Assiut Scientific Nursing Journal
http://asnj.journals.ekb.eg http://www.arabimpactfactor.com
DOI:10.21608/asnj.2025.380297.2070 http://olddrji.lbp.world/indexedJournals.aspx
https://vlibrary.emro.who.int/journals/assiut-scientific-nursing-journal

Effect of a Nursing Protocol on Reducing the Incidence of Acute Kidney Injury in Patients with Acute Heart Failure

Suzan Shawky Botros[1], Ahmed Abdel –Galeel[2] & Mogedda Mohamed Mehany[3]
[1.] Nursing Specialist at Heart Hospital, Faculty of Nursing Assiut University, Egypt.
[2.] Professor of Cardiovascular Medicine, Faculty of Medicine, Assiut University, Egypt
[3.] Professor of Critical Care & Emergency Nursing, Assiut University, Egypt

Abstract
Background: Acute kidney injury (AKI) is a common and serious complication between patients with acute heart failure (AHF). Nurses play a critical role in early detection and prevention of AKI through implementation of nursing protocol. **Aim:** To evaluate effect of a nursing protocol on reducing the incidence of acute kidney injury in patients with acute heart failure. **Design:** A quasi -experimental research design was utilized in this study. **Setting**: Study was carried out in the Coronary Care Unit and Emergency Department at Assuit University Heart Hospital**. Patients:** Purposive sample of 100 adult patients were split into two groups: a control group and study group. **Tools:** Three tools were used to gather the data, **Tool I:** Demographic data and clinical data assessment tool, **Tool II:** Renal assessment tool and **Tool III:** patients' outcomes tool. **Result:** Patients in the study groups showed a significantly lower incidence of AKI compared to the control group (p =0.037*). There was also improvement in renal function parameters in the study group with creatinine (p =0.003*). **Conclusion:** Implementing of nursing protocol success in minimizing occurrence of acute kidney injury, moreover, to decrease the occurrence of renal complication. **Recommendation:** Policy Implementation: Encourage hospitals to adopt nursing protocol for AKI prevention as part of standard care for patients with AHF. Expand of study population: future research should include a larger and more diverse sample across multiple healthcare centers to improve the generalizability of the results.

Keywords: Acute Heart Failure, Acute Kidney Injury & Nursing Protocol.

Introduction
Heart failure is a global pandemic affecting 26 million people worldwide. The prevalence of HF in developed countries is estimated to be 1–2% of the adult population **(Fedacko et al., 2024).** The kidney and heart work together to keep the body's homeostasis, which includes blood pressure, salt, and water balance, in a healthy state. Also they can adversely affect each other's function leading to decompensation and clinical worsening, in disease states **(Banerjee et al., 2025).**

Acute kidney injury (AKI) is a frequent and serious complication in patients with acute heart failure (AHF), often categorized as type 1 cardio renal syndrome. It results from a combination of reduced cardiac output, increased central venous pressure, renal venous congestion, and neurohormonal activation, which collectively impair renal perfusion and function **(Chen et al., 2023).** Acute heart failure (AHF) is marked by the body retaining sodium and fluid because of heightened neurohormonal activity. Acute kidney injury (AKI) can trigger AHF by impairing the kidneys' ability to eliminate salt and water, resulting in fluid overload. This leads to the activation of the renin–angiotensin system and the sympathetic nervous system, which raise cardiac afterload and promote the production of reactive oxygen species, inflammation, and endothelial dysfunction. **(Banerjee et al., 2025).**

Clinically, AKI in the context of AHF presents with signs such as oliguria, fluid overload (manifesting as peripheral edema and pulmonary congestion), elevated serum creatinine and BUN, and electrolyte disturbances like hyperkalemia and hyponatremia. Symptoms may include dyspnea, fatigue, nausea, and confusion in advanced cases. Moreover, the development of AKI is an independent predictor of increased 90-day mortality in this population. Early recognition and intervention are therefore essential to improving outcomes in these patients **(Wang et al., 2023).**

Nursing roles in the overall management of patients with AHF are clinical assessment, care plan development, early detection, fluid management, infection control, and hemodynamic support .Vigilant monitoring of patient symptoms, vital signs, fluid intake and output, and daily weight are crucial assessments, particularly during phases of active diuresis. Medical care teams rely on nurses' assessments to develop thorough treatment plans that ensure safe, effective care and help manage symptoms related to kidney function in patients with acute heart failure. Additionally, nurses assist patients with activities of daily living (ADLs), act as

intermediaries between healthcare providers, caregivers, and families, and play a key role in enhancing patient outcomes **(Jamaludin et al., 2022).** Implementing a nursing protocol for heart failure (HF) management alongside standard care led to notable improvements in AHF signs and symptoms. This progress is largely attributed to better self-care practices, improved medication adherence, and the effectiveness of therapeutic interventions in enabling patients to perform daily activities independently and enhancing their quality of life. Additionally, this improvement may have contributed to a reduction in hospital readmissions **(Kumari et al.,2024).**

Therefore, the present study was conducted to evaluate the effect of a nursing protocol on reducing the incidence of acute kidney injury in patients with acute heart failure

Significance of the Study

The heart and kidneys are closely interconnected. When kidney function is impaired, and the regulation of salt and water is disrupted, it can increase both the preload and afterload on the heart. Additionally, reduced cardiac output can lower blood flow to the kidneys, potentially leading to kidney failure. As such, kidney dysfunction is among the most severe complications of heart failure **(Szlagor et al., 2023).** Acute kidney injury (AKI) has been most frequently observed in hospitalized AHF patients, with an estimated prevalence of around 20%. AKI is also recognized as a strong, independent predictor of both in-hospital and one-year mortality **(Holgado et al., 2020).** The AHF nurse is responsible for encouraging patients to engage in self-care, initiating and adjusting evidence-based medications, and providing timely guidance to both patients diagnosed with acute heart failure and their families **(Hill et al., 2024)**. Also, according to patients record in Assiut University Heart Hospital the number of patients' admission with acute heart failure are about 240 patients in the coronary care unit and 180 patients in the cardiac emergency department in 2023. Therefore, the study was conducted to evaluate the effect of nursing protocols to minimize occurrence of acute kidney injury among patients with acute heart failure.

Aim of this Study

To evaluate the effect of a nursing protocol on reducing the incidence of acute kidney injury in patients with acute heart failure

Research Hypothesis

H (1): It is hypothesized that patients in the study group will exhibit a statistically significant improvement in renal function compared to those in the control group among patients with acute heart failure.

H (2): It is hypothesized that the incidence of renal complications will be significantly reduced in the study group compared to the control group among patients with acute heart failure.

Patients and Method

Study design

Quasi -experimental research design was utilized in this study.

Setting

The study was carried out in the coronary care unit that containing (22 beds for inpatients in 5 separated rooms, 1 examination room for cardiac emergency patients and emergency department that containing (9 beds for inpatients in 3 separated rooms, 2 examination room for cardiac emergency patients) at Assuit University Heart Hospital, in Egypt.

Sample

A Purposive sample of adult patients admitted to above mentioned setting with acute heart failure. Based on determining the main outcome variable, the estimated minimum required sample size is 94 participants. To avoid dropout, 100 participants will be taken, 50 in each group. The sample size was calculated using G*power software 3.1.9.2., based on the following assumptions: Main outcome variable is estimated length of hospital stay in patients with heart failure. Based on previous study where the length of hospital stay in patients with heart failure was 4.73 ± 0.93 compared to 10.11± 1.83 in controls **(Mohamed, et al, 2017)**. Which give a large effect size > 0.8.

Inclusion Criteria

- Patients aged over 18 years.
- Newly admitted patient to the Coronary Care Unit (CCU) and cardiac Emergency Department (ED) with a diagnosis of acute heart failure.
- Both male and female patients.

Exclusion Criteria

- Patients with a known history of kidney –related medical condition.
- Patient with chronic renal failure.
- Comatose patients (unconsciousness)
- Pregnancy

Study Tools

Tool (I): Demographic Data and Clinical Data assessment tool

This divided into two parts:

Part (1): Demographic Data include Patients code, patient gender and age.

Part (2): Clinical Data include past medical history and diagnosis.

Tool (II): Renal Assessment Tool

This divided into three parts:

Part (1): Laboratory Investigations includes:
Renal function test (urea and creatinine), serum electrolyte sodium (Na), potassium (K) and magnesium (Mg).

Part (2): Pitting Edema Scale: using pitting edema scale adopted from **(Ahmadinejad, et al, 2022)** to determine the severity of pitting edema, its assessed by applying pressure to the swollen area and measuring the depth of the resulting indentation (pit). The scale consists of five levels, ranging from 0+ to 4+:

0+: No pitting edema.
1+: Mild pitting edema with a 2mm depression that disappears quickly.
2+: Moderate pitting edema with a 4mm depression that resolves within 10–15 seconds
3+: Moderately severe pitting edema with a 6mm depression lasting up to 1 minute.
4+: Severe pitting edema with an 8mm depression that persists for more than 2 minutes

Part (3): RIFLE Criteria (Risk, Injury, Failure, Loss of Kidney Function, and End-stage Kidney Disease) used for prediction of AKI and adopted from **(Roy et al.,2013)** and used by **(Stille & Herget, 2022)**. Scoring system of this scale:

Risk→ Increase Cr 50-100% **or** U.O. < 0.5 mL/kg/hr. for > 6 hrs.
Injury→ Increase Cr 100-200% or U.O. < 0.5 mL/kg/hr. > 12 hrs.
Failure→ Increase Cr > 200% or > 4 mg/dL or U.O. < 0.3 mL/kg/hr. > 24 hrs. Or anuria for more than 12 hours
Loss of function→ Need for dialysis for more than 4 weeks
End-Stage Renal disease →persistent renal failure (i.e. need for dialysis) for more than 3 months.

Tool (III): Patients' Outcomes Tool
This tool was created by the researcher following a thorough review of relevant literature **(Kidambi & Seth, 2019)** and used to evaluate patients' outcomes as Patient's complication:

Patient's Complications
Assess both control and study group for presence of any complications such as: Acute kidney injury, dehydration and hypotension, hypokalemia, hyperkalemia, hyponatremia and urinary tract infection.

Method:
The study was carried out in three primary phases: the preparatory phase, the implementation phase, and the evaluation phase.

Preparatory Phase:
- Approval to carry out the study was secured from the hospital's authorized personnel following an explanation of the study's aim.
- The data collection tools were designed by the researcher after a comprehensive review of relevant literature.

Validity:
- Once the tools of data collection were prepared, their face validity was judged by five experts in the field of critical care and emergency nursing and cardiovascular department who reviewed the tools to ensure clarity, relevance, applicability, comprehensiveness and ease of implementation.

Reliability:
- The reliability of the tools was evaluated using Cronbach's alpha to determine their consistency and stability as the following:
  Tool I part 1, 2:"0.835"
  Tool II part 1: "854"
  Tool III part 1: "822"

Pilot Study:
A Pilot study was conducted on 10 patients (10%) to test the feasibility and applicability of the tools. After obtaining permission from the authorities of hospital management.

Ethical Consideration
Research proposal was approved from Ethical Committee (No:1120220526) of the Faculty of Nursing. There is no risk for patient during application of the research. The study was follow common ethical principles in clinical research. Written informed consent was obtained from patient's that was willing to participate in the study, after explaining the nature and the purpose of the study. Patient privacy was considered during collection of data. Confidentiality and anonymity had been assured. Each patient had the right to refuse to participate and or withdraw from the study without any rational at any time.

Data Collection: -
- Data were collected approximately from September 2023 to August 2024, with a sample size of about 100 patients.
- The data were gathered from patients admitted with AHF in the emergency department and coronary care unit.
- Clinical data were obtained from electronic medical records, patient interviews, and standardized nursing assessments.

Implementation Phase
- The researcher introduced herself to the patients and nursing staff and explained the nature and objectives of the study.

Both Group:
- The control and study group were assessed demographic data and clinical data using **Tool I.**
- Assessment of renal using **tool II include:**
- Take laboratory investigation tool II part 1 and measurement of serum creatinine value, urea,

sodium (Na), potassium (K) and magnesium (Mg)were analyzed for day of admission, third day and fifth day.

- Assessing severity of pitting edema daily by using **tool II part 2.**
- Follow up RIFLE criteria daily for assessing acute kidney injury daily by using **Tool II Part 3**.
- Both group assessment for patients' complications using **tool III part 1**.

Control Group:

- The control group received the standard care provided by the hospital in coronary care unit and emergency department.

Nursing Protocol

A nursing protocol was implemented to evaluate and manage a specific health problem and to outline appropriate nursing interventions based on best practices and current evidence **(Butcher et al., 2013)**. It was applied to minimize the occurrence of acute kidney injury among patients with acute heart failure.

Nursing protocol contents (Chrysohoou et al., 2022) (Sudusinghe et al., 2022) (Stromber.,2021) include:

1. Early Detection & Monitoring.
2. Optimizing Fluid Management and Electrolyte.
3. Monitoring for early signs of drug toxicity (e.g. Antibiotics, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)).
4. Infection Control Measures.
5. Hemodynamic Stability Support.
6. Early ambulation to the patients.
7. Patient Education & Lifestyle Modifications.

Early Detection & Monitoring of Renal Impairment

- Frequent vital signs & urine output monitoring.
- Strict intake & output (I&O) monitoring to detect early signs of fluid imbalance.
- Daily weight monitoring to assess fluid retention or loss.
- Body Mass Index (BMI) is calculated using the following formula:
- Body Mass Index (BMI) = Weight (kg) / [Height (m)] ^{2}.
- Regular assessment of lab values (creatinine, Blood Urea Nitrogen (BUN), electrolytes).
- Daily monitoring for edema by using pitting edema scale.
- Identifying initial signs of Acute Kidney Injury (AKI) such as reduced urine output (<0.5 mL/kg/hr.), sudden elevation in serum creatinine levels, fluid retention, fatigue, and electrolyte imbalances.
- Early detection and monitoring daily by using RIFLE criteria

Optimizing Fluid Management and Electrolyte

- Encouraging adequate oral hydration if the patient is stable.
- Administering IV fluids as prescribed (crystalloids like lactated Ringer's or saline).
- Preventing fluid overload by carefully balancing fluids, especially in acute heart failure.

Monitoring for Early Signs of Drug Toxicity (e.g., antibiotics, NSAIDs).

- Nursing Care during Diuretic Administration:

Prior to administration, nurses are responsible for conducting thorough assessments, including checking baseline vital signs (particularly blood pressure and heart rate), evaluating fluid status through indicators such as skin turgor and mucous membrane moisture, and reviewing recent laboratory results specifically serum electrolytes, blood urea nitrogen (BUN), and creatinine levels.

During administration, timing and method are critical. Diuretics are typically administered in the morning to reduce the risk of nocturia. Nurses must ensure the correct dosage and route, whether oral or intravenous, and closely monitor the patient for immediate adverse reactions, including dizziness, orthostatic hypotension, and signs of electrolyte disturbances.

Post-administration nursing responsibilities include ongoing monitoring of urine output to confirm therapeutic effect, repeated assessment of vital signs to detect hypotension or compensatory tachycardia, and vigilant observation for symptoms indicative of electrolyte imbalances—such as muscle weakness, cramping, cardiac arrhythmias, or neurological symptoms like confusion or lethargy.

Assess for Toxicity:

- Monitor for signs of digoxin toxicity: nausea, vomiting, confusion, visual disturbances.
- Withhold digoxin and notify provider if toxicity suspected.

Infection Control Measures

- Strict aseptic technique in procedures like catheter insertion and IV lines to prevent sepsis-related AKI.
- Preventing infection. Urinary catheters should be inserted using an aseptic technique and managed according to established guidelines for daily catheter care. This includes keeping the collection bag below bladder level at all times, regularly checking the tubing for kinks, ensuring the drainage bag does not touch the floor, and emptying the bag consistently. Additionally, it's important to maintain a closed drainage system, perform perineal hygiene daily and after every bowel movement, and review the need for the catheter each day and remove promptly and collecting a catheter specimen of urine from sampling port.
- Monitor for early signs of infection (fever, WBC count, localized swelling).

- Administer antibiotics promptly in suspected infections to prevent sepsis-induced AKI.

Hemodynamic Stability Support

- Monitoring for hypotension and ensuring timely intervention (e.g., fluid resuscitation).
- Positioning patients properly to ensure optimal circulation and kidney perfusion (e.g., avoiding prolonged supine positioning in critically ill patients).

Early Ambulation to the Patients

- Early ambulation refers to encouraging patients to start moving—such as sitting up, standing, or walking—as soon as medically stable during their hospital stay.
- Early ambulation promotes better circulatory function, enhances renal perfusion, and supports more effective fluid balance, thereby potentially reducing the risk of AKI.

Patient Education & Lifestyle Modifications

- Teaching patients about hydration, diet (low sodium, balanced protein).
- Educating about early signs of kidney dysfunction (decreased urine output, swelling, fatigue).

Evaluation Phase

1. Both groups were evaluated three times (on admission, on the 3rd day, and on the 5th day) for laboratory investigation and evaluated daily for pitting edema scale and RIFLE criteria for five days that helps to implement early intervention and assesses response to intervention like diuretics and fluid restriction.
2. Both groups were evaluated within five days and until discharge for the occurrence of complications include acute kidney injury, dehydration and hypotension, hypokalemia, hyperkalemia, hyponatremia and urinary tract infection, as determined by electronic medical record reviews and written records which included discharge letters, some other applicable documentation.

Statistical Analysis

Data were entered and analyzed using SPSS version 22 (Statistical Package for the Social Sciences). The results were expressed as frequencies, percentages, means, and standard deviations. The Chi-square test was applied to examine differences between qualitative variables. For parametric data, the independent samples t-test was used to compare quantitative variables between groups. A p-value of less than 0.05 was considered statistically significant.

Results:

Table (1): Distribution of Control and Study Groups Regarding Demographic and Clinical Data for Acute Heart Failure Patients (n=100)

Demographic data and clinical data	Control Group (n= 50)		Study Group (n= 50)		P-value
	n.	%	n.	%	
Gender:					
Male	23	46.0%	36	72.0%	0.008*
Female	27	54.0%	14	28.0%	
Age: (Years)					
Mean ± SD	55.76 ± 10.51		50.88 ± 12.18		0.034*
Past Medical History:					
Diabetes Mellitus(DM)	25	50.0%	25	50.0%	1.000
Hypertension(HTN)	24	48.0%	28	56.0%	0.423
Ischemic Heart Disease (IHD)	19	38.0%	12	24.0%	0.130
Diagnosis:					
Heart Failure(HF)	50	100.0%	50	100.0%	--
Unstable angina (UA)	10	20.0%	14	28.0%	0.0349
Myocardial Infarction(MI)	23	46.0%	13	26.0%	0.037*
Pulmonary Edema (PE)	17	34.0%	23	46.0%	0.221

**=Significant difference *p≤0.05*

Ns= Non significant difference P>0.05

Note: The number of patients with more than one past medical history and diagnosis exceeded the study sample size due to overlapping conditions in individual patients.

Table (2): Comparison Between the Control &Study groups as Regard to Renal Function Test and Serum Electrolytes (n=100)

Renal Function Test & Serum Electrolytes	Control Group (n= 50) Mean ± SD	Study Group (n= 50) Mean ± SD	P-value
Urea:			
On Admission	10.65 ± 4.35	11.88 ± 4.53	0.171
3rd Day	12.80 ± 5.41	12.63 ± 6.50	0.891
5th Day	13.13 ± 6.71	12.83 ± 6.74	0.826
Creatinine:			
On Admission	120.31 ± 49.87	115.05 ± 37.00	0.550
3rd Day	133.58 ± 55.10	118.56 ± 34.15	0.105
5th Day	140.57 ± 56.47	112.72 ± 33.21	0.003*
Sodium(Na):			
On Admission	137.22 ± 9.01	137.06 ± 10.03	0.933
3rd Day	137.34 ± 8.45	137.32 ± 8.25	0.990
5th Day	135.88 ± 8.12	136.84 ± 7.27	0.535
Potassium(K):			
On Admission	4.16 ± 0.83	4.25 ± 0.66	0.539
3rd Day	4.01 ± 0.73	4.12 ± 0.52	0.390
5th Day	3.91 ± 0.65	4.22 ± 0.63	0.019*
Magnesium(Mg):			
On Admission	2.11 ± 0.56	2.06 ± 0.38	0.633
3rd Day	2.04 ± 0.54	2.04 ± 0.43	0.960
5th Day	2.13 ± 0.42	1.94 ± 0.32	0.013*

**=Significant difference *p≤0.05 Ns= Non significant difference P>0.05*

Table (3): Comparison between the Control &Study Groups as Regard to Pitting Edema Scale (N=100)

Pitting Edema Scale	Control Group (n= 50)		Study Group (n= 50)		P-value
	n.	%	n.	%	
On Admission:					
No Pitting Edema	12	24.0%	11	22.0%	0.983
Mild	7	14.0%	8	16.0%	
Moderate	12	24.0%	13	26.0%	
Moderately Severe	12	24.0%	10	20.0%	
Severe	7	14.0%	8	16.0%	
2nd Day:					0.281
No Pitting Edema	12	24.0%	11	22.0%	
Mild	4	8.0%	12	24.0%	
Moderate	17	34.0%	14	28.0%	
Moderately Severe	13	26.0%	9	18.0%	
Severe	4	8.0%	4	8.0%	
3rd Day:					0.734
No Pitting Edema	15	30.0%	17	34.0%	
Mild	14	28.0%	12	24.0%	
Moderate	13	26.0%	16	32.0%	
Moderately Severe	8	16.0%	5	10.0%	
Severe	0	0.0%	0	0.0%	
4th Day:					0.800
No Pitting Edema	25	50.0%	23	46.0%	
Mild	14	28.0%	18	36.0%	
Moderate	8	16.0%	7	14.0%	
Moderately Severe	2	4.0%	2	4.0%	
Severe	1	2.0%	0	0.0%	
5th Day:					0.022*
No Pitting Edema	23	46.0%	34	68.0%	
Mild	12	24.0%	13	26.0%	
Moderate	8	16.0%	3	6.0%	
Moderately Severe	6	12.0%	0	0.0%	
Severe	1	2.0%	0	0.0%	

**=Significant difference *p≤0.05 Ns= Non significant difference P>0.05*

Table (4): Comparison Between the Control &Study Groups as Regard to RIFLE Criteria (N=100)

RIFLE Criteria	Control Group (n= 50)		Study Group (n= 50)		P-value
	n.	%	n.	%	
On Admission: No AKI	42	84.0%	45	90.0%	0.372
Risk	8	16.0%	5	10.0%	
Injury	0	0.0%	0	0.0%	
Failure	0	0.0%	0	0.0%	
2nd Day: No AKI	36	72.0%	40	80.0%	0.217
Risk	7	14.0%	8	16.0%	
Injury	7	14.0%	2	4.0%	
Failure	0	0.0%	0	0.0%	
3rd Day: No AKI	30	60.0%	40	80.0%	0.125
Risk	7	14.0%	5	10.0%	
Injury	10	20.0%	3	6.0%	
Failure	3	6.0%	2	4.0%	
4th Day: No AKI	30	60.0%	40	80.0%	0.125
Risk	7	14.0%	5	10.0%	
Injury	10	20.0%	3	6.0%	
Failure	3	6.0%	2	4.0%	
5th Day: No AKI	33	66.0%	43	86.0%	0.111
Risk	9	18.0%	4	8.0%	
Injury	7	14.0%	2	4.0%	
Failure	1	2.0%	1	2.0%	

**=Significant difference *p≤0.05 Ns= Non significant difference P>0.05*

Table (5): Comparison Between the Control and Study Groups as Regard to complications (N=100)

Complications	Control group (n= 50)		Study group (n= 50)		P-value
	n.	%	n.	%	
Acute Kidney Injury	10	20.0%	3	6.0%	0.037*
Dehydration and Hypotension	7	14.0%	10	20.0%	0.424
Hypokalemia	4	8.0%	1	2.0%	0.362
Hyperkalemia	1	2.0%	3	6.0%	0.617
Hyponatremia	5	10.0%	4	8.0%	1.000
Urinary Tract Infection	9	18.0%	2	4.0%	0.025*

**=Significant difference *p≤0.05 Ns= Non significant difference P>0.05*

Table (1): Illustrate that nearly more than half (54.0%) of the control group were female but in the study group less than one third (28.0%) were female. It noticed that an equal percentage, 50.0%, of both the control & study groups had DM as one of the past medical history. On the other hand, there were no statistically significant differences in past medical history between two groups.

Table (2): There were no statistically significant differences in urea levels across all days of the study between both groups. However, there was a statistically significant difference in creatinine levels on the 5th day in the study group (p = 0.003*). Additionally, the table demonstrates no statistically significant differences in sodium (Na) levels across all days of the study between the groups. Regards, K & Mg, there were statistically significant differences among the studied groups on the 5th day with p = 0.019* and p = 0.013*, respectively.

Table (3): Show that statistically significant differences at the 5th day with (p=0.022*) among the studied groups.

Table (4): Show that were no statistically significant differences in all days between control and study groups.

Table (5): Present that there were statistically significant differences among the studied groups regarding acute kidney injury and urinary tract infection as complications with p = 0.037* & p = 0.025*, respectively.

Discussion

The relationship between acute heart failure (AHF) and acute kidney injury (AKI) is complex and multifactorial, involving hemodynamic, neurohormonal, and inflammatory pathways. In AHF, reduced cardiac output and elevated central venous pressure lead to impaired renal perfusion, initiating kidney dysfunction **(Kazory et al., 2024).**

Targeted nursing protocol play an indispensable role in reducing the incidence and severity of AKI between patients with acute heart failure. Interventions including precise monitoring of fluid status, early recognition of renal impairment, optimization of medication regimens, and avoidance of nephrotoxic agents are critical to preserving renal function **(Al-Kalaldeh et al., 2024).**

The current study revealed that the mean age of patients over fifty years in control group while the study group had aslightly lower mean age fifty years. Regarding patients gender there was found that the control group had aslightly higher proportion of females than males. In contrast the study group had asignificantly higher proportion of males compared to females, as these factors are often associated with cardiovascular health risks. Additionally, hormonal differences between males and females may help explain why being male is a significant risk factor for heart failure across various diagnoses and age groups.

A recent study conducted in Egypt provides insights into the age and gender distribution of heart failure patients, aligning with these results. The study, part of the European Society of Cardiology Heart Failure Long-Term Registry **(Elbarbary et al., 2024)**, analyzed data from 20 hospitals across Egypt. It found that female patients with heart failure were generally older than their male counterparts. This suggests that the control group in these results, predominantly female, might have a higher mean age compared to the study group, which had a slightly lower mean age and a higher proportion of males. Regarding gender distribution reported that most of heart failure patients were female, compared to male. This indicates a higher proportion of females in the overall heart failure population. However, the study also highlighted those men presented with heart failure more frequently due to acute coronary syndrome and had a higher prevalence of smoking.

However, another studies conducted in Egypt by **(Hussein et al., 2024**), which identified that the highest percentage of both (study and control) of heart failure patients whose ages ranged between 40 to < 60 years, were male. This was not in agreement with **(Carmin et al., 2024)** who found that majorty of the sample of heart failure patients were women and this percentage was essentially the same in all subgroups.

It was noted that patients' clinical data for acute heart failure as past medical history had no significant effect on nursing protocol intervention. In relation to past medical history, the present study showed that diabetes mellitus is an equal percentage as a past medical condition in the control and study groups, while the study group had a higher percentage of hypertension compared to the control group. The study of **(Mills et al., 2020)** who shwoen that hypertention is amajor risk factor for heart failure as it increase myocardial work load and leads to left ventricular hypertrophy. Another study of **(Rethy et al., 2022)** who focused on resistant hypertension a condition where blood pressure remains high despite treatment found that third of patients in the controlled hypertension group had diabetes, while more than third in the resistant hypertension group had diabetes among heart failure patients.

Regarding patients diagnosis it was found that myocardial infarction (MI) prevalence, with a higher proportion in the control group compared to the study group. MI is a major cause of HF due to myocardial damage leading to reduced cardiac output **(Jenča et al., 2021)**. This finding suggests that ischemic heart disease, particularly MI, may be a more prominent trigger for HF in the control group than in the study group.

Regarding renal function and electrolyte level between control and study group in heart failure patients, it showed that by the 5^{th} day, creatinine levels are significantly lower in the study group compared to the control group. This may indicate improved renal function or better clearance in the study group, potentially due to applying nursing protocol for study group. Statistically significant difference between both groups regarding potassium and magnesium at 5^{th} day.

This result is in agreement with **(Taha et al., 2024)** who showed that the effect of a nursing intervention program on maintaining fluid and electrolyte balance among patients with acute heart failure, the study demonstrated significant improvements in patients knowledge and practice regarding fluid and electrolyte management.

Symptoms of heart failure especialy edema need to be monitored to prevent impending AHF exacerbations. In the current study showed that statistically signficant differences regarding edema between control and study group in the 5^{th} day.This indicates a significantly faster and more complete resolution of edema among patients receiving the structured nursing protocol. Such improvement suggests that early nursing interventions focusing on fluid management, intake and output monitoring, and early mobilization can enhance venous return and prevent fluid overload. This result is in concurrence with

(Schmaderer, et al, 2022) who found that when used nursing monitoring acute heart failure patients symptoms such as edema result in decreased lower extremity edema.

The purpose of RIFLE criteria is to evaluate kidney function deterioration in both groups over 5 days based on certain criteria. Although there is not statistically significant differences, but there is a clear clinical trend toward less AKI progression in the study group across the 5 days. These findings suggest that the structured nursing protocol may contribute to the minimize occurance of AKI in patients with acute heart failure (AHF).

Effective nursing care can influence renal outcomes by optimizing hemodynamic status, fluid balance, early detection of renal function deterioration, and prompt medical intervention. This result is in concurrence with **(Yaqub et al., 2022)** who found that In a South Asian population, the AKIN criteria showed similar effectiveness in diagnosing acute kidney injury (AKI). Although the RIFLE definition tended to overestimate AKI incidence, especially in stage 1, it demonstrated superior ability to predict mortality compared to the other two criteria..

Regarding patients outcomes in both group, there is statistically significant difference of AKI incidence among acute heart failure patients. This finding strongly supports the primary aim of the study proving that nursing protocol reduces the occurrence of AKI.The lower AKI rate can be attributed to several targeted nursing strategies, including close hemodynamic monitoring, timely medication administration (especially diuretics and nephroprotective agents), fluid balance optimization, and patient education on symptom monitoring.

This results is in agreement with (**Ru et al, 2023)** who found that even during follow-up for heart failure patients, the risk of death remained high, and multiple inpatient variables showed that HF patients tended to have AKI. Early intervention and treatment are important to reduce the incidence of AKI and improve the prognosis.The findings from the current study demonstrate a significantly lower incidence of urinary tract infection (UTI) in the study group as compared to the control group. This suggests that the implemented nursing protocol had a protective effect against the development of UTIs in patients hospitalized with acute heart failure (AHF).

Application of nursing protocol such as timely catheter removal, proper perineal hygiene, regular monitoring for signs of infection, and maintaining adequate hydration are essential components of nursing interventions that have been shown to reduce UTI risk in hospitalized patients .The reduced incidence of UTIs in the study group supports findings by **(Gupta et al., 2023)**, who reported that nurse-driven protocols and staff education significantly decrease catheter-associated urinary tract infections (CAUTIs) in hospitalized settings.

Conclusion:

The implementation of the nursing protocol effectively minimizes the occurrence of acute kidney injury and also reduces the incidence of renal complications.

Recommendations:

Policy Implementation: Encourage hospitals to adopt nursing protocol for AKI prevention as part of standard care for patients with AHF.

Continuous Training: Provide regular training and refresher courses for nurses to ensure consistent and accurate implementation of the protocol.

Long-Term Follow-Up: Incorporate a post-discharge follow-up to assess the ongoing impact of the nursing protocol on renal outcomes.

Expand the study population: future research should include a larger and more diverse sample across multiple healthcare centers to improve the generalizability of the results

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