Assessment of Nurses' Knowledge and Practice Regarding Monitoring Fluid and Electrolyte among Cardiac Surgery Patients in the Intensive Care

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Abstract

Background: Fluids are vital to all forms of life; they help maintain body temperature and cell shape, and they help transport nutrients, gases, and waste. Electrolytes play a vital role in maintaining homeostasis within the body. Nurses are responsible for monitoring fluid and electrolyte balance among cardiac surgery patients. Therefore, their knowledge and practice of fluid and electrolyte balance prevent serious complications after cardiac surgery. **Aim of the study:** The study aimed to assess fluid and electrolyte monitoring among nurses in the ICU of the Cardiothoracic Surgery Unit. **Research design:** A Descriptive research design was utilized. **Setting:** The study was conducted in the ICU of the Cardiothoracic Surgery Unit, Benha University Hospital. **Subject: A** Purposive sample of 40 nurses who are working in the ICU of Cardiothoracic Surgery Unit at Benha University Hospital was taken from both sexes, their ages ranged from 30-<40 years old. **Tools:** Two tools were used: **I, a self-administered questionnaire that assessed nurses' socio-demographic characteristics and knowledge regarding fluid and electrolyte monitoring among cardiac surgery patients, and II.** Nurses' practice observational checklist. **Results:** 85% of studied nurses had a poor level of total knowledge regarding fluid and electrolyte balance, and 90% of studied nurses had an average level of total practice regarding fluid and electrolyte balance in the ICU of the Cardiothoracic Surgery Unit. **Conclusion:** The nurses' knowledge was poor, and their practice was average regarding fluid and electrolyte balance among cardiac surgery patients. There was a negative correlation between total knowledge and total practice, as evidenced by p-value>0.050. **Recommendations:** Future studies should be conducted to evaluate the effect of an educational program regarding fluid and electrolyte balance on nurses' knowledge and practice among cardiac surgery patients.

Key words: Fluid and electrolyte balance, Knowledge, Practice, Cardiac surgery patients.

Introduction

Cardiac surgery is one of the most critical and advanced specialties in modern medicine. It involves surgical procedures performed on the heart or the great vessels to treat a wide range of cardiac disorders, such as coronary artery disease, congenital heart defects, and valve heart diseases***(Lee et al, 2024).***

Following cardiac surgery, patients are at high risk of developing fluid and electrolyte imbalances due to multiple factors such as cardiopulmonary bypass, blood loss, fluid shifts, diuretic therapy, and changes in renal perfusion***(Messina et al, 2025).***

These disturbances in fluid and electrolyte balance may manifest in several clinical forms that such as hyponatremia or hypernatremia potassium imbalances, whether hypokalemia or hyperkalemia, calcium and magnesium abnormalities may lead to muscle cramps, tetany, hypotension, or prolonged QT interval on the electrocardiogram. Fluid overload can result in pulmonary edema,

dyspnea, and decreased oxygen saturation, while fluid deficit may cause hypotension, tachycardia, poor urine output, and impairedtissue perfusion***(Gregory & Bett, 2025)***

Accurate monitoring and timely correction of fluid and electrolyte disturbances are essential components of postoperative care, directly influencing patient outcomes and survival after cardiac surgery so , it is essential that ICU nurses possess advanced knowledge, clinical skills, and critical observation abilities. They are responsible for accurate measurement of fluid intake and output, careful monitoring of electrolyte levels, and early detection of imbalances that may compromise cardiac function or overall patient stability. Through continuous assessment, timely interventions***(Mahmoud, Ammar & Mohamed, 2023).***

Significance of the study

More than 2 million people around the world have open-heart surgery to treat various heart problems, and approximately 500,000 people undergo open-heart surgery each year in the United States to correct various cardiovascular problems. In Iran, 30,000 heart surgeries are performed annually, approximately 50 to 60 percent are for coronary artery bypass surgery (CABG) ***(Rahimi et al., 2023).***

In developing countries like Egypt, approximately 11% of cardiac disease patients undergo cardiac operations; the average annual case volume of adult cardiac surgery is 300-350 cases. ***(Vervoort et al, 2020).*** The number of patients undergoing cardiac surgeries in the cardiothoracic surgery unit at Benha University Hospital in 2022 was about 96 patients ***(Benha University Hospital Statistical Office, 2022).***

Electrolyte disorders following cardiac surgery are common occurrences leading to complications. Studies revealed that hypokalemia has been reported in 34% of patients, hypomagnesemia in 46%, hypophosphatemia in 83%, and hypocalcemia in 7.8%. Correction of intraoperative hypomagnesemia in cardiac surgery patients undergoing extracorporeal circulation has been reported to reduce the incidence of ventricular tachyarrhythmia ***(Gebregzabher, Gebretensaye& Alemu2023).*** Therefore, this research was carried out in an attempt to promote the nurses' performance regarding their assessment and monitoring of fluid and electrolyte balance and imbalance for cardiac surgery patients ***(Mahmoud, Ammar & Mohamed,2023).***

Aim of the study

The study aimed to assess the nurses' knowledge and practice regarding monitoring fluid and electrolyte balance among cardiac surgery patients.

Research questions:

1. What is the level of nurses' knowledge related to measuring fluid and electrolyte for cardiac surgery patients?
2. What is the level of nurses' practice related to measuring fluid and electrolyte for cardiac surgery patients?
3. What is the relationship between the knowledge and practice of nurses related to measuring fluid and electrolyte for cardiac surgery patients?

Research design

A quasi-experimental design study was used to conduct the study (pre- and post-test design).

Study setting

The study was conducted in the ICU of the Cardiothoracic Surgery Unit at Benha University Hospital, Qalyubia Governorate, Egypt. When entering the ICU in the first floor of medical building, there is main door, doors, one for Cardiothoracic Surgery Unit and the other for ICU of Cardiothoracic Surgery Unit, there are four beds for receiving the patients after cardiac surgery that are surrounded by a curtain to preserve the privacy of patients, cardiac surgery performed two days a week, Sunday and Wednesday, included two cases per day. The Cardiothoracic unit on the second floor of the medical building receives patients before the day of surgery for preparation, while the ICU of the Cardiothoracic Surgery Unit receives

patients after surgery for care. Follow-up is done after discharge every Tuesday in the Cardiothoracic Outpatient Clinics.

Subjects

A purposive sample of 40 nurses from the aforementioned setting was recruited within 6 months.

Inclusion Criteria

-Who is assigned for direct patient care and willing to participate in the study.

Exclusion criteria:

-Nurses have working experience of not less than six months in the ICU of the Cardiothoracic Surgery Unit.

Tools of data collection

Two tools for data collection were used as follows:

Too lI: Self-administered questionnaire: (Appendix I)

This tool was designed by researchers and translated into Arabic after reviewing recent relevant literature and scientific references. It involved the following two parts as follows:

Part1:Nurses'demographic characteristics: This part is concerned with the assessment of nurses' personal data related to their age, sex, marital status, and educational qualification, as well as their years of experience in the ICU of the Cardiothoracic Surgery Unit. Workshops were held before the program regarding the monitoring of the fluid and electrolytes or cardiac surgery patients.

Part 2: **Nurses**' **Knowledge Assessment:** It was developed by the researcher through a review of related literature and adapted from ***(Ouda, Said & Mohamed, 2020) & (Hassan, 2021)***. It aimed to assess knowledge about the monitoring of fluid and electrolyte balance and imbalance for cardiac surgery patients. It consisted of 32 questions divided into six sections as follows:

Section 1: It was concerned with assessing nurses' knowledge regarding fluid and electrolyte balance monitoring in cardiac surgery patients and included 7 questions.

Section 2: It was concerned with assessing nurses' knowledge regarding the normal levels and values of fluids and electrolytes in the body and included 8 questions.

Section 3: It was concerned with assessing nurses' knowledge regarding the features of various fluid and electrolyte disorders and problems in the body and included 9questions.

Section 4: It was concerned with assessing nurses' knowledge regarding the fluid and electrolytes assessment after open heart surgery and included 11questions.

Section 5: It was concerned with assessing nurses' knowledge regarding the types of solutions used before and after open-heart surgery and included 4questions.

Scoring system:

For all items related to knowledge, each question was scored from 0 -2 scores where two scores were given for each correct, complete answer, one score for an incomplete answer, and zero for an incorrect answer. The total knowledge questions were 39 points, and the total score of knowledge was calculated and converted into percent and categories as follows:

- Knowledge scores > 80 % good knowledge. (> 62grades)
-Knowledge score 60 - ≥80 % average knowledge. (47 ≥ 62grades)
- Knowledge score <60 % poor knowledge. (<47 grades)

Tool II: Nurses' practice observational checklist: (Appendix I)

It aimed to assess nurses' practice for assessing and monitoring fluid balance and clinical parameters of imbalance in post-cardiac surgery patients. It was developed by the researcher after reviewing related literature and adapted from **(Hosny, Sherief, & Mohamed, 2022).** And divided into seven sections as follows:

Section 1: It was concerned with assessing nurses' practice regarding the measurement of the patients' fluid and electrolyte intake (input). It included 21 steps**.**

Section 2: It was concerned with assessing nurses' practice regarding the measurement of the patients' fluid and electrolyte output. It included 14steps.

Section 3: It was concerned with assessing nurses' practice regarding the central venous pressure measurement. It included 12 steps.

Section 4: It was concerned with assessing nurses' practice regarding capillary refill time measurement. It included 10 steps.

Section 5: It was concerned with assessing nurses' practice regarding arterial blood gases measurement. It included 26steps.

Section 6: It was concerned with assessing nurses' practice regarding the Glasgow Coma Scale tool to measure the degree of consciousness. It included 11steps.

Section 7: It was concerned with assessing nurses' practice regarding height and weight measurement. It included 11steps.

Scoring system:

Each procedure was scored from 0 -1. One score for each completed step and zero for the not-done step. The total practice steps were 105 steps, and the total score of practice was calculated and converted into percentages and categories as follows:

- A practice score of ≥ 85% is considered a competent level. (≥89grades)
- A practice score of < 85% is considered an incompetent level. (<89grades)

Method:

I- Administrative design:

Official permission to conduct the study was obtained from the hospital director, nurse supervisor, and head nurse of the Emergency department at Benha University Hospital by the submission of a formal letter from the dean of the faculty of nursing at Benha University.

Ethical considerations:

- Oral consent was obtained from the studied nurses to participate in the study.
- The aim of the study was explained to all nurses, and they were reassured that all information will be confidential and will be used only for their benefit and for the research purpose.
- The studied nurses also informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time without any reasons giving.
- The research tools will not cause any harm for participants
- Permission to carry out the study from responsible authorities in the faculty of nursing at Benha University and hospital administration personnel.

II-Preparatory phase:

This phase included reviewing of literature on various aspects of this study to develop the appropriate tools for data collection according to supervisors' guidance and experts' opinions. During this phase, the researcher also visited the study setting to be acquainted with the personnel and the setting.

Validity and Reliability

Tools validity:

The content validity of the tools was checked by a jury consisting of three experts in the field of medical-surgical nursing from the faculty of nursing at Benha University. The experts reviewed the tools to check the questions' relevance, simplicity, clarity, comprehensiveness, and applicability. The consensus among experts regarding the questionnaire percentage ranged between 90% to 100%, and the observational checklist ranged between 90% to 100% for most items. Then all required modifications were done consequently and the final form of the tools was used for data collection.

Tools Reliability:

The reliability was tested using Cronbach's alpha coefficient. The reliability scores of the tools of the knowledge questionnaire and practice checklist were as follows:

Knowledge	0.946	40
Practice	0.672	116

Pilot study:

A pilot study was conducted on 10 % of the studied sample (10 nurses) to test the clarity and applicability of the study tools and the program, as well as to estimate the time required for each tool to be filled by the researcher, as well as to identify any possible

obstacles that may hinder data collection. Based on the results of the pilot study, the necessary modifications were made for more applicable tools to collect data. The nurses selected for the pilot study were excluded from the study subjects.

III- Fieldwork and data collection:

- Reviewing all available recent local and international related literature and exploring websites concerning the topics of the study, using textbooks, and evidence-based articles.
- Developing the questionnaire format for knowledge in order to assess nurses' knowledge regarding triage.
- Measuring tools of subjective and objective outcomes was tested for validity and reliability.
- Before conducting the study, an exploration visit was done in the ICU of Cardiothoracic Surgery Unit at Benha University Hospital to estimate the total number of nurses and a suitable time for collecting data.
- Interviewing with nurses before starting the data collection procedure was conducted to establish a good relationship with them, explain the aim and nature of the study was done for them.
- The study was conducted over a period of 6 months, which started from the beginning of April 2024 to the end of October 2024; data were collected by interviewing the studied nurses in the emergency department at Benha University Hospital.
- Data collected by the researcher who attended the study setting two days (Tuesday and Thursday) per week. The precautionary practice measures for infection control to prevent wound infection, such as wearing a facemask, gloves, and using an alcohol aseptic solution, for both the researcher and the nurses included in the study.

Once the aim of the study was explained to the participant of nurses in simple words, each participant was individually interviewed using the structured questionnaire concerning nurses' demographic characteristics, then the studied nurses were assessed for their knowledge concerning fluid and electrolyte monitoring for cardiac surgery patients using (tool I) and observe the nurses' practice regarding fluid and electrolyte monitoring for cardiac surgery patients using (tool II). The tools were collected by the researcher preprogram implementation for each nurse individually.

Statistical analysis:

Data was fed to the computer and analyzed using the IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using numbers and percentages. The Shapiro-Wilk test was used to verify the normality of the distribution. Quantitative data were described using mean and standard deviation. Significance of the obtained results was judged at the 5% level.

The tests used were as follows

ANOVA with repeated measures for normally distributed quantitative variables, to compare between more than two period stages, and Post Hoc Test Bonferroni for pairwise comparisons. The Friedman test for abnormally distributed quantitative variables, to compare between more than two periods. Pearson coefficient, to correlate between two normally distributed quantitative variables. Cochran's test for a non-parametric test for binary response variable and Post Hoc Test (Dunn's) for pairwise comparisons.

Statistical significance was considered as follows:

- P-value > 0.05 Not significant
- P-value < 0. 05 Significant

Results

Table (1): Shows the distribution of studied nurse's personal information , it was noticed 70.0% of nurses were in the age category of 30- <40 years old, with mean age 31.93 ± 4.83. Females were more prevalent and constituted 55.0% of the studied nurses and 100.0% of them were married. As regards educational qualifications, 75.0 % of them

had a diploma from the nursing institute with 10 years or more experience in the nursing field, adding to one year -< 5 years of experience in the intensive care unit of cardiothoracic surgery.

Table 2 shows the distribution of nurses studied regarding their total knowledge about fluid and electrolyte balance among cardiac surgery patients. It was noticed that 85% of the nurses studied had a poor total knowledge level.

Figure 1: Shows the distribution of studied nurses regarding their total knowledge about fluid and electrolyte balance. It was noticed that 85 % of the studied nurses had a poor level of knowledge.

Table (3): Shows the distribution of studied nurses regarding their levels of practice among cardiac surgery patients, it was noticed that90% of the studied nurses had average total practice level.

Figure (2): Shows the distribution of studied nurse's regarding their levels of practices among cardiac surgery patients, it was noticed that 90% of the studied nurses had average total practice level.

Table (4): Shows the correlation between total nurses ' knowledge and their practice level about fluid and electrolyte balance among cardiac surgical patients, it was noticed that there was no significant negative correlation between total knowledge and total practice.

Table 1: Frequency distribution of studied nurses according to their socio demographic characteristics (n =40)

The nurse's socio demographic data	Total (n = 40)	
	No.	%
Age (Years)		
• 20>- 30	12	30.0
• 30>- 40	28	70.0
• 40-50	0	0.0
Mean ± SD.	31.93 ± 4.83	
Sex		
• Male	18	45.0
• Female	22	55.0
Marital status		
• Single	0	0.0
• Married	40	100.0
• Widow	0	0.0
• Divorced	0	0.0
Educational qualification		
• Diploma from the Nursing Institute	30	75.0
• Bachelor of Nursing	10	25.0
• Master's degree	0	0.0
• Doctorate degree	0	0.0
Years of experience in the field of nursing:		
• Less than one year	0	0.0
• From one year to less than 5 years	3	7.5
• From 5 years to less than 10 years	10	25.0
• From 10 years or more	27	67.5
Years of experience in the intensive care unit of the cardiothoracic surgery unit:		
• Less than one year	0	0.0
• From one year to less than 5 years	16	40.0
• From 5 years to less than 10 years	13	32.5
• From 10 years or more	11	27.5
Attending previous training courses :		
• No	38	95.0
• Yes	2	5.0

Table (2): Frequency distribution of studied nurses regarding their total of knowledge about fluid and electrolyte balance among cardiac surgical patients (n =40).

Total nurses' knowledge regarding fluids and electrolyte balance.	Poor (<60%)		Average (60%-80%)		Good (> 80%)	
	No.	%	No.	%	No.	%
- Fluids and electrolyte balance among cardiac surgery patients	32	80.0	8	20.0	0	0.0
-Normal rates and values of fluids and electrolytes in the body	30	75.0	10	25.0	0	0.0
-Fluid and electrolyte disorders in cardiac surgery patients	24	60.0	16	40.0	0	0.0
- Types of solutions used after cardiac surgery	22	55.0	18	45.0	0	0.0
- Role of nurses in evaluating fluids and electrolyte after cardiac surgery	22	55.0	18	45.0	0	0.0
Overall	**34**	**85.0**	**6**	**15.0**	**0**	**0.0**

Figure (1): Frequency distribution of studied nurses regarding their total level of knowledge about fluid and electrolyte balance among cardiac surgical patients (n= 40).

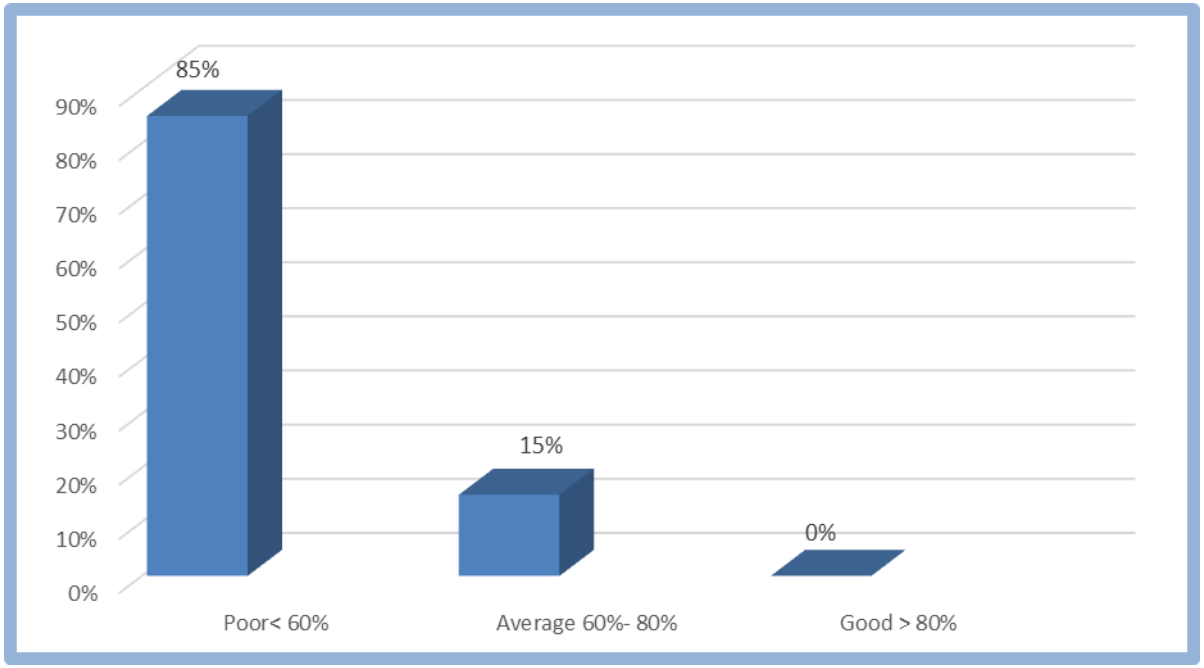

Table (3): Frequency distribution of studied nurses according to their levels of practices among cardiac surgery patients (n =40).

Nurses' practices levels regarding fluids and electrolyte balance measurements	Poor (<60%)		Average (60%-80%)		Good (> 80%)	
	No.	%	No.	%	No.	%
-Measurements of fluid and electrolyte intake	20	50.0	20	50.0	0	0.0
-Measurements of fluid and electrolyte output	23	57.5	17	42.5	0	0.0
-Clinical parameters assessment (CVP	20	50.0	20	50.0	0	0.0
Clinical parameters assessment (capillary refill)	24	60.0	16	40.0	0	0.0
-Clinical parameters assessment (ABG)	12	30.0	28	70.0	0	0.0
-Clinical parameters assessment (GCS)	32	80.0	8	20.0	0	0.0
-Clinical parameters assessment (height and weight)	12	30.0	20	50.0	8	20.0
Overall	**4**	**10.0**	**36**	**90.0**	**0**	**0.0**

Figure (2): Frequency distribution of studied nurses regarding their total level of practice about fluid and electrolyte balance among cardiac surgical patients (n= 40).

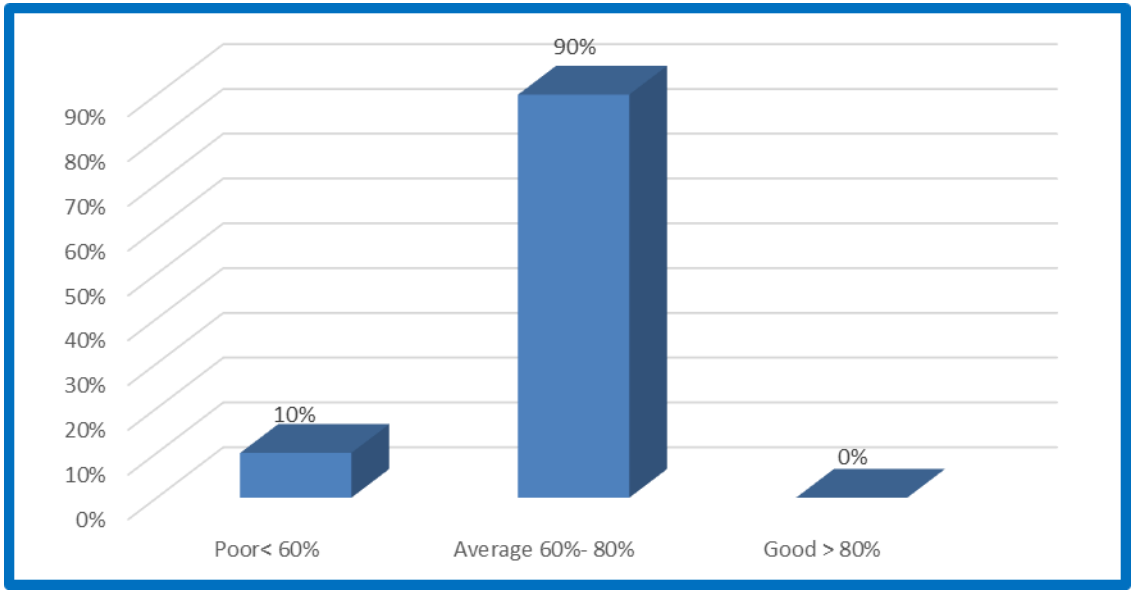

Table (4): Correlation between total nurses ' knowledge and their practice level about fluid and electrolyte balance among cardiac surgical patients (n = 40).

Knowledge vs. practices	Result
R	0.154
P	0.342

Discussion

Fluid balance monitoring is an essential part of the process of care in ICU of cardiothoracic surgery unit. Fluid balance is the balancing of intake and output of fluid to allow metabolic processes to function correctly. Maintaining fluid balance plays an important role in the managing cardiac surgery patients, the accurate monitoring of fluid balance activities is a vital part of patients' baseline information, which guides medical and nursing interventions to achieve physiological stability) **Rasmussen et al., 2024).**

Regarding demographic characteristics of the studied nurses, the current study revealed that more than two-thirds of the studied nurses, were recorded within age group of thirty to forty years old. This result in the same line with **Mohammed, Roshdy & Mokhtar, (2020).** Whose study titled " Effect of Safe Hydration Management Educational Program on Nurses' Performance and Patients' Outcomes in Minia University Hospitals. " , and reported that the age of most of the studied nurses were recorded within age group of thirty to forty years old.

But the present study findings incongruent with **Hosny, Sherief & Mohamed , (2022).** about " Prevalence of Assessment of Nurses' knowledge and Performance Regarding Fluid and Electrolyte Management for Cardiac Surgery Patients at the cardio-thoracic surgery department affiliated to Mansoura University Hospital. " , and reported that the age of most of the studied nurses were recorded between twenty six to less than thirty years.

As regard to sex, the current study results showed that more than half of the studied nurses were female. From researcher point of view this results may be explained by the fact that nursing is a universal feminine profession especially in Egyptian society culture as well as the enrolment of the male students in this profession was started in the late decades.

This finding is in line with **Abd Elalem, & Fouad (2020).** Whose study about " Effect of an instruction intervention about body fluid balance assessment on knowledge and practice among nurses in Intensive Care Unit in intensive care unit at Menoufia University Hospital. " Showed that the majority of the studied nurses were female.

Regarding to educational qualification, the current study showed that three-quarters of the studied nurses had a diploma from the Nursing Institute. From the researcher's point of view, these results are explained by a little number of faculty′s graduates employed in the university hospital and other work in schools or the Ministry of Health Hospital. This result in the same line with a study done **Mohamed, Mohammed & Taha (2018) .** Showed that three-quarters of the study sample graduated from a technical institute.

On the other hand, the present study findings are incongruent with **Hosny, Sherief & Mohamed, (2022).** Titled "Assessment of Nurses' knowledge and Performance Regarding Fluid and Electrolyte Management for Cardiac Surgery Patient in cardio-thoracic surgery department of Mansoura University Hospitals. " showed that almost two third of the studied nurses had bachelor degree.

Concerning years of experience in the field of nursing, the current study findings revealed that two third of studied nurses had ten years in the field of nursing. From the researcher's point of view, governmental hospitals often tend to have a nursing workforce composed mainly of experienced staff. This may be due to the fact that the number of newly graduated nurses is insufficient to meet the growing healthcare demands. As a result, the nursing staff in these institutions is largely made up of nurses with long years of experience, who have remained in service to fill the gap caused by the shortage of new recruits. This finding is consistent with a study was done by **Michelsen, et al., (2022).** Entitled "A study on accuracy and precision of fluid volume measurements by nurses, patients and healthy persons in a clinical setting in university Hospital in Denmark. " which reported that

the more than half of studied nurses had ten years in the field of nursing.

Concerning their years of experience in the intensive care unit of the cardiothoracic surgery unit, the result revealed that two fifth of the studied nurses had experience in the intensive care unit of the cardiothoracic surgery unit from one year to less than 5 years. From the researcher's point of view, this may be due to that the hospitals are increasingly recruiting new nurses into specialized units to meet the growing needs of cardiothoracic surgical care, especially given advancements in surgical procedures and rising patient numbers .This result is dis agreement with a study by **Mansour, (2020).** about " Developing Nursing Standards for Maintaining Fluid and Electrolyte Balance for Critically Ill Patients in Intensive Care Units in ICUs of Mansoura University Emergency Hospital. " and found that most of the sample were had experience in the intensive care unit of the cardiothoracic surgery unit for more than 20 years.

Concerning their marital status, the result revealed that all of them married. It may attributed to that the Egyptian females prefer to be married in young age according to Egyptian society culture . This finding is in line with a study supported by **Hafez et al., (2022) .** About " Effect of Implementing Fluid and Electrolyte Resuscitation Educational Package on Nurses' Performance and Outcomes of Patients with Burn at Mansoura University Hospitals. " and found that most of the sample were married.

Regarding training courses or workshops on fluid and electrolyte monitoring for cardiac surgery patients, the findings of the current study revealed that most of the studied nurses didn't participate on fluid and electrolyte monitoring workshops for cardiac surgery patients. From the researcher's point of view, this could be attributed to several factors such as limited availability of specialized training programs, lack of institutional support, or workload pressures that prevent nurses from attending such educational activities.

This finding is in line with a study supported by **Abd Elalem & Fouad, (2020).** Found that majority of the sample weren't participate on fluid and electrolyte monitoring workshops for cardiac surgery patients.

Regarding nurses' total knowledge scores about fluid and electrolyte balance among cardiac surgery patients, the study revealed that the majority of the studied nurses had a poor level of knowledge. From the researcher's point of view, this result may be due to many factors such as the lack of orientation programs for the newly hired nurses regarding their role in fluid and electrolyte monitoring among cardiac surgery patients .

This finding congruent with study carried out by **Eta et al.,(2024)** . Which entitled" Nurses' practices of input and output monitoring of patients on intravenous fluid therapy in hospitals within Fako Division, Cameroon. " they indicated that majority of the studied nurses had unsatisfactory total knowledge about fluid and electrolyte monitoring .

Regarding nurses' total practice scores about fluid and electrolyte monitoring for cardiac surgery patients, the study showed that majority of studied nurses had an average level of practice. From the researcher point of view, this may be attributed to a lack of studied nurses' knowledge, lack of job training, and continuous education.

This result was supported by in a study carried out by **El Desouky, N., Taha, N. & Hafez, G. , (2020).** which entitled" Factors affecting Nurses' performance regarding the care for patients underwent coronary artery bypass graft n cardiothorathic Intensive Care Unit and intermediate intensive care unit At Zagazig University Hospitals." they indicated that more than half of the studied nurses had unsatisfactory total knowledge and inadequate total practice regarding the care for patients underwent CABG and need educational training program to improve nurses

'performance regarding care for cardiac surgery patient.

Concerning the correlation between total knowledge and total practice regarding fluid and electrolyte balance among cardiac surgery patients, it was revealed that there was no significant negative correlation between total knowledge and total practice. This result is in agreement with a study done by **A Hosny, A., Sherief, W., & Mohamed, M. (2022).** Who conducted a study titled " Assessment of Nurses' Knowledge and Performance Regarding Fluid and Electrolyte Management for Cardiac Surgery Patients. at the cardio-thoracic surgery department affiliated to Mansoura University Hospital ", and reported that there was no significant relationship between knowledge and practice regarding fluid and electrolyte balance in cardiac patients.

Conclusion

The majority of the studied nurses had a poor level of knowledge regarding fluid and electrolyte balance in cardiac patients. Also, all of the studied nurses had an average level of practice regarding fluid and electrolyte balance in cardiac patients. There was a negative correlation between total nurses' knowledge and their total practice regarding fluid and electrolyte balance in cardiac patients.

Recommendations

Continuous educational and training courses should be implemented for nurses working in the ICU of the Cardiothoracic Surgery Unit to update their knowledge and practice regarding fluid and electrolyte balance in cardiac patients.

- The study should be replicated on a large sample and in different hospital settings to detect and generalize the results.
- Further study should be conducted to evaluate the effect of implementing an educational program regarding fluid and electrolyte balance on nurses' performance among cardiac patients.

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