ - value= 500), stains and lower lipid agent( $P$ - value= 0.803) as well as beta blockers( $P$ - value= 0.461).

**Table (3)** shows that, all the study group had no bleeding before, after ambulation and next morning, while 2.9 % of the control group had bleeding only before ambulation. 11.4 % of the study group had minor hematoma  $\leq 5$  cm next morning, while the control group was 17.1%. The same table illustrates that, there was no statistically significant difference between the two groups regarding bleeding and hematoma formation before, after ambulation and next morning ( $P$ -value= 0.500, 0.500, 0.367).

**Table (4)** illustrates that, there was no statistically significant difference between the study and control groups pre the knowledge assessment questionnaire and there was a highly statistically significant difference between the study and control groups post the educational session( $P$ - value= 0.000).

**Table (1): Comparison between the two studied groups regarding socio-demographic characteristics (n=35 for each group) :**

Variable	Study group		Control group		X <sup>2</sup>	P
	No	%	No	%		
<b>Sex:</b>						
Male	25	71.4	25	71.4	1.5	0.828
Female	10	28.6	10	28.6		
<b>Age:</b>						
20-40	3	8.6	6	17.1	2.99	0.224
41-60	24	68.6	17	48.6		
>60	8	22.9	12	34.3		
<b>Age: Mean± SD</b>	53.17±10.16		55.65±10.63		T=	0.321
					1.01	
<b>Educational level:</b>						
Illiterate	5	14.3	5	14.3	2.34	0.673
Read and write	4	11.4	4	11.4		
Preparatory level	8	22.9	4	11.4		
Secondary level	16	45.7	21	60		
University education	2	5.7	1	2.85		
<b>Marital status:</b>						
Single	4	11.4	1	2.9	2.07	0.356
Married	29	82.9	31	88.6		
Widow	2	5.7	3	8.5		
<b>Occupations:</b>						
Professional	9	25.7	11	31.4	5.6	0.231
Employed	8	22.2	7	20.0		
Unemployed	4	11.4	1	2.9		
Retired	5	14.3	7	20.0		
Housewife	9	25.7	9	25.7		
<b>Smoking history:</b>						
Smoker	13	37.1	13	37.1		0.598
Non smoker	22	62.9	22	62.9		
<b>Diagnosis:</b>						
Ischemic heart disease	28	80.0	31	88.6	9.2	0.330
Others	7	20.0	4	11.4		

\*Significant at  $P \leq 0.05$

Table (2): Comparison between the two studied groups regarding the Angioplasty Assessment (35 for each group):

Variable	Study group		Control group		X <sup>2</sup>	P
	No	%	No	%		
<b>Bed rest after the procedure:</b>						
≥ 4 h	35	100.0	0	0.0	70	0.000*
≤6 h	0	0.00	35	100.0		
<b>Length of hospital stay after CC:</b>						
5hrs					70	0.000*
7hrs	35	100.0	0	0.0		
8hrs	0	0.00	23	65.7		
24hrs	0	0.00	10	28.6		
	0	0.00	2	5.7		
<b>Pulse:</b>						
Normal	34	97.1	32	91.4		0.307
Abnormal	1	2.9	3	8.6		
<b>Blood pressure:</b>						
Normal	28	80	26	74.3	0.32	0.569
Abnormal	7	20	9	25.7		
<b>Current medication:</b>						
Anti-hypertensive	14	40.0	20	57.1	2.60	0.151
Ca Channel blockers	1	2.9	2	5.7		
Vasodilators	0	0.00	1	2.9		0.500
Anti-platelets	30	85.7	31	88.6		0.500
Statins & lower lipid agents	22	62.9	23	65.7	0.06	0.803
Beta-blockers	12	34.3	15	42.9	0.54	0.461
	<b>Mean ± SD</b>		<b>Mean ± SD</b>			<b>P</b>
<b>Time of compression by minutes:</b>	1.86 ± 0.36		1.97 ± 0.17			0.09
<b>Number of affected vessels:</b>	1.6 ± 1.09		1.69 ± 1.21			0.684

\*Significant at P ≤ 0.05

Fig (1): Bar graph representing comparison of incidence of back pain between study and control group.

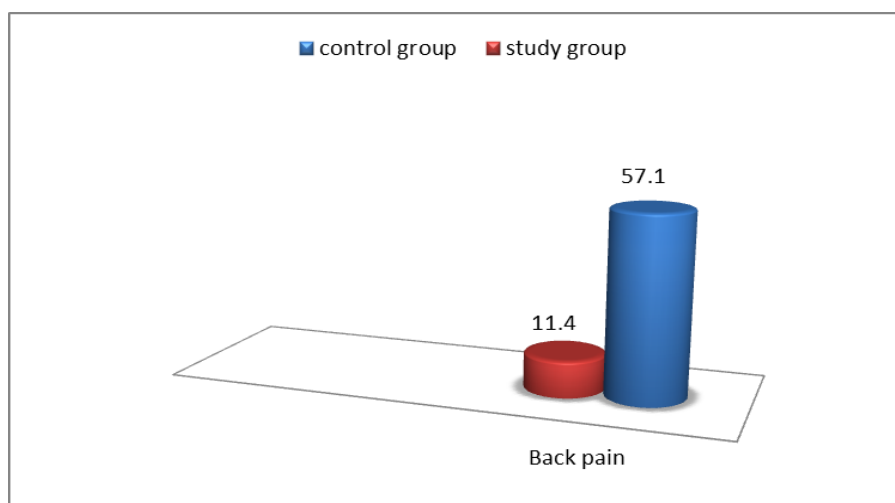


Figure (1) show that, 57.1 % of control group had a back pain, while the study group was 11.4%.

Table (3): Comparison between the two studied groups regarding post cardiac catheterization vascular complications (n=35 for each group):

Variable	Before ambulation				After ambulation				Next morning			
	Study group		Control group		Study group		Control group		Study group		Control group	
	N	%	N	%	N	%	N	%	N	%	N	%
<b>Bleeding:</b>												
No	35	100	34	97.1	35	100	35	100	35	100	35	100
Minor	-	-	1	2.9	-	-	-	-	-	-	-	-
p					0.500							
<b>Hematoma</b>												
No	35	100	34	97.1	35	100	34	97.1	31	88.6	24	65.7
≤ 5 cm	-	-	1	2.9	-	-	1	2.9	4	11.4	6	11.7
X <sup>2</sup> , p	0.500				0.500				0.463, 0.367			

\* Significant at P ≤ 0.05

Table (4): Comparison between the knowledge of the two studied groups pre and post the educational session:

Total Knowledge	Study group		Control group		X2	P
	N	%	N	%		
<b>Pre test</b>	2	5.7	0	0.0		0.25
Mean ± SD	5.60 ± 3.24		5.34 ± 2.84			0.799
<b>Posttest</b>	26	74.3	2	5.7	62.23	0.000*
Mean ± SD	18.69 ± 1.95		9.29 ± 2.20			0.000*

\*Significant at P ≤ 0.05

#### 4. DISCUSSION

Cardiac catheterization and percutaneous coronary interventions are widely used procedures in the evaluation and treatment of patients with coronary artery disease. The safety and comfort of these procedures have been the subject of continuous research, in particular the issue of early ambulation post- catheterization done through the femoral artery (Kobrossi, Tamim and Dakik, 2014).

The result Considering gender of the studied patients, the present study showed that two thirds of patients in the study and control groups were male. This finding could be due to the high exposure to life stress, and female hormones protect female from CAD and smoking habits in males, which consider the major risk factors of coronary artery disease among male more than female. This result is in accordance with Kobrossi, et al (2014) who reported that all of their subjects were male.

As regards to the age of the studied patients, the present study revealed that, study and control groups were more than forty years with a mean age (53.17±10.16 & 55.65± 10.63). This finding could be due to that CAD has no age as it might be heredity or acquired because of unhealthy lifestyle like smoking and unhealthy food. This finding was supported by Abdollahi, Mehranfard, Behnampour, and Kordnejad (2015) who found that, mean age in their study for both study and control group was (55.5 ±7.40 & 55.4±7.81) respectively.

In relation to studied patients` educational level, more than half of the study group and half of the control group were secondary educated, while university education represent the minority in both groups. This result supported by Chair, et al (2012) who revealed that one third of both study and control groups were secondary educated. This result is not in line with, World Health Organization (2011) which stated that one fifth of studied patients had College or university education.

In relation to marital status, the study result illustrated that, more than three quarter of the two studied groups were married. This finding could be due to the majority of the studied patients were aged between 30-70 years old. This finding is consistent with the finding of Elsaid Soliman, Sobh, and Maaty(2015) who clarified that the majority of their studied patients were married.



As regards to the occupation of both study and control groups, the present study demonstrated that one third of the study and control group were professional like drivers. This finding could lead to CAD as it increases the tension and nature of work which may lead to increased hypertension which lead to increase risk factors for CAD. This finding is not in line with the finding of **Chair et al. (2012)** who mentioned that the half of their studied patients were retired.

Regarding to habits like smoking, the result of the study revealed that one third of both study and control groups were smokers. This finding could be due to smoking habit is considered from major risk factors of CAD, and also considered from familiar habits of the Egyptians. This finding is consistent with the finding of **Kobrossi et al. (2014)** who reported that more than one third of the both study and control groups were smokers. As well, this finding is supported by **Lauck, Johnson and Ratner (2009)** who reported that one quarter of the studied patient's were smokers.

Management of hemostasis at the access site after CC is important to reduce complication, increase patient comfort and safety and reduce hospital stay. The current study clarified that all the patients from both groups using manual compression after sheath removal rather than using the femostop or any other device to compress on the puncture site after the sheath removed. The usage of manual compression rather than any device such as femostop preferred because the incidence of bleeding that result after sheath removal decreased with the manual compression. This result is consistent with **Sekhar, Sutton, Raheja, Mohsen, Anggelis, Keith, Dawn, Straton, and Flaherty (2016)** who stated that all the patient had a manual compression after sheath removal rather than using any closure device.

As well, the finding is in the same line with **Boztosun et al, (2008)** who reported that the manual compression hemostasis followed by bed rest has been the standard of care following cardiac catheterization via femoral access. However, there are no guidelines on optimal duration of bed rest following the procedure .Studies have shown that early ambulation doesn't increase the risk of vascular complications and improves patient comfort.

Regarding total patients` knowledge about anatomy and physiology of the cardiovascular system and about cardiac catheterization types, care needed before and after, and complications after the procedure, the result of the present study revealed that, the majority of the studied patients from both study and control groups had an unsatisfactory level of knowledge about cardiovascular disease and cardiac catheterization. This could be due to low educational level of the studied patients, and being for the first experience doing this procedure.

Education has been shown to significantly decrease cardiac mortality, improve psychological status and quality of life, enhance compliance, improve satisfaction with medical care and decrease risk factor behaviors in patients after cardiac catheterization. This finding is consistent with **Mohammed, (2015)** who found that the total score of the patient's level of knowledge was unsatisfactory level and patients undergoing cardiac catheterization need a lot of information before and after the procedure.

Regarding back pain, the present study demonstrated that, there was a statistically significance difference between both study and control groups regarding back pain intensity after bed rest following the procedure. One fifth of the study group and more than the half of the control group had a low back pain. This could be due to the patients who ambulated early had a low incidence of back pain unlike the control group who ambulated late and had a higher incidence of back pain from prolonged bed rest. This finding supported by **Mohammady et al. (2014)** who found that, Early ambulation was associated with a lower level of back pain intensity and the study group had low level of back pain than the control group. Also, this finding is in agreement with **Sabzaligol, Shariat, Varaei, Mehran, and Bassampour (2010)** who Clarified that there was a highly statistically significant difference between two groups regarding back pain and the study group had low incidence of back pain than the control group.

Regarding vascular complication's post CC, bleeding after the procedure there was no statistically significance between the study and control groups. This finding may be due to manual compression for 10-15 minutes after sheath removal and bandage used in the femoral area where the sheath is removed. This finding is supported by **Schiks, Schoonhoven, Aengevaeren, Nogarede-Hoekstra, Achterberg and Verheugt, (2009)** who found that there were no statistically significant differences regarding bleeding between early ambulation group and late ambulation group.

Regarding hematoma formation, there was no statistically significant difference between control and study groups. One fifth of the study group and two fifth of the control group patients had minor hematoma. This result revealed that early ambulation of the patient after sheath removal within 4hrs is safe. This study in agreement with this result of **Schicks, et al (2009)** who found that there was no statistically significant difference between early ambulation group and late ambulation group regarding hematoma formation but the early ambulation group had a lower incidence of hematoma than the late ambulation group.

## 5. CONCLUSION

Early ambulation post the diagnostic cardiac catheterization is not only feasible and safe, but has beneficial effects on patient comfort through decreasing back pain, hematoma formation and overall satisfaction and also patients undergoing diagnostic cardiac catheterization showed an unsatisfactory level of knowledge about anatomy and physiology of the heart and cardiac catheterization but the study group showed a satisfactory level of knowledge after the educational session. Patients undergoing CC can safely get out of bed after 4 hours of bed rest. Reduced time for bed rest can decrease back pain and promote general well being of patients. The potential benefits of early ambulation of decreasing nursing time needed for post CC patient care, decreasing hospital length of stay and reducing hospital costs cannot be neglected. Therefore, early ambulation at 4 hours after CC is an acceptable strategy to improve patient care outcomes after trans-femoral CC.

## 6. RECOMMENDATION

Based upon results of the current study, the following recommendations are suggested:

### Recommendations related to patients:

- Apply early ambulation for patient's undergoing cardiac catheterization with established guidelines of nursing care
- Provide comprehensive education and self-care after the procedure for patient's undergoing cardiac catheterization .
- Provide adequate information about heart disease for patients undergoing cardiac catheterization, such intervention will faster the cope with the situation and prevent deterioration of disease.

### Recommendations for furthers researches:

- Replication of the study on larger probability samples.
- Further studies have to be carried out in order to determine the effect of early ambulation post therapeutic cardiac catheterization on patient's outcomes.

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