

Critical Care Nurse's Knowledge Regarding to Fluid and Electrolytes Administration in Al-Hilla, Iraq

Nawar Rabah Baiee, Sahar Adham Ali

Adult Nursing Department, College of Nursing, University of Babylon, Babylon, Iraq

Abstract

Background: The problem of fluid and electrolyte imbalance is critical. Poor fluid and electrolyte management in critically sick patients leads to hydro electrolytic overload, which results in physiological disturbances and worse outcomes. Nurses have the knowledge and clinical abilities necessary to maintain patients' electrolyte balance and hydration status in the best possible way. They can continuously assess their patients' health and quickly identify any abnormalities that call for immediate intervention, such as fluid and electrolyte imbalances. **Objectives:** To assess intensive care unit nurses' knowledge related to fluid and electrolyte administration. **Materials and Methods:** Descriptive-observational study design is chosen to carry out this study to achieve the objectives which structures to analyze the knowledge of nurses who work in the intensive care unit according to intravenous fluid and electrolyte delivery and specifically look into the following phenomena of interest, from the period from March 10 to April 16, 2023. Non-probability convenience sample of 174 nurses were selected out of 269 nurses working in the intensive care units in Al Hilla Teaching Hospitals according to Richard Geiger's equation. **Results:** The findings indicated that the majority of the study sample 88 (50.6%) were male. The results represent that most of their age 91 (52.3%) were between (20 and 25) years age group, the higher percentage 90 (51.7%) were married, the majority of the study sample, 110 (63.2%) had a bachelor's degrees, and 120 (69.0%) lived in urban resident. The overall nurse's knowledge recorded (71.15%) poor knowledge related to intravenous fluid and electrolyte administration. The knowledge scores are negatively correlated and the training courses have a positive influence on nurses' knowledge. **Conclusion:** Overall knowledge level of the nurses related to fluid and electrolytes administration was recorded as unsatisfactory.

Keywords: Fluid and electrolytes administration, intensive care units nurses, knowledge

INTRODUCTION

Fluid therapy has typically been administered to patients once a clinician has determined whether they are hypovolemic, euvoletic, or hypervolemic. How does pathophysiology work? Of the patient's illness, and second, are there electrolyte abnormalities? The majority of clinicians concentrate on hypovolemia. This disorder is particularly prevalent in pediatrics and has historically had the highest fatality rate due to gastroenteritis. These clinical indicators give a fluid loss estimate. The degree of dehydration associated with hyponatremia is frequently less severe than it appears from clinical features. The degree of dehydration in hypernatremia is frequently higher than the clinical features imply. The extracellular space accounts for the vast bulk of patients' fluid loss. This is significant because "rapid and generous

replacement of extracellular fluid with 0.9% saline or Ringer's solution" is the treatment for dehydration or depletion of plasma volume or extracellular volume (isotonic liquid).^[1]

Fluid therapy is a proven life-saving technique, but overzealous delivery without sufficient monitoring and evaluation can counteract its positive benefits. In critically ill patients, an increase in mortality has been directly linked to the development of fluid overload. Fluid excess can also occur in heart failure, pulmonary

Address for correspondence: Mrs. Nawar Rabah Baiee,
Adult Nursing Department, College of Nursing,
University of Babylon, Babylon, Iraq.
E-mail: nawarrbah503@gmail.com

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edema, which impairs gas exchange, gastrointestinal dysfunction, and peripheral edema, which results in pressure ulcers, infections, and sluggish wound healing.^[2]

In order to avoid these consequences, nurses' role in monitoring and evaluating hydration status cannot be overstated. Nurses should examine the patients for peripheral edema, pulmonary crackles, shortness of breath, jugular venous distention, and additional heart sounds as indicators of hypervolemia.^[2]

Because of the risks associated with intravenous fluid therapy and the fact that only approximately half of patients benefit from it, predictors of fluid responsiveness can be used to help determine whether a certain patient is likely to respond. Static indicators of fluid responsiveness include right ventricular end-diastolic volume, left ventricular end-diastolic volume, central venous pressure, and pulmonary artery occlusion pressure are no longer commonly recommended for directing or evaluating response to intravenous fluid therapy. Dynamic measures such as stroke volume variation, pulse pressure variation, and inferior vena cava collapsibility are better at predicting fluid responsiveness.^[3]

Monitoring for under-resuscitation and under-replacement is another vital duty of the critical care nurse. Nurses keep an eye out for signs of hypotension such as tachycardia in hypotension (which may be a compensatory response), decreased urine output, prolonged capillary refill time, and lower-than-expected blood pressure (either systolic or mean arterial pressure).^[4]

On the other hand, patients with diabetes insipidus, hyperglycemic crises, or iatrogenic diuretic use may produce an excessive amount of urine, which results in hypovolemia. Acute kidney injury, electrolyte imbalances, and acid-base issues are some additional fluid treatment adverse effects that need to be checked for. Laboratory values such as sodium, creatinine, and lactate should be evaluated at least once daily in patients with unstable situations because they are related to volume status and the harmful consequences of fluid therapy. Other electrolytes, such as potassium, chloride, and magnesium, should also be checked before to fluid therapy and at irregular intervals in order to establish a secure electrolyte balance and guarantee that the appropriate fluid is selected.^[5] Patients may have different fluid needs when they first arrive, and they may also be going through acute illness processes that are dynamically affecting their fluid status and requirements. The bedside critical care nurse must therefore constantly reevaluate patients and their hydration management.^[4]

Nurses have the knowledge and clinical abilities necessary to maintain patients' electrolyte balance

and hydration status in the best possible way. They can continuously assess their patients' health and quickly identify any abnormalities that call for immediate intervention, such as fluid and electrolyte imbalances.^[6] To deliver high-quality patient care, one should engage in critical thinking, advanced problem-solving techniques, and based on evidence-based research.^[7,8]

Nursing standards are the accepted or anticipated levels of performance and practice for nurses.^[9] It is an effective tool for assisting nurses in their work and ensuring high-quality care. Nursing standards offer a platform for assessing the quality of care given despite not being an evaluation instrument in and of themselves. The nurse has an important role in helping these patients to comply with their treatment regimen.^[7] The main objective of this study to assess intensive care unit nurses' knowledge related to fluid and electrolyte administration and find out the relationship between the nurse's knowledge related to demographical characteristics.

MATERIALS AND METHODS

Design of the study

Descriptive–observational study design is chosen to carry out this study to achieve the objectives from the period from November 9, 2022 to May 27, 2023.

Setting of the study

The research was carried out in intensive care units in Al Hilla teaching hospitals (Al-Imam Al-Sadiq teaching hospital, Marjan Medical City, and Al- Hilla surgical teaching hospital).

Sample of the study

Non-probability convenience sample of 174 nurses out of 269 was selected. The sample size has been determined using Richard Geiger's equation [Table 1].

Study instrument

To achieve the objectives of this study and to facilitate data collection, a comprehensive review of related literature was made. A special questionnaire form consisting of multiple-choice question was prepared. It is a contracted questionnaire consisting of three parts: The part one (demographical characteristic) consists of three items, part two (professional data) consists of four items, and part three (intensive care unit nurse's knowledge related to intravenous fluid and electrolyte administration) consists of four domains distributed to 53 items. The prepared questionnaire contained 53 multiple-choice questions rated as correct and incorrect by the scoring system which adapted 2 for correct answers and 1 for incorrect answers.

Validity

To ensure its validity, the questionnaire to measure nurse knowledge was distributed among 11 experts to assess its clarity and applicability. These experts, who are multidisciplinary field experts with a minimum of 10 years of experience in their field, underwent a thorough revision process, and changes were made in response to their suggestions.

Pilot study

A pilot study involving 10% of the original sample size of nurses was carried out to assess the applicability, visibility, clarity, and item arrangement of the questionnaire.

A pilot study is conducted up on 17 nurses in the coronary care unit (CCU), selected from Marjan Teaching Hospital carried out between 26 and 27 February 2023. To estimate the time needed for each participant to complete the questionnaire, which takes between 20 and 35 min. Calculated reliability is noted as $r = 0.83$.

Data collection

After obtaining the participant's oral consent, the structured questionnaire that had been previously created to capture the data was collected using the direct face-to-face interview approach. Every nurse takes time ranging from 20min to 35min to complete the questionnaire, and this step started from (10 March to 16 April 2023).

Ethical consideration

The study was conducted according to ethical principles. It was carried out with nurses' verbal and analytical approval before the sample was taken. The study protocol, the subject information and the consent form were reviewed and approved by a local ethics committee, according to the document number 269 dated in February 6, 2023 to get this approval.

RESULTS

Table 1: Distribution of sample

Hospitals names		N	N	%
Al-Imam Al-Sadiq teaching hospital	RCU	69	51	29%
	CCU	37	25	15%
Marjan Medical city	CCU	52	20	Pilot study
Al-Hilla surgical teaching hospital	RCU	111	98	56%
Total		269	174	100%

RCU: respiratory care unit

Table 2: The study sample was distributed according to their demographic parameters

Variables	Categories	Frequency	Percent
Gender	Male	88	50.6
	Female	86	49.4
	Total	174	100.0
Age	20–25 years	91	52.3
	26–30 years	68	39.1
	31–35 years	15	8.6
	Total	174	100.0
Marital status	Married	90	51.7
	Single	82	47.1
	Widow	2	1.1
	Total	174	100.0
Qualification	Nursing school	10	5.7
	Diploma	51	29.3
	Bachelor	110	63.2
	Post graduate	3	1.7
	Total	174	100.0
Residency	Rural area	54	31.0
	Urban area	120	69.0
	Total	174	100.0

Table 3: Distribution of the study sample related to their employment characteristics

Variables		Frequency	Percent
Years of experience in a hospital	<1 year	59	33.9
	1–3 years	49	28.2
	>3 years	66	37.9
	Total	174	100.0
Participation in training sessions concerned to intravenous fluid and electrolyte administration:	No	131	75.3
	Yes	43	24.7
	Total	174	100.0
Do you work on educating yourself about the field of specialization in a self-reliant way?	No	21	12.1
	Yes	153	87.9
	Total	174	100.0

Table 4: Knowledge of the study sample related to intravenous fluid and electrolyte administration

Questionnaire domain	General mean	Standard deviation	Assessment
General information related to intravenous fluid	1.25	0.407	Poor
Electrolyte administration	1.47	0.541	Poor
Assessment related to fluid and electrolytes	1.31	0.511	Poor
Administration fluid and electrolyte	1.43	0.478	Poor
Complications fluid and electrolyte	1.39	0.451	Poor
Caring	1.55	0.485	Fair

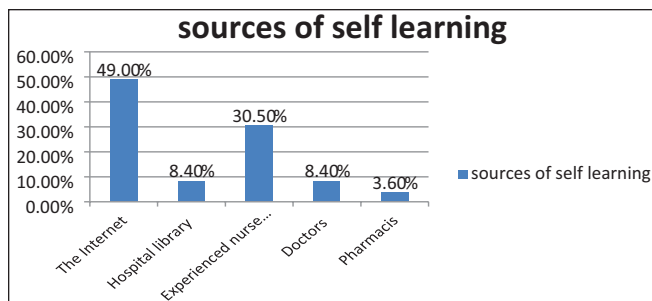


Figure 1: Distribution of study sample related to self-learning sources

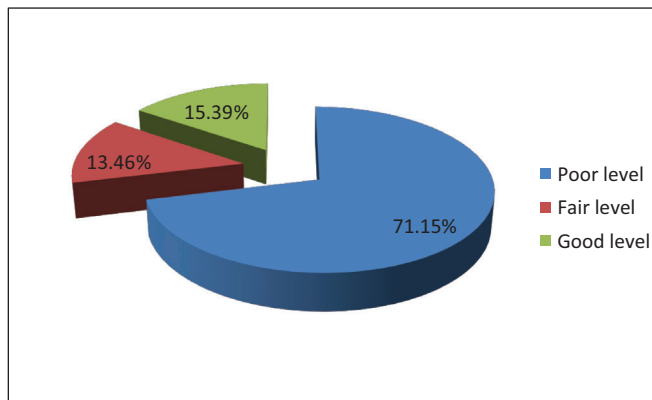


Figure 2: Over all knowledge regarding intravenous fluid and electrolyte administration

Table 5: Association between intensive care unit nurse's knowledge and demographical characteristics

Parameter	Chi square value	Df	P value
Gender	35.352 ^a	23	0.048 S
Age	68.257 ^a	46	0.018 S
Marital status	73.655 ^a	46	0.350 NS
Qualification	82.501 ^a	69	0.128 NS

^a P probability ≤ 0.05 , Df = degree of freedom

DISCUSSION

Study sample regarding demographic characteristics of the studied group in the current study showed [Table 2] that 88 (50.6%) were male nurses; this study results are similar with Zyoud SH *et al.*^[10] Male nurses made up 153 (54.6%) of the total number of nurses, making up the majority of nurses (121; 43.2 %).

Related to age, the results were recorded 91 (52.3%) between 20 and 25 years ago. This result is similar to El-Garawani *et al.*^[11] The result of the current study showed with a mean age of 43.32 ± 7.64 , and 43.3% of the study volunteers were between the ages of 20 and 29. The results show that the factors impacting nurses' expertise are their age, gender, and attendance at training sessions.

Related to the study sample marital status and residency, the percentage 90 (51.7%) were married, 120 (69.0%)

were urban residency; these results are similar with Abd Elfatah *et al.*^[12] who showed marital situations in 60% of the nurses who had completed the study were married and resided in urban areas (60.0 %).

As regards to educational level, whereas most of the study sample 110 (63.2%) were bachelor's degree holders. The findings of this study are comparable to that of Mahmoud *et al.*^[13] The result of the current study showed that more than half of the studied nurses had bachelor's degree of nursing. From the investigator's point of view, this result might be due increased number of graduates from nursing faculties and new policies for nurses who had bachelor's degrees in nursing working at ICU. Additionally Figure 1 show Internet represent (49%) of self-learning sources among nurses participates.

The current study showed years of experience in the hospital the findings show that 37.9% have more than 3 years of experience [Table 3]. This study's results are similar to the study Hassan *et al.*^[14] given that half of the nurses have experience from between one and five years ago, and the majority of them are recently graduated (56.9%).

There are relationships between the intensive care unit nurse's knowledge and employment characteristics, except training sessions were distributed with $P \leq 0.05$.

In order to be able to provide nurses with the right education to update their knowledge and to prevent any improper handling of high-risk medications that could endanger patients' lives, it is necessary to assess nurses' knowledge about intravenous fluid and electrolyte administration. This was revealed by this portion of the current research.

Table 4 indicates that general information related to intravenous fluid recorded a low mean score in all items, whereas item (8) recorded a fair level. The overall level of general information was recorded as poor (1.25 ± 0.407). This result was consistent with Aslam *et al.*'s^[15] findings in their study of general information nurses working with cardiac surgery patients, which revealed that nurses' knowledge of fluid and electrolyte administration in public hospitals is lacking, lowering the standard of nursing care.

General information related to electrolyte administration recorded the overall level recorded poor (1.47 ± 0.541). As these nurse's care for critically ill patients, they should have a solid background in nursing knowledge to be able to give these patients the care they require. However, the nurses' knowledge of this topic was insufficient, indicating the need for interventions to increase nursing knowledge.

Both Mogileeswari *et al.*^[16] and Mohamed *et al.*^[17] demonstrated that there was an unacceptable degree of awareness about fluid balance monitoring, which was particularly prevalent in their studies of the pre-educational

protocol. Additionally, in a study by Abd Elalem *et al.*,^[18] they evaluated the knowledge of critical care nurses in relation to the assessment of fluid balance and discovered that the majority of the nurses were underprepared. From the researcher's point of view, organ systems cannot operate properly and eventually die if an imbalance is not discovered and addressed. So that they can act quickly, nurses must be able to spot minute changes in the fluid or electrolyte balances of their patients.

The study's goals were to evaluate nurses' fluid and electrolyte administration and monitoring knowledge in the intensive care unit. Table 4 shows that most of the items related to assessment recorded low ill items, and the overall mean score of this domain was low (1.31 ± 0.511). This is similar to the result of Mansour.^[19] The findings of the present investigation revealed that experts concurred on the significance of central venous pressure (CVP) monitoring in the evaluation and treatment of fluid and salt imbalance in critical ill patients.

This result is compatible with a prior investigation by Li *et al.*^[20] into the relationship between high CVP and the outcomes of critically ill patients. And shows that most of the items related to intravenous fluid and electrolyte administration recorded a low overall score in this domain (1.43 ± 1.43). To improve the quality of care in public hospitals, nurses' knowledge regarding the administration of fluids and electrolytes need to be improved. This is similar to the result of Aslam *et al.*^[15] showing that there is a knowledge gap among the nurses at the Punjab Institute of Cardiology because the majority of them disagree on knowledge-related issues.

The findings show that nurses' procedures regarding the administration of fluids and electrolytes following heart surgery also fall short on a moderate to high level. Furthermore, the nurses' contempt for low to moderate-level norms and standards and their belief that doing so could endanger the patient's safety. Regarding their knowledge of responsible parties for fluid monitoring, $n = 37$ nurses (17.79%) indicated that they strongly disagreed, $n = 56$ nurses (26.92%) disagreed, $n = 4$ nurses (1.92%) were unsure, $n = 53$ nurses (25.48%) agreed, and $n = 58$ nurses (27.88%) highly agreed.

That most of the items related to complications related to fluid and electrolyte administration recorded the overall mean score of this domain were low (1.39 ± 0.451). That is similar with Abd Elfatah *et al.*^[12] according to the study's findings, only one-fourth of participants received strong knowledge scores for all knowledge questions, whereas more than a quarter had fair knowledge and close to half had low knowledge. Considering that nurses are crucial in the treatment of critically ill patients who have fluid, electrolyte, and acid-base imbalances. Lack of understanding of fluid and electrolyte imbalances is seen

as a barrier to treating patients; this may be because nurses have not paid enough attention to continuing education or training programs, particularly those that address fluid and electrolyte imbalances.

This finding is consistent with Mogileswari *et al.*^[16] which found that among 100 samples, there are three levels of understanding of fluid and electrolyte replacement therapy: The knowledge levels of 15 (15%), 62 (62%), and 23 (23%), respectively, were adequate, fairly adequate, and insufficient. From the researcher's point of view, nurses must be able to spot tiny changes in patients' fluid or electrolyte balances so they can act quickly. Nurses must have the knowledge and skills required to recognize the signs of fluid loss and hypovolemia, assess and monitor patients' fluid balance, manage IV fluid delivery, control vascular access devices, and, possibly, give IV fluids.

The current study assesses the knowledge regarding caring for and maintaining peripheral intravenous cannulation among nurses. This study indicated that most nurses are practicing appropriately and have a fair understanding of IV cannula guidelines. Nurses may find it difficult to follow evidence-based recommendations for reducing IV catheter-related infections if they lack expertise in infection control and adequate nursing care. There are still nurses who do not follow the recommended standards and insert, remove, and maintain IV cannulas incorrectly despite the acknowledged risks of percutaneous coronary intervention. Table 4 shows that most of the items related to manual for caring recorded the overall mean score of this domain was low (1.55 ± 0.485).

The quality of care, patient safety, and patient satisfaction ratings can all be improved as a result of nurses' understanding of and early identification of phlebitis risk factors, which can also shorten hospital stays and lower total healthcare costs Milutinović *et al.*^[21] According to this study, 97% of respondents are aware that thrombophlebitis and infection are the most frequent side effects of IV cannulations. In a similar vein, 75.5% of those surveyed were aware of how ambient cleanliness affected IV site infections.

Overall knowledge regarding fluid and electrolytes [Figure 2] intensive care critically sick patients undergo physiological stressors that disrupt homeostasis, and nurses play a significant role in recognizing and treating these conditions. The current study showed that the majority of nurses had unsatisfactory knowledge regarding fluids and electrolytes, and this sustained result might be referred to as that Hassan *et al.*^[22] From the researcher's point of view, because these nurses care for important situations, it is necessary to develop interventions to increase nursing knowledge. This is because these nurses must have a solid knowledge base to be able to give these patients the care they require.

The results of the present study showed that there was no statistically significant relationship between nurses' total knowledge scores and their demographic characteristics at marital status and qualification. Their gender and age did significantly affect their overall knowledge results. Table 5 shows that their relationship between the intensive care unit nurses' knowledge and demographical characteristics. According to Pancorbo-Hidalgo *et al.*,^[23] there was a negative correlation between years of experience and knowledge levels, with nurses with more years of working experience (21–30 years) having lower levels of knowledge than those with fewer years of working experience (1–10 years). The findings of the current study did not support this conclusion. The notion that nurses with more job experience may have had fewer opportunities to receive current knowledge may have helped to explain these findings.^[24-27]

CONCLUSION

In conclusion, nurses' knowledge about intravenous fluid and electrolytes administration is variable, with an overall poor percentage of total unsatisfactory knowledge.

No significant relationships were found between the nurse's knowledge and their demographical characteristics related to (educational status, residency, and marital status) except their age and gender.

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Conflicts of interest

There are no conflicts of interest.

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