

Effect of Nursing Instructions on Minimizing Contrast induced nephropathy for Patients undergoing Cardiac Catheterization

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Abstract: Despite technological advances contrast induced nephropathy (CIN) remains responsible for a third of all hospital-acquired acute kidney injury, but considered the agent of choice in cardiac interventional procedures. The aims of this study were to; identify associated risk factors for contrast induced nephropathy and assess patients' knowledge as regard preventative measures for CIN , and evaluate the effect of nursing instructions on minimizing CIN, **Methods:** Research design: a quasi- experimental research design. **Setting:** The study was conducted in cardiac catheterization unit at El -Orman Heart Hospital of Assiut University. **Sample:** A purposive sample of hundred male and female adult patients who underwent cardiac catheterization. **Tools:** tool (I): Structured Interview Questionnaire Sheet: This included four parts (demographic data, physiologic reactions to contrast, risk factors for development of CIN, and serum creatinine follow-up), Tool (II): Patients' knowledge assessment sheet. **Results:** showed statistical significant differences between pre and post nursing instruction as regarding patient preventive measures for minimizing CIN after contrast injection. **Conclusion:** Nursing instructions had a good effect on reducing CIN among patients who underwent cardiac catheterization. **Recommendation:** Provide evidence-based prevention strategies to allow nurses assist in the prevention of CIN

Keywords: Contrast Induced Nephropathy, Nursing Instructions, Cardiac Catheterization.

1. INTRODUCTION

Contrast induced nephropathy (CIN) is the third leading cause of hospital-acquired acute renal failure, (Nash et al., 2002). And affects between 1% and 2% of the general population and up to 50% of high-risk subgroups following coronary angiography (CA) or percutaneous coronary intervention (PCI) (Mehran and Nikolsky, 2006).

Contrast induced nephropathy is defined as the impairment of renal function measured as either (25%) increase in serum creatinine (SCr) from baseline or 0.5 mg/dL (44 µmol/L) increase in absolute SCr value within (48-72) hours after intravenous contrast administration. (Richard and Jeffrey, 2010). (Solomon et al., 2009).

Contrast induced nephropathy develop in patients with pre- existing risk factors, these risks are divided into modifiable and non- modifiable risk factors. The non-modifiable risk factors are; advanced age, diabetes mellitus, pre-existing renal failure, chronic heart failure, acute myocardial infarction, cardiogenic shock, renal transplant .While the modifiable risk factors include; volume of contrast media, hypotension, anemia and blood loss, dehydration, low serum albumin level (<35g/l), ACE inhibitors drugs, diuretics, non-steroidal anti-inflammatory drugs and nephrotoxic antibiotics (Rancic, 2016).

There are preventive measures that should be taken for all patients at risk for nephrotoxicity after CA or PCI procedures, especially if serum creatinine elevates at (25%) from baseline or a 0.5 mg/dL (44 μ mol/L). These preventive measures include minimizing contrast volumes to (<4) mL/kg, pre-procedure glucose levels monitoring and low-density lipoprotein cholesterol, anemia correction, control of blood pressure (**Roger et al., 2016**).

Diabetes is a known risk factor for CIN in patients undergoing coronary angiography (regardless of pre-existing diabetes). So pre-procedural glucose measures used to prevent CIN should be considered in these patients (**Tolker et al., 2010**). Anemia is another risk factor that creates a chronic hypoxic state which affects all body systems. Hypoxia and stress are further aggravated by contrast medium. Also dehydration, diuretics, and vomiting this factor activates the renin angiotensin, leading to renal vasoconstriction (**Denhaerynck et al., 2007**) (**Anderson and Smith (2006)**).

Nurses' actions before the procedure based on rationale for strategies to prevent contrast-induced nephropathy including; identification of risk factors and correction of modifiable risk factors, obtain a complete history to identify comorbid conditions, preexisting renal impairment, diabetes, heart failure, obtain medication history; collaborate with physician about the need to withhold dehydrating or nephron-toxic medications (**Nikolsky and mehrain 2008**).

Nursing intervention pre procedure include; assessing hydration status, blood urea nitrogen level, electrolytes, urine output, assess renal function, determine stability of hemodynamic status (**Bellomo et al., 2004**). Monitor vital signs, assess for unstable hemodynamic status as evidenced by hypotension, shock, sepsis, or use of intra-aortic balloon pump. Alert physician of concerns related to hemodynamic state. Notify physician of need to modify risk factors before administration of contrast material (**Majumdar et al., 2009**).

The key component in CIN is the nurse's role in risk stratification, prevention, and follow-up. Maintaining the quality of a patient's life is the core of these preventive measures (**Solomon et al., 2009**). Oral volume intake after CIN is a very simple but important prophylactic procedure for contrast-induced acute kidney injury especially in diabetic patients (**Yoshikawa et al., 2011**).

The nurse should be sure that the patient understands why some medications may be temporarily discontinued and exactly when the medications can be restarted after the procedure. The nurse should assess for preexisting kidney disease and ensure that laboratory tests of serum creatinine and GFR are completed and that the ordering clinician is aware of the results. Ask the patient about any previous testing that include contrast material (**Gallegos et al., 2016**).

When an oral hydration strategy is planned, the nurse should assess if the patient is at risk for fluid overload. If there is no medical reason to restrict fluids, educate the patient on the critical importance of fluid intake both before and after the procedure, and offer guidance about the amount and type of fluids to drink and document the hydration protocol until target urine output (>150 ml) /hours for 6 hours post procedure. (**Cheungpasitporn et al., 2014**).

Nurses should instruct the patient to monitor the color and amount of urine output, as a decrease in volume and darkening color may be indications of worsening renal function. They also need to understand the importance of following up on laboratory evaluation approximately (48 to 72) hours after the procedure specially serum creatinine and alert physician to an increase in serum level of creatinine of (0.5 mg) /dL or (25%) greater than baseline or decrease in glomerular filtration rate (**Peggy et al., 2017**).

Significance of the study:

From the researchers' experiences; it was noticed that contrast-induced nephropathy is a widely recognized and clinically significant problem in patients undergoing diagnostic and therapeutic cardiac catheterization that has increased remarkably over the recent years and the problem of contrast induced nephrotoxicity is similarly faced more frequently. So that nursing instructions to improve patients' knowledge regarding preventative measures should be taken to reduce the CIN incidence.

Aims of the study were to:

- Identify the associated risk factors for nephrotoxicity.
- Assess patient knowledge as regard preventative measures for CIN.
- Evaluate the effect of nursing instructions on minimizing CIN for patients undergoing cardiac catheterization.

Research hypothesis:

- The post mean knowledge scores of patient who will be exposed to design nursing instructions will be higher than their pre mean knowledge.
- After applying nursing instructions, the studied patients will show less developed to CIN.
- A positive relationship will exist between patient knowledge and developing CIN for patients undergoing cardiac catheterization.

Patients and method**Research design:**

Quasi-experimental design was utilized in this study.

Setting:

The study has been conducted in cardiac catheterization unit at El -Orman Heart Hospital of Assiut University.

Study sample:

A purposive sample of (100) patients with the following inclusion criteria adult male and female, their age range from (18 to 65) years and are willing to participate in the study.

The sample size was calculated by using power analysis according to the patient's flow with precision levels (5%) at confidence level (95%) and $p < .05$.

Exclusion criteria:

Patients who were exposed to contrast media within (14) days before cardiac catheterization.

Tools:**Tool 1: Structured Interview Questionnaire Sheet:**

This sheet was developed by the researchers based on the best available evidence. It includes four parts:

Part I: Patient demographic data: It included the following items; patient's age, sex, level of education, occupation and marital status.

Part II: Assessment of contrast physiologic reactions:

This part was divided into normal reaction, mild reactions, moderate reaction and severe reaction of contrast media.

Part III: Risk factors for developing contrast induced nephropathy: Using Mehran risk scoring tool to predict risk for contrast medium-induced nephropathy. The Mehran risk scoring tool provides reliable data before patients have percutaneous angiography. After review of literature and conducting a pilot study some modification were added to Mehran scoring according to the nature of patients and clinical manifestations and patient risk factor represented was divided in to:-

1. **Primary non modifiable risk factors:** as oliguria, kidney disease, hypotension, family history of KD and hypovolemia.
2. **Secondary non modifiable risk factors:** as liver disease, diabetes mellitus, old age and cardio -vascular disease.
3. **Modifiable risk factors:** as nephrotoxic drugs, recent contrast administration, dehydration, and diuretic.

Part IV: Serum Creatinine follow-up: This part was used to illustrate the incidence of contrast-induced nephropathy through measure serum creatinine level after two day and after two weeks from intravenous contrast medium injection.

Tool 2: Pre/ Post patients' knowledge assessment sheet:

This tool aimed to assesses patient's knowledge about CIN, nutritional and health preventive measure after contrast injection to minimize complications after contrast injection.

It included two parts:

Part I: Nutritional preventive measures: this part was used to assess the patient's nutrition aspect post contrast injection that helps in decreased (CIN) (e.g types of food allowed, amount of fluid consumed by the patient). The total number of questions was (10).

Part II: Health preventive measures: this part was used to assess the patient's health practices when exposed to the contrast. This measure to minimis the adverse effect of contrast, the total number of questions was (10).

Scoring system:

Total score was (20) degrees. One score was given for each right answer and zero for wrong answer. Patients who obtained less than 50% were considered having unsatisfactory level of knowledge, while those who obtained more than 50% were considered having satisfactory level of knowledge.

Nursing instructions: it was developed by the researchers based on the literature review, researchers' experience, and the opinions of medical and nursing expertise. It was designed to reduce the incidence of CIN, it consists

Part one: Pre contrast injection instructions which include:

- Ensuring patients' awareness of risk and need for monitoring of renal function.
- Provide instructions on: Importance of follow-up care; serum level of creatinine and glomerular filtration rate as early indicators of renal impairment.
- Instruct the patient about early indicators of CIN in the early stages, concerns about swelling, sudden weight gain, or decreased urine output that should be reported to the physician immediately within 10 days to one month after contrast media procedure
- Withhold nephrotoxic medications for 24h prior cardiac catheterization. These medications can potentially cause a kidney problem by decreasing blood flow to the kidneys; as dyes can also decrease kidney blood flow, the two agents should not be given concurrently.
- Increase oral hydration before cardiac catheterization unless contraindicated with other cases about (3 liter) daily.
- Monitor the urine output amount and color (target urine output 150 mL/ hour for 6 hours post procedure.
- Instruct the patients about avoiding certain type of foods as (salty food, canned fast food; excess salt, sugar and coffee).

Part two: Discharge instructions which include;

- Continues assessing serum creatinine after two day and at a peak level after two weeks from intravenous contrast medium injection.
- If serum creatinine elevated more than normal refer the patient to the urologist.
- Instruct the patient about the signs of decreased renal functions that should be monitor as decreased in urine output (<30 mL/h), concentrated urine, elevated serum levels of sodium and blood urea nitrogen and any alteration in the blood pressure reading.

Ethical considerations:

An official permission was obtained from the head of cardiac catheter unit at El Orman Heart Hospital of Assiut University .The researchers gave clear and simple rationalization of the study nature, the study was voluntary and harmless. Oral permission for voluntary participation was obtained. Anonymity and confidentiality were assured through coding of the data. The patients had the right to refuse to participate in the study and can withdraw at any time.

Validity and Reliability:

It was established by a panel of five experts (three experts from Medical Surgical Nursing staff and two cardiology and nephrology staff) who reviewed the tool for clarity, relevance, comprehensiveness, understanding, and applicability. Minor modifications were required. Test reliability of proposed tools was attained and ascertained with Cronbach's alpha = 0.90.

Pilot study:

A pilot study was conducted on 10% (10) patients of the sample. The purpose of the pilot study was to detect any particular problem in the statements clarity, feasibility, and applicability of the tools. Minor modifications were done to the tools, so the patients selected for the pilot study were included in the main study.

Fieldwork:

- The researchers met the selected patients; each patient was fully informed with the purpose and nature of this study and the patients' agreement was obtained.

Base line data were established using tool 1 (part I), then assessment of contrast physiologic reactions using (part II)

- Risk factors for development of contrast induced nephropathy were assessed using tool1 (part III), serum creatinine level using tool 1 (part IV), then patients' knowledge was assessed using tool 2.

- The studied patients were given nursing instructions pamphlet in clear Arabic language, each patient was met for one session. Each session took about 30-40 min. The study was carried out in the morning shift before entering the patient to perform cardiac catheterization.

- Nursing instructions were applied on an individual basis.

- After each session there were (5-10) minutes for discussion and feedback. Reinforcement was performed according to patients' needs to ensure understanding.

- The researcher used pictures and diagram to help them retain the learned material.

- Data were assured anonymity and confidentiality and were collected using the study tools.

- The researchers arranged with the patients the time and place for follow up which were after two days and then after two weeks from intravenous contrast medium injection in the outpatient clinics at EL Orman Heart of Hospital Assiut University.

- Data were collected during the period from April 2018 to September 2018.

- Patients were reassessed after two days from intravenous contrast medium injection using the same tools; physiological reactions to contrast using tool1 (part II) and patients' knowledge was assessed using tool 2.

- Patients were reassessed after two days and then after two weeks form intravenous contras medium injection using the same tools serum creatinine level using tool1 (part IV).

Statistical design:

The data obtained and analyzed through using computer program SPSS version 22. Results were presented as number, percentage, mean and standard deviation. Independent sample T-test and, Chi-square tests used in the relationship between both groups'. P-value considered statistically significant when $p < .05$.

2. RESULTS

Table (1): Demographic characteristics of the studied patients (n=100)

Characteristics	N.	%
Age(years):		
18 – 35	4	4.0 %
36 – 50	25	25.0 %
51- 65	71	71.0 %
Mean ± SD	54.0100± 9.07810	
Range	37.00	
Sex		
Male	69	69.0 %
Female	31	31.0 %

Address:		
Rural	81	81.0 %
Urban	19	19.0 %
Education level:		
University education.	15	15.0 %
Secondary	51	51.0 %
Read & write	13	13.0 %
Illiterate	21	21.0 %
Occupation :		
Employee	31	31.0 %
Literal	69	69.0 %
Marital status:		
Single	3	3.0 %
Married	97	97.0 %
Widow	0	0.0 %

Table (1): Shows that the highest percentage of the studied patients their ages ranged between 51-65 years old, with mean 54.01 ± 9.07 and the highest percentage was male (69.0 %), from rural area (81.0 %). Concerning the educational level, (51%) of the studied patients had secondary level of education. In relation to patients' occupation, the highest percentages of the studied patients (69%) were literal and the highest percentage was married (97.0%).

Table (2): Distribution of the study sample physiologic reactions to contrast media after contrast injection (N=100).

Physiologic reactions		N.	%
Normal reaction	Headache	1	1.0%
	Dizziness	2	2.0%
	Warmth	41	41.0%
	No reaction	56	56.0%
Mild reaction	Sneezing	5	5.0%
	No reaction	95	95.0%
Moderate reaction	No reaction	0	0.0 %
Sever reaction	No reaction	0	0.0 %

Table (2): Reveals that (41%) of the studied patients had warmth sensation as a normal reaction to contrast, while (5%) of patients had sneezing as mild physiologic reaction to the contrast media. However there is no moderate or sever reaction to the contrast administration.

Table (3): Frequency distribution of serum creatinine level of the studied patients before, after two days and after two weeks from the contrast administration(n=100)

Serum Creatinine level		N.	%
Before	Normal	100	100.0%
	High	0	0.0%
After 2 days	Normal	69	69.0%
	High	31	31.0%
After 15 days	Normal	93	93.0%
	High	7	7.0%

Table (3): Reflecting that all of the study sample showed that there was a normal reading of serum creatinine level, while (31%) percent of the patients were affected by a rise in serum creatinine levels after contrast injection two days after injection and after two weeks (7%) of the patients who underwent the study, the level of creatinine in the blood was high.

Table (4): Distribution of the risk factors for development of contrast induced nephropathy among the studied sample (N=100).

Risk factors	N.	%
Primary Non modifiable risk factors		
Oliguria	10	10.0 %
Kidney Disease	19	19.0%
Hypotension	22	22.0%
Family history of KD	5	5.0 %
Hypovolemia	33	33.0 %
Secondary non modifiable risk factors		
Liver disease	19	19.0 %
Diabetes Mellitus	42	42.0%
Old age	71	71.0 %
Cardio -Vascular disease	65	65.0 %
Modifiable risk factors		
Nephrotoxic drugs	18	18. %
Recent contrast administration	0	0.0%
Dehydration	0	0.0%
Diuretic	5	5.0 %

Table (4) :revealed that the most common primary non modifiable risk factor that affect on CIN occurrence in the studied sample was hypovolemia (33.0 %) but according to the secondary non modifiable factors the majority (71.0 %) were old age and(18%) of the study sample was nephrotoxic drugs as a modifiable risk factor .

Table (5): Relation between pre and post nursing instructions as regards dietary preventive measure for patient undergoing cardiac catheterization (N= 100).

Patient knowledge	Pre (n=100)		Post (n=100)		X ² test	p-value
	No.	%	No.	%		
<u>Nutritional preventive measure:</u>						
Avoid salty snacks	65	65.0	98	98.0	33.958	<0.001**
Avoid canned fast food	43	43.0	98	98.0	70.105	<0.001**
Eat fibers	80	80.0	100	100.0	20.056	<0.001**
Avoid fatty foods	63	63.0	99	99.0	39.799	<0.001**
Use vegetable	90	90.0	95	95.0	1.153	0.282
Avoid excess sugar	89	89.0	90	90.0	0.000	1.000
Avoid excess salt	87	87.0	99	99.0	9.293	0.002**
Avoid eating fast food	10	10.0	0	0.0	8.526	0.003**
Drink 6 cups water daily	50	50.0	98	98.0	57.406	<0.001**
Take excess coffee \ tea	97	97.0	10	10.0	148.648	<0.001**

(*) Statistically significant at p<0.05, P>0.05 no Significance,***P<0.000 highly Significance.

Table (5): shows comparison between patient adherence to the dietary preventive measure before and after application of nursing instructions.

Table (6): Relation between pre and post nursing instructions as regards health preventive measure for patient undergoing cardiac catheterization (N= 100).

Patient knowledge about	Pre (n=100)		Post (n=100)		X ² test	p- value
	No.	%	No.	%		
Importance of follow-up after contract medium injection	50	50.0	98	98.0	57.406	<0.001**
Consult physician by symptom	85	85.0	90	90.0	0.731	0.392

Monitoring vital signs.	95	95.0	99	99.0	1.546	0.213
Regularity investigations of blood Na,K,Cl.	10	10.0	89	89.0	121.692	<0.001**
Regularity performs of kidney function.	38	38.0	98	98.0	79.986	<0.001**
Discuss health problems with other	88	88.0	97	97.0	4.613	0.031
Observe health urine change (Color, amount).	30	30.0	99	99.0	100.972	<0.001**
Reading books about health problem	47	47.0	80	80.0	22.090	<0.001**
Used prescribed drugs only	90	90.0	100	100.0	8.526	0.003**
Observe the body weight change	82	82.0	98	98.0	12.500	0.000**

(*) Statistically significant at $p < 0.05$, $P > 0.05$ no Significance, *** $P < 0.000$ highly Significance.

Table (6): shows statistically significant differences between pre and post nursing instruction implementation as regarding health preventive measure to minimize CIN after contrast injection.

3. DISCUSSION

The contrast induced nephropathy is a common complication of cardiac catheterization that can happen following the contrast exposure (Accardi et al., 2017).

The present study showed that the largest proportion of patients their age group were between (51-65) years old; from the researcher opinion the possible reasons of the high incidence of CIN in elderly were age-related changes in renal functions such as; calcification of the vessels, defective prostaglandin synthesis, or the presence of reno-vascular disease. Furthermore, hypovolemia is very common in elderly patients, decrease of kidney weight, appearance of sclerotic glomeruli and intimal proliferation in the renal artery. This is in the same line with (Campbell and O'Hare 2008) who stated that the patients with cardiac disease who underwent contrast coronary intervention, their age was (>65) years .Also in the same with (Beibei, et al., 2018) who reported that the median age was (64) years old.

As regard to sex, most of the patients were male versus the lowest percentage found among females.(Giancarlo et al., 2015) in the same line reported that more than half of the patients of the study sample were males. This result disagree with (Barbieri et al., 2016) who revealed that the highest rate of CIN after coronary angiography/PCI was among females, this is due to ovarian hormones can affect the renin-angiotensin system and renal blood flow.

In this study the vast majority of patients were married. (Mohammed, et al., 2016) in the same line with the current study; who found that the majority of patients in his research were married.

It is important to understand and early recognize the physiologic reactions to contrast as a key for appropriate management of these patients. These reactions were thinking to be produced by fibrinolytic systems, kinin systems, and the release of histamine, prostaglandins, bradykinins, and other mediators (Fulvio et al., 2011).

Regarding physiologic reaction to contrast the present study revealed that there is no moderate or severe reaction found among the study group. This result from the researcher opinion; normal physiologic reactions occur among all patients after exposure to low osmolar contrast injection. As (LIA et al., 2006) also said most reactions are mild and transient, with skin reactions most frequently seen. Also severe, life-threatening reactions to contrast media are rare. This is in line with (Mitchell and Kline, 2007) who found that only incidence of mild hypersensitivity reactions to contrast administration was (<3%) moderate to severe incidence (<0.04%).

The contrast induced nephropathy is rare in the absence of risk factors, but it affects about (20%) of patients with pre-existing risk factors. All nurses inside catheterization unites are responsible for assessing the patients' risk factors and obtain the base line serum creatinine and then compare to serum creatinine levels following contrast exposure (O'Donovan, 2010).

A similar results has also been proposed by (Tziakas et al., 2013) who found that pre-existing renal disease, diabetes mellitus, nephrotoxic drug and peripheral arterial disease were also independent predictors of CIN. In the current study there were more than third of patients suffering from diabetes. The role of diabetes in predisposing to CIN can be associated with endothelial dysfunction and decreased vasodilator responses. (Toprak et al., 2007) stated that diabetic patients, particularly insulin-dependent type have the great chance of developing CIN.

In the present study about one fifth of the studied sample were having hypotension after exposure to contrast media. This agree with **(Weisbord and Palevsky., 2005)** who found that the majority of patients with CIN after contrast media exposure had a history of hypotension and hypovolemia, and they explained the relationship between hypovolemia and reduced renal perfusion potentiate renal vasoconstriction after contrast media injection. In contrary with cohort study of **(Bartholomew et al., 2004)** who found that hypertension has a risk for CIN in patients who underwent PCI.

The current study found that one fifths of the studied sample uses the nephrotoxic drugs. At the same line with **(Cynthia and naughton 2008)** who mentioned that a number of nephrotoxic drugs affecting renal function. These drugs have adverse effect on the kidneys, which produce volume depletion or renal vasoconstriction.

Also this results was supported by **(Mueller, et al., 2002)** and **(Rahall, et al., 2002)** who revealed that pre-procedural management and nursing preparation for patients at risk for CIN requires a review of the patient's medications and withholding, potentially nephrotoxic drugs, including aminoglycoside antibiotics, non-steroidal anti-inflammatory drugs, and diuretic therapy.

The current study revealed that two thirds of the studied patients were having cardio vascular diseases as secondary non modifiable risk factors. In contrary with the current study **(Selvatore et al., 2012)** studied the risk factors of CIN among Italian patients, the result illustrated that less than one quarter of patients(28%) have vascular disease. While **(Bartholome et al., 2004)**

In a cohort study found that patients with vascular disease are increasingly subject to vascular treatments that require the use of iodized contrast media, putting them at risk of developing CIN. Similarly **(Mehran and Nikolsky, 2006)** stated that CIN frequently occurs in patients with underlying risk factors as renal vascular dysfunction, diabetes, anemia, and the elderly patients.

Also **(Rancic, 2016)** demonstrated that the reversible CIN occur as a result of the administration of radio-contrast .Generally contrast induced nephropathy is less occur than 1% among the patients with no risk, while the risk for developing of contrast induced nephropathy increases up to 15% in patients with pre-existing risk factors (e.g. diabetes mellitus, chronic kidney disease). In contrary with **(McDonald et al., 2013)** who found that the incidence of contrast induced nephropathy was not significantly different between the contrast group and control group. Thus, they suggest that intravenous iodinated contrast agents are not the cause of change in renal function after contrast agent administration.

Looking at serum creatinine level; the results of the present study revealed that the vast majority of patients had normal creatinine level before exposure to contrast media, however more than one third only of patients had serum creatinine elevation after (2) days from CM exposure then most of the patients returned to baseline after (15) days, from the researchers point of view this is due to the effect of nursing instructions and patient compliance with the instructions given to them.

Nurses play an important role in nephropathy prevention and need to be familiar with CIN as a potential complication of PCI. In order to ensure safe, high-quality care, and nurses must be involved in efforts to prevent CIN as well as interventions that minimize patients' risk of CIN **(Peggy et al., 2017)**.

Regarding the effect of the nursing instructions on minimizing the CIN the present study proved that after applying the nursing instructions there was significant differences between pre and post instruction as regarding patient nutritional and health preventive measure to minimize CIN. From the researchers point of view this may be due to containment of the nursing instructions on the all needed information that help reduce the CIN (e.g., increasing fluids and fibers, reducing food that contain high potassium and phosphorus, monitoring the amount and color of urine, withholding nephrotoxic medications before the contrast injection, plus the preventive measures as monitoring vital signs specially the blood pressure). Also, continuous follow-up of serum creatinine level to early predict of CIN.

Nurses play a key role in ensuring that the patient has good follow-up care to monitor the creatinine level. Patients should be taught to watch for indications of decreased renal function, such as changes in the amount of urine and a darker color of urine. Polyuria and nocturia may develop in early ARF because the kidneys are unable to concentrate urine. As renal function worsens, urine output will decrease **(Lewis et al., 2007)**.

4. CONCLUSION

Nursing instructions had a good effect on reducing CIN among patients who underwent cardiac catheterization.

5. RECOMMENDATIONS

Based on the findings of the current study, it is recommended

1. Provide evidence-based prevention strategies to allow nurses assist in the prevention of contrast-induced nephropathy.
2. Replication of this study on larger sample from different geographical areas in Egypt to generalize the results.

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