

Efficacy of Safety Nursing Measures on Clinical Outcomes of Patients Undergoing Emergency Transradial Percutaneous Coronary Intervention.

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Abstract

Background: - The transradial approach is recommended for percutaneous coronary intervention (PCI) due to decreased associated complications. Safety nursing measures involved in transradial PCI are critical for better outcomes. **Aim:** -This study aimed to determine the efficacy of implementing safety-nursing measures on clinical outcomes of patients undergoing emergency transradial percutaneous coronary intervention. **Design:** - Quasi-experimental research design. **Setting:** - This study conducted in coronary care unit at Tanta Main University Hospital. **Subjects:** - Convenience sample of 60 adult patients undergoing transradial PCI divided into two equal groups, control group received routine care by coronary nursing staff and study group managed by safety nursing measures that implemented by the researcher. **Tools:** -Two tools had been used. **Tool I:** Structured interview schedule. **Tool II.** Transradial percutaneous coronary intervention: clinical outcomes assessment tool. **Results:** There was significant difference between both groups in relation to bleeding, hematoma, neurovascular complications and wrist pain but it was not significant in relation to hand ischemia and compartment syndrome. **Conclusions:** Safety nursing measures which included safety measures before, during the procedure and safety measures after the procedure that consisted of continuous monitoring of hemodynamic parameters, cold application around insertion site, blood pressure cuff inflation, interventional limb raising management strategy and velpau bandage had a positive effect on patients' clinical outcomes. **Recommendations:** - Safety nursing measures should be carried out as a routine care for patients undergoing emergency transradial PCI.

Key words: Safety nursing measures, Emergency transradial PCI, Clinical outcomes

Introduction

Percutaneous coronary intervention (PCI) is an invasive technique that aims to relieve the narrowing or blockage of the coronary artery and reestablish arterial blood flow to heart tissue. Usually, this is accomplished using of different techniques, the most popular ones being inflating the narrow portion or inserting a stent to maintain the artery open (**Stouffer, 2019; Ahmad et al., 2022**). Emergency or primary PCI is the urgent use of PCI in people with acute heart attack, myocardial infarction or unstable angina particularly if the ECG shows signs of cardiac damage. Acute coronary syndrome (ACS) patients' mortality rate has been effectively reduced by emergency PCI (**Milojevic et al., 2018; Toshima et al., 2021**).

During percutaneous coronary intervention, peripheral arteries, such as the femoral, brachial or radial artery, give the access to the coronary arteries to enable the performance of diagnostic or therapeutic (or both) procedures (**Kolkailah et al., 2018; Thomas et al., 2021**). Transfemoral access (TFA) is currently the most applied access site for PCI of complex coronary lesions, especially when large-bore guiding catheters are required. However, results from clinical trials indicated that the TFA was associated with increased access site bleeding complications, especially for emergency procedures such as primary PCI than elective procedures (**Batra et al., 2020**).

The transradial access (TRA) for percutaneous coronary procedures has been associated with several benefits as compared to transfemoral technique, and has become the default for coronary angiography and intervention. Over the past three decades, a substantial body of evidence supporting the transradial strategy has been gathered, encouraging its global adoption (**Scalise et al., 2019**). In general, TRA approach is preferred to reduce the risk of access site hemorrhage because the radial artery can be easily compressed against the radial bone compared to the femoral artery. However, because of its small size, access to the radial artery needs more experience and training (**Cantor et al., 2015**). The main complications for this approach loss of radial pulse, radial artery spasm and infrequent to rare adverse effects

may include compartment syndrome and pseudo syndrome (**Choi et al., 2020 & Isawa et al., 2020**).

Patient safety in intensive care units has received more attention lately. The cornerstone of providing high-quality healthcare is patient safety practices. Patient safety necessitates ongoing monitoring and the pursuit of novel approaches since adverse events are frequently employed as markers of safety in the provision of health services (**Bassuni & Bayoumi, 2015**). Objectives of nursing management for the patient undergoing emergency transradial PCI are decreased PCI problems, increased patient satisfaction, and improved clinical outcomes (**Meng & Huimin, 2018**). In order to prevent difficulties, measures like bed rest, skin preparation prior to procedure, serial electrocardiography (ECGs), continuous monitoring of oxygen saturation, vital signs, and postoperative injury care should be used (**Smeltzer et al., 2020 & Zhang et al., 2020**).

For patients undergoing transradial PCI, critical nursing care is essential. The nurse must regularly assess peripheral circulation in the interventional extremity, considering factors like capillary refill time, peripheral skin color temperature, and the presence of peripheral pulses (**Abd El-Aty & Abozead, 2018**). Most studies compare different dedicated mechanical devices that consist of pneumatic or rotational compression systems with the shape of wristbands (**Lavi et al., 2017**). Additionally, applying compression at the site of the radial artery puncture for approximately 30 to 60 minutes following the removal of the introducer sheath using a sterile dressing composed of sterile gauze cushion and hypoallergenic adhesive tape is safe and effective in preventing bleeding (**Campos et al., 2018**). Hemostasis in forearm bleeds from distant sites can be achieved by compressing the brachial artery with a sphygmomanometer cuff (**Chugh et al., 2015**).

Following transradial PCI, the interventional limb raising management strategy (ILRMS) is applied. ILRMS improves the level of general comfort for patients undergoing transradial PCI and shows promise in reducing wrist metacarpus swelling

and pain more effectively (Zhong, 2016). It was recently discovered that cold application on interventional limb after the arterial sheath is removed lessens the likelihood of hematoma formation, ecchymosis, and pain at the catheter site (Bayındır et al., 2017; Kurt & Kaşıkçı, 2019).

Significance of the study: - Globally, it's estimated around 200 million people are suffering from coronary artery diseases (CADs) and high percentage of them require coronary intervention as first line of management. CAD is one of the most common contributors to disability and morbidity for both sexes, combined with the largest increase in low and middle-income countries. Further, the burden of CAD and PCI complications on the government, health care systems, families, and patients are increasing worldwide (Gomar et al., 2016). Recent approaches for management of the patients undergoing transradial PCI have completely changed the role of the coronary care nurse. Therefore, the aim of the present study is to examine of the effect of implementing safety-nursing measures on emergency transradial PCI patients' clinical outcomes.

Aim of the study was to determine the efficacy of implementing safety-nursing measures on clinical outcomes of patients undergoing emergency transradial percutaneous coronary intervention. **Research hypothesis:** Patients undergoing emergency transradial percutaneous coronary intervention in study group who exposed to a safety nursing measures exhibit reduction in wrist pain with little or no progression of transradial PCI complications as bleeding, compartment syndrome, forearm hematoma, hand ischemia and neurological complications including arm numbness and tingling than patients in control group.

Subjects and method

1. Research design: Quasi-experimental research design was utilized. **2. Setting:** This study conducted in coronary care unit of Tanta University Hospital. **3. Subjects:** Convenience sample of 60 adult patients undergone transradial

percutaneous coronary intervention were selected and assigned on Epi-info program and divided alternatively into two equal groups: **Control group**, had been received their routine nursing care by hospital nursing staff and **study group**, managed by safety nursing measures as developed and implemented by the researcher. The subjects of this study had been selected according to the following criteria: conscious, newly admitted adult patients, of both sexes, Free from any associated diseases including bleeding disorders (hemophilia) and liver disease.

4. Tools: Two tools had been used: **Tool (1) Structured Interview Schedule** was developed by the researcher and included patient's sociodemographic characteristic, clinical data and hemodynamic parameter assessment. **Tool (II):- Transradial percutaneous coronary intervention: clinical outcomes assessment tool**, this tool was developed by the researcher based on extensive review of recent relevant literature (**Choi et al., 2020 & Isawa e al., 2020**) and it included the following transradial PCI complications.

External bleeding means more than one 4×4 gauze, and no bleeding means there was one 4×4 gauze. Put circle by pen on the spot of the blood that appears on dressing pad post relieving of the pressure on the catheter insertion site.

Hematoma was defined as accumulation of blood at skin level with bruising or swelling in the area of the artery punctures. Hematoma size measured by identification of hematoma border firstly by palpation then the diameter measured by a ruler. Significant hematoma measurement was $>5\text{cm}^2$ while non-significant $\leq 5\text{cm}^2$ (**Bertrand, 2010**). **Hand ischemia** was suspected when there are five Ps which including (pallor, pain, pulselessness, paresthesia and poikilothermia) and delayed capillary refill time.

Neurovascular complications included, hand numbness and tingling.

Compartment syndrome was suspected when there was forearm swelling and acute forearm pain following the procedure, measuring forearm and arm diameter by using tape. Swelling value of the index finger circumferences at the interventional limb, mild swelling measurement $<5\text{cm}$, moderate swelling

measurement 5-10 cm while severe swelling measurement >10cm (**Shroff e al., 2013**).

- **Assessment of wrist pain using visual analogue scale**, this part used to measure severity of pain. Patient's severity of pain measured on visual analogue scale across a continuum from none to an extreme pain. Visual analogue scale is usually a horizontal line; 10 cm in length, the patient makes on the line the point that they felt represents their perception of their pain. **Scoring system was as follow:** No pain equal score (0), mild pain score range from 1-3, moderate pain range from 4-6 and sever pain range from 7-10 (**Hjermstad et al., 2011**).

Research method

-Hospital permission was obtained from the responsible authority of cardiac care units and data were collected over a period of 7 months. The developed tools were tested for content validity by nine experts in the field of medical-surgical, critical care nursing, cardiologists and medical biostatistics.

- A pilot study was carried out on 6 patients to test the applicability and feasibility of the tools. Written informed consent was obtained from the patients or their families to participate in the study after explaining the aim of the study. Confidentiality and privacy were assured using code number instead of name and withdrawal from the study was allowed at any time.

During **assessment phase**, both groups were assessed to collect base line data by using study's tools. During **planning phase**, safety-nursing measures were developed based on patient's goals, priorities and expected clinical outcomes. **In implementation phase:- control group participants** were received their routine hospital nursing care as provided to the patients by coronary care nurses while **study group patients** were received their safety nursing measures that implemented by the researcher and agreed by the treating physician in the coronary care unit, it included the following:-

1) Safety nursing measures for patient preparation before transradial (PCI):- include psychological and physical preparation in addition to assessment of the collateral circulation by performing barbeau test (modified Allen's test).

2) Safety nursing measures during PCI in the cardiac catheterization laboratory
- Protection the patient from infection by hand washing and disinfection of the hand with alcohol, wearing facemask, surgical gown and sterile gloves. Calm and instruct the patient to take deep breathing exercise during insertion of catheter, and to inform the physician or the nurse if chest pain occurs. Continuously monitor patient hemodynamic parameter for abnormalities.

3. Safety nursing measures after the procedure

A. Before removal of PCI sheath:- Keep the patient in bed rest on supine position with continuous monitoring of hemodynamic parameter. Assessment of distal pulse and capillary refill time and insertion site for hematoma and bleeding. . **Cold**

application:- Application of cold pack around insertion site for the first 5 minutes before withdrawing the radial arterial catheter to reduce pain and hematoma.

B. During removal of PCI sheath:-

Inflate blood pressure cuff, select a pressure of 20 mmHg, during removal the sheath to decrease blood flow to the insertion site. Instruct the patient to take deep breathing during removal the sheath to decrease pain sensation.

Post removal of PCI sheath

1. Blood pressure cuff inflation:- To inflate blood pressure cuff, select a pressure of 20 mmhg and deflate every 15 minutes. Finger O₂ saturation monitored at the same time of inflated blood pressure cuff.

2. Interventional limb raising management strategy (ILRMS)

Interventional limb raising management strategy is used post transradial PCI by using intervention upper limb pad (IULP) which is 30 –degree angle sloping triangular sponge pad that the patient can stably place forearm on it for 3 hours with their palm faced up. While ambulating, patient needs to maintain the interventional limb above heart level.

3. Velpeau bandage: - After hemostasis occurs, velpeau bandage was used to maintain mild positive pressure and reduce hand swelling. Movement activities of metacarpophalangeal joint of index finger for 10 minutes every one hour.

Evaluation phase: - Evaluation was done for both control and study groups three times before removal the sheath and after 6 hours and 24 hours post removal the sheath by using tool (III).

Results: - **Table (1) illustrates distribution of studied patients undergoes emergency transradial PCI according to their socio demographic characteristics.**

In the study group, observation revealed that 60.0% of the patients were between 51 to 60 years old with a mean age of 46.63 ± 10.60 , while in the control group, the results showed that 40.0% of the patients were between 51 to 60 years old with a mean age of 47.40 ± 7.96 . Regards to sex, it was noticed that more than two thirds of the study and control groups patients 66.7% and 70.0% were male respectively. **Concerning to marital status and educational level**, it showed that most of patients were married 80.0% and 76.7% in the study and control group. Moreover, nearly half 46.7% and 30.0% of the study and control groups' patients had secondary school education. As for occupation, 33.3% and 26.7% of the patients in study and control groups were manual worker respectively. This table revealed that more than half 53.3% of the study and control groups' patients live in rural areas. In relation to duration of CCU stay, it presented that the most 86.7% of the study group and 70.0% of control group patients were stayed for one day.

Figure (1) presents distribution of studied patients undergoing emergency transradial PCI according to their clinical data between control and study groups. It clarified that 40.0% of the study group's patients had NSTEMI while the highest percentage of the patients in control group 33.3% had unstable angina. **Concerning chief complains**, 60.0% and half (50.0%) of the study and control groups, patients had orthopnea. In addition, 80.0% and 46.7% of the patients in study and control group had dyspnea respectively. **Regarding to chest pain**, 40 % and one-third (33.3 %) of the patients in study group had stabbing and throbbing pain

respectively, while 43.3% and one third 33.3% of the patients in control group had burning and stabbing pain respectively.

Figure (2) describes distribution of the bleeding clinical outcome of the patients between control and study groups. It observed that 13.3% of the study group had bleeding before removal the sheath. In relation to control group, slightly less than one quarter (23.3%) of them had bleeding, 28.5% of them had internal bleeding and 71.5% of them had external bleeding. **Table (2) distributes the patients undergoing emergency transradial PCI according hematoma of control and study groups.** It clarified that 13.3% of the study group had hematoma before removal of sheath, while all of them (100.0%) had no hematoma after 6 and 24 hours of removal the sheath. In relation to control group, slightly less than one quarter (23.3%) of them had hematoma, before removal of sheath. After 6 hours, 16.7% of patients in control group had hematoma while, after 24 hours, only 13.3% of control group had hematoma.

Figure (3) illustrates distribution of the patients in control and stud groups regarding compartment syndrome. It clarified that only 6.7% of the study group had compartment syndrome before removal of sheath compared by none of them post removal of sheath. While, nearly one quarter (26.7%) of control group had compartment syndrome before removal of sheath compared by 20.0% and none of them after 6 and 24 hours post removal of sheath respectively. **Figure (4) shows distribution of the studied patients regarding hand ischemia.** It found that 13.3% and 30% of patient the study and control groups respectively had compartment syndrome before removal of sheath. While, 6.7% and 20% of study and control groups' patient had compartment syndrome after 6 post removal of sheath respectively. **Table (3) illustrates distribution of the patients between control and study groups regarding neurological complication.** It clarified that (26.7%) of the study group's patients had neurological complications before removal the sheath compared by 6.7% and none of them after 6 and 24 hours post removal the sheath respectively. In addition, (46.7%) of the control group's patients had neurological complications before removal the sheath compared by 40% and 23.3% of them after 6 and 24 hours post

removal the sheath respectively. **Table (4) illustrates distribution of the studied patients regarding severity of wrist pain.** It found that 50% of the study group patients and 43.3% of the control group patients had described pain severity as hurts even more before removal the sheath. After 24 hours post removal the sheath, 40 % of the study group patients had hurt little bit pain and 36.7% of the control group patients had described pain severity as hurts little more.

Table (1): Distribution of patients undergoing emergency transradial PCI according to their socio demographic characteristics between control and study groups.

Socio-demographic Characteristics	The studied patients (n=60)				χ^2	P
	Study group (n=30)		Control group (n=30)			
	N	%	N	%		
Age					0.723	0.694
• 31 – 40	4	13.3	9	30		
• 41 – 50	8	26.7	9	30		
• 51 – 60	18	60	12	40		
Range	31 – 60		32 – 59			
Mean \pm SD	46.63 \pm 10.60		47.40 \pm 7.96			
Sex					0.077	0.781
• Male	20	66.7	21	70		
• Female	10	33.3	9	30		
Marital status					0.098	0.754
• Married	24	80	23	76.7		
• Widow	6	20	7	23.3		
Educational level					4.305	0.506
• Illiterate	4	13.3	7	23.3		
• Read and write	8	26.7	7	23.3		
• Primary education	0	0	2	6.7		
• Secondary education	14	46.7	9	30		
• Bachaluric	3	10	3	10		
• Master	1	3.3	2	6.7		
Occupation					1.093	0.779
• Manual work	10	33.3	8	26.7		
• Employee	6	20	6	20		
• House wife	10	33.3	9	30		
• Not work	4	13.3	7	23.3		
Residence					1.348	0.510
• Rural	16	53.3	16	53.3		
• Urban	4	13.3	7	23.3		
• City	10	33.3	7	23.3		
Duration of CCU stay (in days)					2.805	0.246
• 1	26	86.7	21	70		
• 2	3	10	8	26.7		
• 3	1	3.3	1	3.3		

Figure (1): Distribution of studied patients undergoing emergency transradial PCI according to their clinical data between control and study groups.

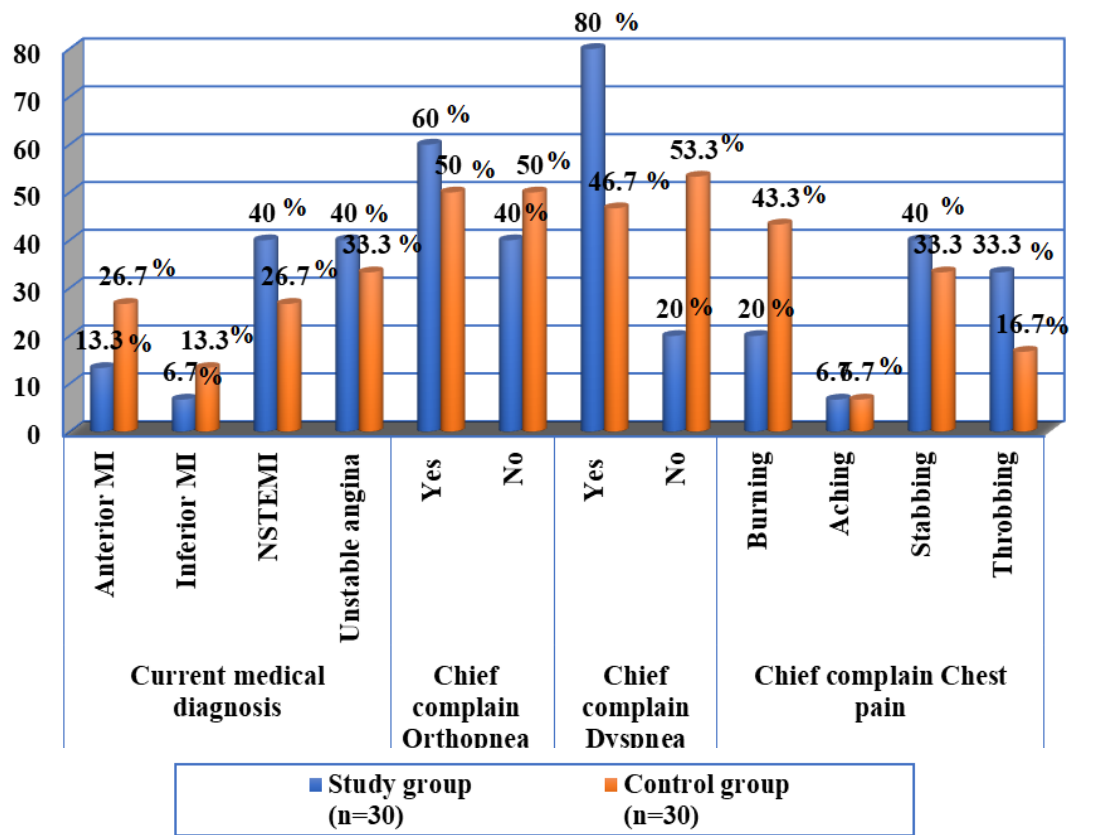


Figure (2): Distribution of the bleeding clinical outcome of the patients between control and study groups.

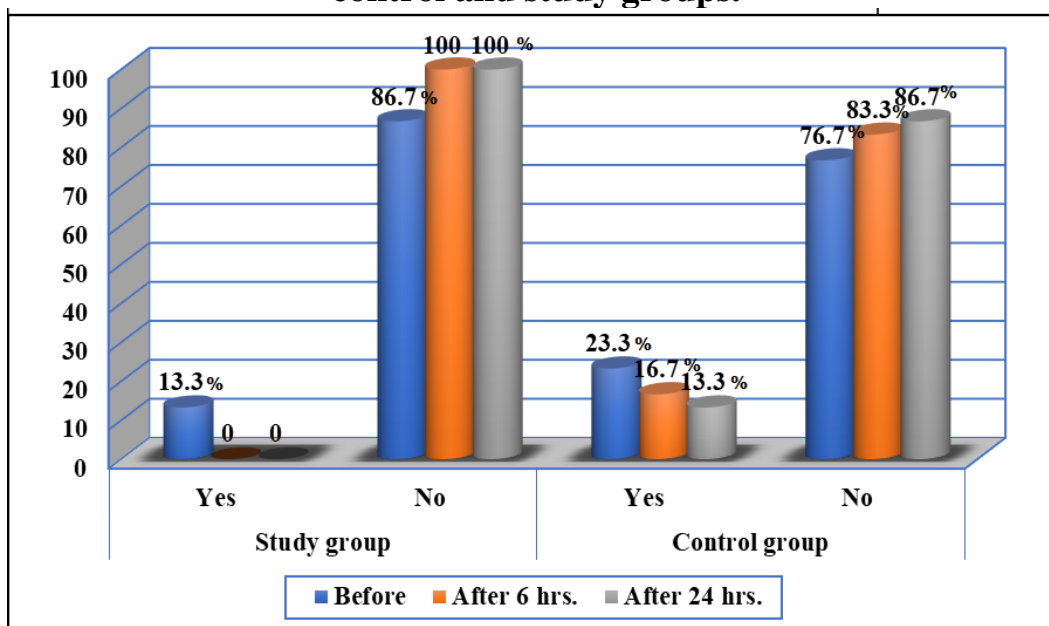


Table (2):- Distribution of the studied patients undergoes emergency transradial PCI in control and study groups according hematoma formation.

Hematoma	The studied patients (n=60)													
	Study group (n=30)							Control group (n=30)						
	Before		After 6h.		After 24h.		χ^2 P	Before		After 6h.		After 24h.		χ^2 P
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	
Hematoma														
Yes	4	13.3	0	0	0	0	8.372	7	23.3	5	16.7	4	13.3	1.064
No	26	86.7	30	100	30	100	0.015*	23	76.7	25	83.3	26	86.7	0.587
χ^2 (study Vs control)	1.002		5.455		4.286									
P	0.317		0.020*		0.038*									
Size of hematoma														
Significant hematoma > 5 cm	2	50	0	0	0	0	--	3	42.8	2	40	2	50	0.343
Non-significant hematoma ≤5 cm	2	50	0	0	0	0	--	4	57.2	3	60	2	50	0.842
χ^2 (study Vs control)	0.052		--		--									
P	0.819		--		--									

Figure (3):- Distribution of the clinical outcome of the patients between studied groups regarding compartment syndrome.

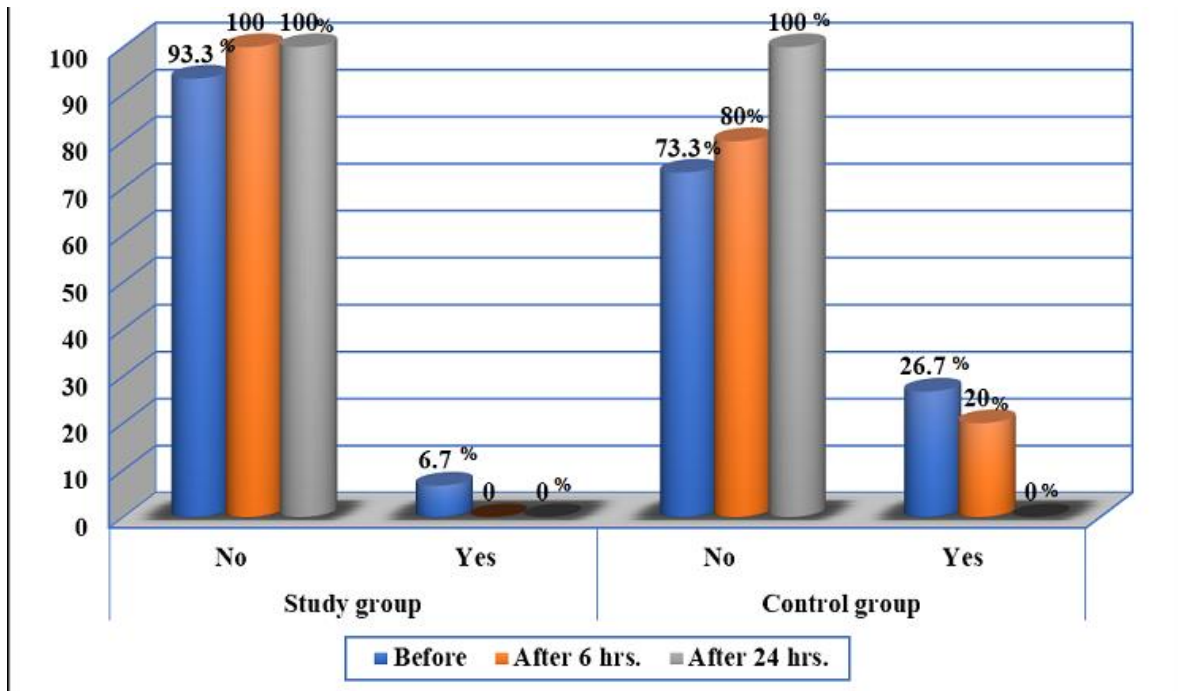


Figure (4):- Distribution of the clinical outcome of the patients between studied groups regarding hand ischemia.

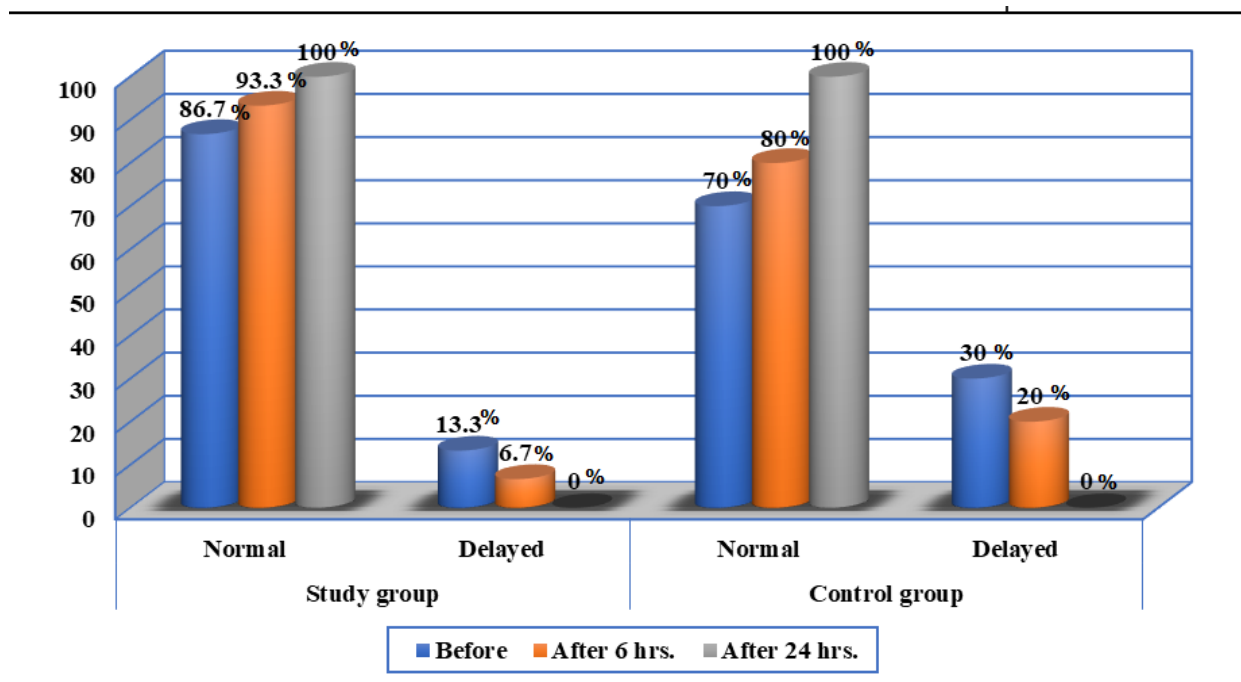


Table (3): Distribution of patients undergoing emergency transradial PCI according to neurological complications of control and study groups.

Neurological complication	The studied patients (n=60)						χ^2	P
	Before		After 6h.		After 24h.			
	No.	%	No.	%	No.	%		
Study group								
• No	22	73.3	28	93.3	30	100	11.702	0.003*
• Yes	8	26.7	2	6.7	0	0		
Control group								
• No	16	53.3	18	60	23	76.7	3.732	0.155
• Yes	14	46.7	12	40	7	23.3		
χ^2	2.581		9.322		7.921			
P value	0.108		0.002*		0.005*			

(*) Statistically significant difference at level P < 0.05.

Table (4):- Distribution of the patients undergoes emergency transradial PCI according to wrist pain of study and control groups.

Wrist pain	The studied patients (n=60)												χ^2 P	
	Study group (n=30)						Control group (n=30)							
	Before		After 6h.		After 24h.		Before		After 6 h.		After 24 h.			
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Pain Severity														
No hurt	0	0	10	33.3	18	60	72.040 0.0001**	0	0	0	0	0	0	7.893 0.444
Hurts little bit	0	0	8	26.7	12	40		2	6.7	2	6.7	5	16.7	
Hurts little more	10	33.3	10	33.3	0	0		5	16.7	8	26.7	11	36.7	
Hurts even more	15	50	2	6.7	0	0		13	43.3	10	33.3	6	20.0	
Hurts whole lot	3	10	0	0	0	0		7	23.3	8	26.7	7	23.3	
Hurts worst	2	6.7	0	0	0	0		3	10	2	6.7	1	3.3	
χ^2 (study Vs control)	5.610		29.156		45.882									
P	0.230		0.0001**		0.0001**									

(*) Statistically significant difference at level P < 0.05.

(**) Statistically highly significant at level P<0.01

Discussion

Regarding sociodemographic characteristics of the studied patients' undergone emergency transradial PCI, the result of the present study revealed that more than half of the study sample was between fifty one to sixty years old. This finding was in line with study results was done by **Aliyu A (2016)** who reported that more than three quarter of the studied patients undergoing percutaneous coronary intervention were within the age group of fifty years and above. **Sanchis-Gomar F (2016)** also mentioned that getting older is a conventional non- modifiable risk factor for coronary heart diseases. This finding is justified by effect of aging physiological changes on myocardium and blood vessels with increasing the incidence of all types of atherosclerotic diseases with aging.

Regarding to sex, the study found that more than two third of the patients in control and study groups were male. This finding was in line also with **Jonathan C (2022)** who stated that Men are at increased risk for coronary artery disease compared to women. Similarly, **El-Ashmawy N et al (2018)** they concluded that most of the AMI patients in the study sample were male. Overall, it appears that men's coping with stressful events may be less adaptive physiologically, behaviorally, and emotionally, contributing to their increased risk for CHD. In addition, during a woman's fertile age, estrogens have been found to exert beneficial effects on the cardiovascular system (CVS), which often protects women from atherosclerosis during this time.

In relation to marital status, most of the patients in both groups were married; this may be due to marital stress among younger adults (ages eighteen to fifty five years). This result was in line with **Dhindsa D (2020)** who concluded that psychosocial and socioeconomic factors, as well as other acute stressors, may contribute to the association between marital status and CVD outcomes, but the underlying mechanisms are not completely clear.

Concerning duration of CCU stay, it was found that the majority of patients in study group and more than two third of patients in control groups stayed for one days in the CCU. This because radial access is associated with reduced ambulation time, shorter CCU stays. This result was in line with another study for **Jinnouchi H & Sakakura K (2012)** examines the duration of CCU stay for patient with AMI in the radial group and found that the duration of CCU, stay was \leq three days in two third, four or five days in one quarter, and \geq six days in minority of the patients sample.

Regarding present diagnosis, the highest percentage more than one third of patients in both groups had unstable angina (UA) and NSTEMI. This result was in contrast study conducted by **Nassar A(2016)** showed that fifty-two percent were having NSTEMI, forty -two percent were having STEMI, and minority of patients six percent were having UA at Ain Shams University Hospitals.

Concerning complications of transradial PCI between both groups, in this regard, it was observed that the minority of the study group's patients had bleeding before removal of the sheath, compared by none of them had no bleeding after 6 and 24 hours post removal of the sheath. Related to control group, nearly one quarters, minority of them had bleeding before, after 6 and 24 hours post removal of the sheath respectively. There was a statistically significant difference between study and control groups. This may be due to the immediate nursing measures provided to study group patient after PCI as blood pressure cuff inflation at pressure of 20 mmHg for 15-20 minutes and deflate it gradually during and after removal of the sheath.

Mason et al. (2018) is accept this result by observational studies which reported a lower rate of both minor and major bleeding complications associated with TRA compared with TFA. In addition, **Cheng et al (2013)** , they reported a low rate of puncture site bleeding in transradial group suggest that common access site complications post trans radial coronary procedures among Chinese population are

relatively minor in nature and the rate of post procedural vascular complications only one percent.

In relation to hand ischemia on both groups, the present study clarified that minority of the patients in both study and control groups had hand ischemia, with no a statistically significant difference between both groups. This result is approved by, **Avdikos et al (2017)**, who stated that radial artery occlusion occurs in one to ten percent of patients undergoing transradial catheterization. In addition, **Riangwiwat & Blankenship (2021)** concluded that hand ischemia is a rare complication of transradial access with an incidence less than one in a little bit. **Concerning compartment syndrome**, in the current study it was found that the minority of the study group had compartment syndrome before removal the sheath compared by none of them post removal the sheath. Nearly one quarter of control group had compartment syndrome before removal the sheath compared by twenty percent and none of them after 6 and 24 hours post removal the sheath respectively. **Gergoudis & Raizman (2022)** they stated that, acute compartment syndrome of the forearm is a rare complication of transradial angiography.

Regarding neurological complication, the current study clarified that nearly one quarter of the study group had neurological complications as numbness and tingling before removal he sheath compared by the minority of them after 6 and 24 hours post removal , with a statistically significant difference between both groups. This result is accepted by **Beutel et al (2016)**, who stated that for percutaneous radial artery access, the incidence of radial neuropathy is estimated to occur in twenty five percent of patients at discharge. This finding was in contrast with **Ul Haq et al (2018)** who mentioned that nerve damage and regional pain post transradial PCI are rare.

In relation to wrist pain assessment, the findings of the current study revealed a significant decline in severity of wrist pain was reported by the patient after 6 hours moreover, 24 hours post removal the sheath as compared to wrist pain before removal

of the sheath among study group patient, with highly statistically significant difference between both groups. This may due to the effect application of cold pack around insertion site for the first five minutes before withdrawing the sheath and prevention unnecessary movement of interventional limb especially before removal the sheath among study group's patients. Nearly half of the study subjects in control and study groups complains from hurts even more wrist pain before removal the sheath, also the majority of patients in both groups describe the wrist pain as aching pain that increased with movement and compression as precipitating factors. **Ul Haq et al (2017)** accept this result; they found that wrist pain post transradial access was the most common form of hand dysfunction nearly seven percent in 3 studies. The current study results is in line with observations of different studies results conducted by **Kurt & Kas, İkçi, (2019)** and **Wicaksono& Djamil (2020)** they concluded that cold compresses effectively reduce pain intensity in femoral sheath patients with post percutaneous coronary intervention (PCI). Cold compress (ice gel) is a nurse's independent action to reduce the pain intensity on the scale and increase comfort during the treatment phase.

Conclusions

Based on the results of this study, it could be concluded that safety nursing measures for patients undergoing emergency transradial percutaneous coronary intervention including safe nursing guidelines for patient preparation before and during transradial (PCI). Safety nursing measures after the procedure that consisted of continuous monitoring of hemodynamic parameters, cold application around insertion site for the first 5 minutes before withdrawing the radial arterial catheter, blood pressure cuff inflation, interventional limb raising management strategy (ILRMS) and velpeau bandage were more effectively and had positive effects on clinical outcomes

Clinical outcomes included complications of transradial PCI as severity of wrist pain, bleeding, hematoma formation, hand ischemia, compartment syndrome and arm

tingling and numbness, among critically ill patients in study group than control group patients who undergone current practices and routine nursing hospital care.

Recommendations

- Safety nursing practices should be carried out as a routine care for critically –ill patients undergoing emergency transradial percutaneous coronary intervention.
- It is recommended that the cold application around insertion site, velpeau bandage and interventional limb raising management strategy (ILRMS) to alleviate swelling and wrist pain should be included in the care of patient post transradial PCI.
- It is recommended that the blood pressure cuff inflation to alleviates vascular complication as bleeding and hematoma should be included in the care of patient post transradial PC
- Development of in service training program for nursing staff in cardiac catheterization lab and coronary care units about safe nursing measures.
- To generalize the findings more broadly, the study could be done with bigger sample size and different coronary care units.
- Further studies are needed to increase follow up period post emergency percutaneous coronary interventions

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