Effect of Implementing Fluid Therapy Program on Nurses' Performance at Intensive Care Unit

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Abstract

Background: Fluid management of critically ill patients is a fundamental nursing practice. To provide high-quality patient care, nurses must be knowledgeable about administering and monitoring fluids and electrolytes. **Aim to** evaluate the effect of a fluid therapy program on nurses' performance at Intensive Care Unit **Design:** Quasi-experimental research design. **Setting:** Surgical ICU at Tanta Main University Hospital **Subjects**: convenience sample of 60 nurses. **Tools**: Data were collected using two different tools, **Tool I**, Nurses' Structured Interviewing Questionnaire. **Tool II**, Nurses′ Observational Checklist. **Results:** These results showed that most (90%) of nurses had an unsatisfactory level of practice pre-program, compared to over than three-quarters (78.33%) had satisfactory level of practice post-program implementation. Also, the total knowledge score of the nurses and their practice were presented to be statistically significantly correlated post- program fluid treatment where **p= (0.001). Conclusion:** A fluid therapy program's implementation is a very effective way to raise nurses' practice and their knowledge levels. **Recommendations:** continuous training programs and adherence to evidence-based practices to achieve optimal patients care.

Keywords: Fluid Therapy**,** Nurses' performance

Introduction

Due to significant role of nurses in infusion therapy, an inadequate level of knowledge and practice with intravenous fluid therapy is a major source of mistakes, which raises hospitalized patients' morbidity and mortality rates **(Lim et al., 2025).** Despite intravenous fluid therapy being one of the most well-known routine nursing care methods that has been applied in clinical settings for over a century globally, nurses frequently require training to regulate and manage this therapy **(Salama, 2023).**

According to the standards of practice stated by the Royal College of Nursing, Infusion treatment, including IV fluid types, assessment, administration, monitoring, and adverse events, must be covered in nursing education **(Gorski et al., 2021).** Furthermore, classification, ionic composition, kinds, and indications of common intravenous fluids must be covered in nursing education **(Messmer et al., 2020)**.

The nurse should understand the fundamentals of the body's fluid and electrolyte disturbance. Knowledge must be crucial for patient assessment, intervention planning, and measuring the results of care **(Jones, 2024).**

Complications of IV fluid therapy range from infiltration, infection, extravasation, and thrombophlebitis to organ failure resulting from prolonged insufficient amount of IV fluids **(Gorga et al.,2022).** To handle the possible side effects of IV fluid therapy, nurses need to understand all aspects of intravenous management **(Park et al., 2022).**

Nurses are in charge of measuring the risks, benefits, and harms about intravenous fluids. Also monitor the patient's response, report and record any changes, and take appropriate action as needed (**Cumpstey, Grocott, & Mythen, 2020).** Monitoring fluid balance falls under the scope of nursing practice. **(Mohamed, Mohammed, & Abdel-Malek, 2023).**Each patient treatment plan was impacted by inappropriate calculation of fluid equilibrium (**Büyükkasap & Yazıcı, 2024).** Therefore**,** it is the responsibility and accountability of ICU nurses to accurately calculate and record fluid balance (**Ahlstedt, et al., 2024).**

They should also have critical thinking and advanced problem-solving abilities, to provide patients with best possible standard care which is the process of achieving the maximum level of quality in the provision of patient care **(Lim et al., 2025).**

Significance of the study

When treating patients who are in critical conditions, one of the most important interventions is the administration of fluids. More than 30% of patients in critical care units (ICUs) receive fluid resuscitation on their first day there, and more than 20% of patients receive intravenous fluid resuscitation **(Mark & Mahesh, 2020).**

In critical care, the rate of fluid therapy errors during hospitalization may reach 1.3 per patient. These errors can have serious consequences, potentially leading to increased patient risk and prolonged hospital stays. A substantial portion of these errors involve the rate of fluid administration, inappropriate fluid selection, incorrect fluid volume calculations, and **(Kurttila, Saano, & Laaksonen, 2021).**

Nurses must take preventive strategies to prevent these complications. Therefore, they should be skilled and knowledgeable in handling these problems. The study concerned to evaluate their intravenous treatment knowledge and practice **(Wuyts et al., 2024).**

The aim of the study was to determine the effect of implementing a fluid therapy program on nurses' performance.

Research hypothesis

- Nurse's performance is exposed to be improved post implementation of fluid therapy program.

Subjects and methods

Design: A quasi-experimental research design was employed for this research.

Settings: This study was carried out in the surgical ICU at Tanta University Hospital.

Subjects: A convenience sample of nurses (60) who were working at the previously mentioned setting,

Data collection tools: Two tools were employed for this investigation.

Tool (I) Nurses' Structured Interviewing Questionnaire:

The researcher created it after scoping out recent literature **(Eta, Akong, Bassah, &Amahnui, 2024; Tesgera, Kaweti, Melkamu, & Abate, 2023).** This tool was divided into two components that included:

Part (a): Nurses' socio-demographic characteristics, which included nurses 'age, gender, level of education, experience years, and previous attendance of the educational program about infusion therapy in ICU.

Part(b): Knowledge Assessment Questionnaire Regarding the Fluid Therapy Program at the Intensive Care unit . This part was created by the researcher after looking at the relevant literature (**Tomas& Kamati, 2024; Ali, &**

Saud, 2021; Mark & Mahesh, 2020). Examine nurses' knowledge of electrolyte and fluid balance, principles of intravenous fluid administration, and complications of fluid management. It consisted of thirty-one closed-ended inquiries. It had multiple-choice questions (MCQs) in four different categories.

-Nurse's knowledge regarding fluid and electrolyte balance (12 items)

-Nurse's knowledge regarding principles of intravenous fluid therapy (7items)

- Nurse's knowledge regarding fluid administration (7items)

-Fluid balance calculation (7items)

-Nurse's knowledge regarding fluid therapy complications (5 items).

Scoring system of nurses' knowledge:

- Right response scored (1).

-Incorrect or no response scored (0).

Classified as follows

-High-level knowledge is indicated by 80% of overall score or more.

-A moderate level of knowledge is indicated from (70-<80%) of overall score.

-Knowledge level considered low if score (<70%) of overall score.

Tool II: "Nurses′ Observational Checklist pertaining to Fluid Therapy, was utilized to assess nurses' practice related fluid therapy program by using a 49-items checklist which included; -

-Nurses' practices regarding the primary assessment phase of fluid therapy protocol (10 items),

-Fluid resuscitation phase of fluid therapy protocol (4 items).

-The maintenance phase of fluid therapy (8 items).

-Assessment of fluid intake (7 items).

-Assessment of fluid output (5 items),

-The administration phase of fluid therapy (8items).

-Fluid balance calculation (1 item).

-Reassessment phase of fluid therapy protocol (6items)

The scoring system

The scoring was as following

- Satisfactory practice level ≥ 75%

-Unsatisfactory practice level <75%.

Methods

1-Obtaining approval:

After obtaining approval to collect data from the Faculty of Nursing after deciding on a location for the study, the researchers contacted the appropriate authorities there to get permission to perform the research.

2-Ethical consideration

- Approval was granted by the scientific nursing research committee with No. 267-6-2023, Medicine was obtained with No. 36264MD107-6-23.

- The nurse was asked to provide their informed consent once the

study's purpose was explained. Everyone who took part in the study was informed of its goals and given the option to stop at any moment.

- Names were replaced with code numbers to maintain data confidentiality and nurses' privacy

3-Tool development: The researcher developed study tools Tool I and Tool II of the study after examining pertinent literature **(Eta, Akong, Bassah,& Amahnui, 2024;Tesgera, Kaweti, Melkamu, & Abate, 2023)**

4. Validity of tools: Just before each instrument was presented to the Jury, a group of five Critical Care Nursing and medical professionals reviewed it for clarity, relevancy, and applicability.

5. Reliability of the tools: The tools' reliability was tested by using Cronbach's alpha test. Which was for tool I is 0.835 for 36 items applied to 6 nurses. Cronbach's alpha for tool II is 0.977 for 49 items introduced to 6 nurses.

6. A pilot study

Six patients representative of the research population served as pilot testers to guarantee tools usability and applicability. This allowed identifying potential problems that may arise during data collection, and then it was segregated from the main research's subjects.

7- Duration of data collection

During the time span beginning in September 2023 to end of September 2024.

8- Phases of the study

Phase 1: Assessment phase:

The researcher assessed all nurses for their socio-demographics by using tool (I) Part (a).

Using tools I, section (b), and II, the researcher assessed nurses' fluid treatment knowledge and practice. The researcher met with each nurse to collect knowledge questionnaire responses. Furthermore, the researcher watched each nurse individually during the day shifts to assess their practice during the morning and evening shifts without informing the nurses that they were observed.

Phase 2: Planning phase

- Fluid therapy protocol was created depend on findings from the first phase, and predetermined criteria were considered to ensure an effective plan. Educational interventions were planned based on nurses' educational needs and evidence available in the relevant literature review **(NICE,2024;Boehm&Menke,2021; Seitz, Caldwell ,Hough ,2020)**

-The researcher created a booklet. It was written in easy Arabic and included both theoretical and

practical sections. Experts in critical care nursing revised the booklet.

-Expected outcomes

-Improve mean scores of nurses' practice and knowledge about fluid therapy post-program implementation

Phase 3: Implementation phase

-Fluid therapy program conducted for nurses through the use of booklets, lectures, and video presentations. To maintain a nurse-to-patient ratio as one to one patient in severe conditions, nurses were split up into ten subgroups, each consisting of six nurses, based on their day shift distribution.

- Each session takes time ranged from 15 – 25 minutes.

- The researcher carried out the fluid protocol intervention for all nurses as the follows:

For the theoretical part: Three sessions lasting 30 minutes each were used across three consecutive days.

First session: This session was concerned with providing critical care nurses with knowledge about, definition of fluid therapy, indications, and adverse events of fluid therapy.

Expected outcome

-Improve of mean scores of nurses' knowledge definition, indication, complications of fluid management.

Second session: Fluid physiology, Mechanism of fluid movement, Types of IV solution.

Expected outcome

- Improve mean scores of nurses' knowledge about Fluid physiology, Mechanism of fluid movement, Types of IV solution,

Third session: calculation formulas related to fluid therapy, and how to estimate weight of a critically ill patient.

Expected outcome

-Improve mean scores of nurses' knowledge about calculation formulas for fluid therapy, and how estimate weight of critically ill patient.

For Practical part, two sessions of 30 minutes each were employed over two consecutive days.

Fourth Session: include fluid therapy program steps, measuring of fluid intake and output, measuring central venous pressure. During these sessions, researchers employ basic training videos to teach practical skills and graphics to communicate information in an easy-to-understand manner.

Expected outcome

-Improve mean scores of nurses' practice fluid therapy program steps, including measuring of fluid intake and output, measuring central venous pressure.

Fifth session: This session was concerned with fluid therapy administration; focus on maintenance and replacement phase.

Expected outcome

- Improve the mean scores of nurses' practice for administering fluid therapy in maintenance and replacement.

At the end of the training sessions researcher took positive verbal feedback and summarized the key themes before ended the session provide nurses with feedback and suggestions, and then hand out the questionnaire to create a post-test.

Phase (4): Evaluation phase

-Nurses' knowledge and practice were evaluated by tool I and II before and after the fluid treatment program was implemented.

Results

Table (1) presented the socio-demographic of the study group pre- post-program implementation at (ICU). The data indicate that nearly half (46.7%) of studied sample were aged between (30-<40) years old and the majority (86.7%) of them were females. **Also,** half (50%) of the studied group had bachelor's degree. **Pertaining** experience years at Intensive Care Unit, it revealed that half (50%) of the studied group had (1 -<5) years of experience. It can be seen that none of the nurses under study attended previous courses or clinical training regarding the fluid therapy program.

Table (2): depicted mean score of knowledge domains for the studied group concerning of fluid therapy pre-post program implementation. These results highlighted that statistically significant differences were high. Regarding knowledge domains of the study group including (fluid and electrolytes balance, principles for intravenous fluid therapy, fluid administration and fluid balance calculation, complications of fluid therapy) pre-implementation where p value (**0.000***).

Moreover, it was demonstrated that total mean score (6.27±4.839) of nurses' knowledge domains related to fluid therapy pre-implementation was in a significant decrease Nonetheless, the overall mean score significantly improved(24.65±4.532) post-implementation

Figure (1) demonstrated total knowledge level of the research group . The findings highlighted that**,** before the fluid program was implemented, all of the nurses in the study (100%) reported a low level of overall knowledge in comparison to nearly fifty (51.67%) of the research group with high level of knowledge post implementation of fluid program.

Table (3): illustrated nurses' average scores of their practice domains. It was found that a significant decrease of total mean score (**11.63±9.850)** regarding nurses ' practice related to practice domain of fluid therapy pre-implementation,However significant improvement in total means score (**39.70±6.074)** of nurses 'practice related to practice related to fluid therapy post end of program.

Figure (2): Displayed Percentage of Nurses ' overall practice level . The finding indicated that most (90%) of research group had inadequate practice level prior the program, compared to over three-quarters (78.33%) had a satisfactory degree of practice was observed post- implementation.

Table (4) illustrated Correlation between the overall level of knowledge and overall level of practice among studied nurses throughout periods of intervention. The results showed a statistically significant positive correlation between the nurses' practice and their overall level of knowledge regarding fluid therapy post program implementation, where **p= (0.001*)**.

Table (5): Clarifies Relation between Socio-demographic characteristics of the research group and their overall mean scores knowledge regarding fluid therapy pre, post program implementation a statistically significant link between total knowledge score and gender of the research group where p=0.032* Also, it was observed no significant differences relation between total knowledge mean score among the for the research group and their age, education level and experience years throughout periods of intervention where p (0.820, 0.873, 0.618) respectively.

Table (6) presented relation between Socio-demographic characteristics of the research group and their total practice mean scores concerning fluid therapy. Findings illustrated that level of education for nurses and their overall practice mean score had a statistically significant relationship.

Additionally, It was shown that the relationship between sociodemographic data and overall practice mean score did not differ significantly among nurses under study regarding gender, educational level and attending previous training courses pre, and post-fluid program, where P<0.05.

Table (1): Socio-demographic characteristic distribution of the research group pre- post-program implementation at (ICU).

Characteristics	The studied nurses (n=60)	
	N	%
Age (in years)		
- (21-<30)	21	35.0
- (30-<40)	28	46.7
- (40-<50)	9	15.0
- (50-60)	2	3.3
Range	**(23-53)**	
Mean ± SD	**33.43±6.748**	
Gender		
- Male	8	13.3
- Female	52	86.7
Educational level		
- Technician	19	31.7
- Bachelor	30	50.0
- Post studies	11	18.3
Experience (in years)		
- (1 -<5)	30	50.0
- (5 -<10)	23	38.3
- (≥10)	7	11.7
Range	**(1-15)**	
Mean ± SD	**5.37±3.827**	
Previous education program workshop about fluid therapy		
- No	60	100.0

Table (2): Average scores of knowledge domain of the research group related to fluid therapy pre -post program implementation.

Knowledge domains	The studied nurses (n=60) Range Mean ± SD		t P
	Pre	Post	
- Fluid and electrolyte balance	(0-8) 2.08±2.142	(4-12) 9.95±2.361	**19.12 0.000***
- Principles for intravenous fluid therapy	(0-7) 1.70±1.880	(2-7) 5.15±1.436	**11.29 0.000***
- Fluid administration and fluid balance calculation	(0-6) 1.72±1.851	(1-7) 5.47±1.855	**11.09 0.000***
- Complications of fluid therapy	(0-4) 0.77±1.267	(1-5) 4.08±1.030	**15.73 0.000***
Total mean knowledge score	**(0-17) 6.27±4.839**	**(14-31) 24.65±4.532**	**21.48 0.000***

* Significant at level P<0.05

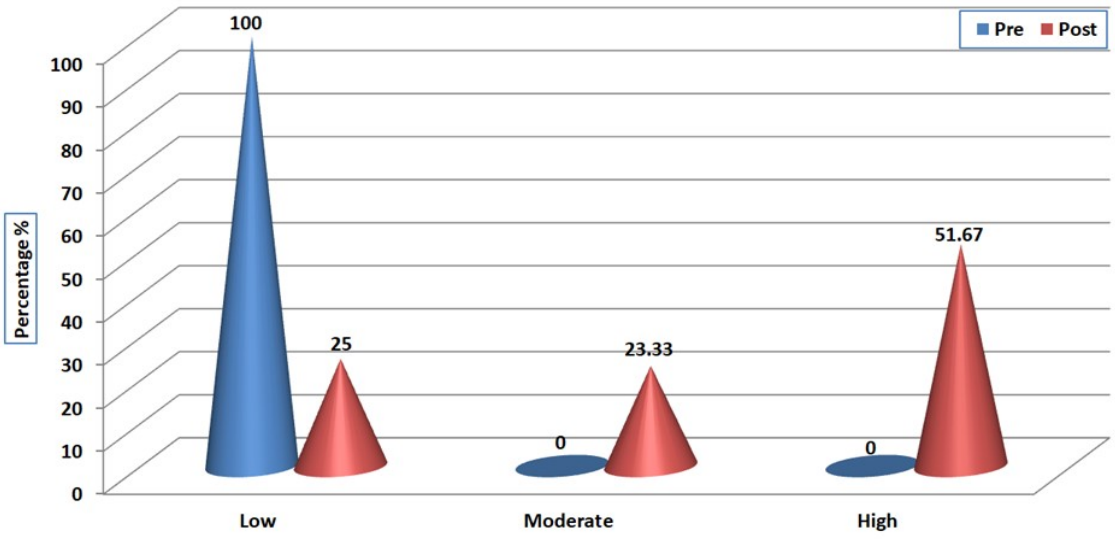
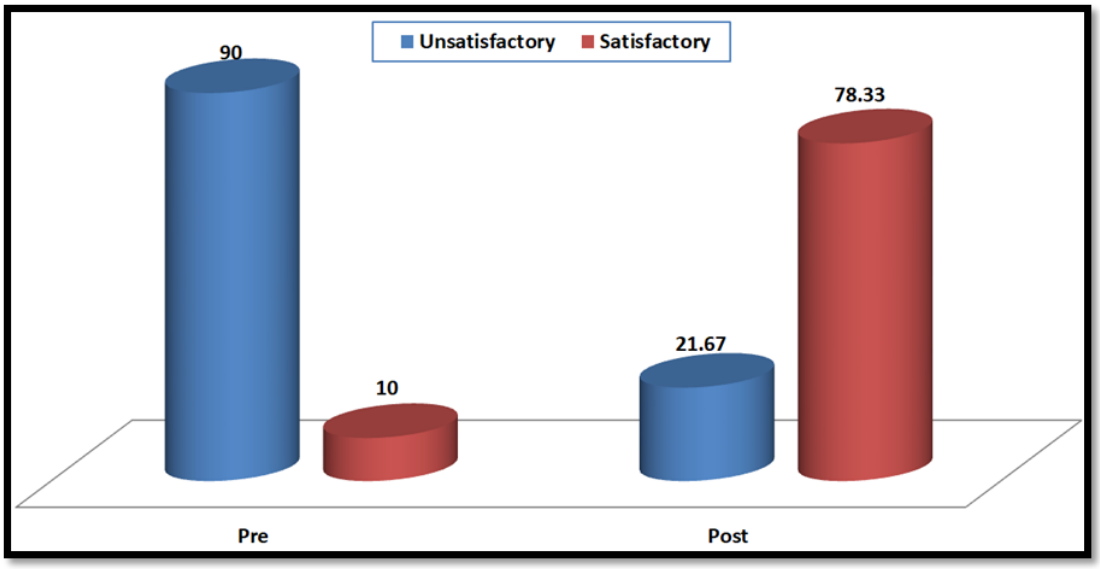


Figure (1): Total knowledge level of the studied group pertaining fluid therapy

Table (3): Percentage of the studied sample regarding their mean scores of practice before, after program

Practice Domains	The studied nurses (n=60) Range Mean ± SD		t P
	Pre	Post	
- Primary assessment phase of fluid therapy protocol	(0-9) 1.77±2.317	(2-10) 8.35±2.413	**15.24 0.000***
- Fluid Resuscitation phase of fluid therapy protocol	(0-4) 0.52±0.948	(1-4) 3.30±0.788	**17.49 0.000***
- Maintenance phase of fluid therapy	(0-6) 1.80±1.885	(2-8) 6.88±1.967	**14.46 0.000***
- Adverse events of fluid therapy			
- Assessment of fluid intake	(0-6) 1.40±1.906	(1-7) 5.58±1.488	**13.41 0.000***
- Assessment of fluid output	(0-4) 1.08±1.253	(0-5) 3.98±1.490	**11.54 0.000***
- Administration phase of fluid therapy and fluid balance calculation	(0-7) 2.12±1.958	(3-9) 7.08±1.453	**15.78 0.000***
- Reassessment phase of fluid therapy protocol	(0-6) 1.28±1.403	(0-6) 4.52±2.004	**10.24 0.000***
Total practice score	**(0-38) 11.63±9.850**	**(22-49) 39.70±6.074**	**18.79 0.000***



* Significant at level P<0.05

Figure (2): Nurses ' total practice level regarding fluid therapy throughout periods of intervention.

Table (4): Correlation between overall knowledge level and overall practice level among research group.

Total knowledge level	The studied nurses (n=60) Total practice level									
	Pre					Post				
	Unsatisfactory		Satisfactory		χ^2 P	Unsatisfactory		Satisfactory		χ^2 P
	N	%	N	%		N	%	N	%	
- Low	54	100.00	6	0.00	-	6	10.00	9	15.00	**14.572 0.001***
- Moderate	0	0.00	0	0.00		6	10.00	8	13.33	
- High	0	0.00	0	0.00		1	1.67	30	50.00	
r , P	0.195 , 0.136					**0.323 , 0.012***				

Table (5): Relation between Relation between Socio-demographic characteristics of the research group and their overall mean scores of knowledge

Characteristics	The studied nurses (n=60) Total knowledge score Mean ± SD			
	Pre	F/t P	Post	F/t P
Age (in years)				
- (21-<30)	6.38±4.801		24.14±5.043	
- (30-<40)	**6.43±4.818**	0.307	**28.00±2.828**	0.480
- (40-<50)	6.22±5.740	0.820	24.33±5.074	0.697
- (50-60)	3.00±2.828		24.89±4.122	
Gender				
- Male	2.88±1.808	**4.828**	24.31±4.553	2.273
- Female	**6.79±4.956**	**0.032***	**26.88±3.944**	0.137
Educational level				
- Technician	6.21±4.614	0.136	24.11±4.988	0.199
- Bachelor	**6.53±4.925**	0.873	24.87±4.232	0.820
- Post studies	5.64±5.372		**25.00±4.858**	
Experience (in years)				
- (1 -<5)	6.39±4.346	0.486	24.50±4.762	0.083
- (5 -<10)	**6.57±5.090**	0.618	**25.29±5.122**	0.921
- (≥10)	4.57±5.653		24.65±4.228	

Table (6): Relation between socio-demographic data of the research group and their overall score of practice pre, post program implementation.

Characteristics	The studied nurses (n=60) Total practice score Mean ± SD			
	Pre	F/t P	Post	F/t P
Age (in years)				
- (21-<30)	12.00±1.454	1.101 0.357	39.38±6.538	0.574 0.635
- (30-<40)	**16.33±2.708**		**44.50±6.364**	
- (40-<50)	10.25±7.382		38.44±6.287	
- (50-60)	6.00±4.243		40.00±5.774	
Gender				
- Male	11.19±8.850	0.779 0.381	39.62±5.902	0.075 0.786
- Female	**14.50±5.372**		**40.25±7.536**	
Educational level				
- Technician	11.89±1.902	0.673 0.514	39.63±6.542	0.009 0.992
- Bachelor	10.43±7.328		**39.80±5.839**	
- Post studies	14.45±2.185		39.55±6.455	
Experience (in years)				
- (1 -<5)	10.93±0.979	0.865 0.426	40.23±6.532	1.706 0.191
- (5 -<10)	**13.52±1.854**		**42.57±4.791**	
- (≥10)	8.43±3.552		38.13±5.554	

Discussion

Among the most challenging parts of providing care for critically ill patients is administering fluids. The interdisciplinary team in charge of difficult fluid management includes critical care nurses. Guidelines for fluid management must be taken in consideration to direct critical care staff in their practice **Dessalegn et al. (2024).**

Part I: sociodemographic traits of the nurses under study. Nearly half of the research group ranged in age from thirty to forty years old, and most of them were females. This may be related to this age, give staff ability to overcome the workload in the ICU. Moreover related to nature of the nursing profession in Egypt, as most of the nurses were female, this explained by the legislation for studying nursing science in Egyptian universities and schools, which were solely for females. Additionally, in recent years, more men have entered the nursing field.

The results are aligned with **Ouda, Said, and Mohamed (2020),** who illustrated that almost half of the studied group was in age ranged from 30 to 40 years old. However, these findings contradict with **El-Fadl (2020),** who proved that fewer than 50% of the studied group spanning the age from 25 to 35 years old. **Concerning gender,** the most of the studied group were females.

Regarding educational level and years of experience at ICU, the present results exhibited that half of the participants had bachelor's degrees. This might elaborate on the current condition of nursing qualifications. Additionally, it was shown that half of the nurses in the study had years of expertise (1 -<5) Also, reflect that none of the research group take previous lectures or clinical training courses regarding the fluid therapy program. This may be explained by lacking motivation, an increase in the clinical workload, and lack of administrative support.

In the same context, none of the nurses in the study took any training classes in the study by **Elsayed & Saad (2022),**these findings disagreed with **Teshome et al. (2023), who** noted that most of respondents with bachelor's degrees, and over fifty half percentage of the nurses had (6 -<10) experience years

Part II: Nurses' practice and knowledge related to fluid management.

Regarding mean score related to the knowledge domains about fluid therapy, these results highlighted that overall average score of nurses' knowledge pre-intervention significantly decrease.

It also noticed that a significant increase in the total average score of nurses' knowledge observed post-implementation. The reason for this improvement may explained by most of staff are motivated to learn and have a highly strong desire to learn more about fluid therapy protocol.According to **Mohamed, Mohammed, and Abdel-Malek (2023),** proved that a significantly increasing in overall mean score of nurses' knowledge post implementation where $p< 0.001$.

As regard to the nurse's overall knowledge level related to fluid therapy, in light of the current research clarified that all participants with a low level of total knowledge before intervention. This could be explained by a lack of nursing care and orientation training prior to employment. as well as a lack of conferences on nursing care, unavailability of scientific journal, which guide staff to acquire the needed knowledge. These results are supported by **Mohammed, Hassan, and Mohammed (2021), who** proved that all, nurses, had unsatisfactory before the program. This result in different with **Mahmoud, Ammar and Mohamed (2023)** shown that two-thirds of the group under study lacked sufficient knowledge.

Concerning the average scores of the practice domains of the nurses under study, this study suggest that the overall average score for nurses' practice **pre-**implementation significantly decrease in however, a significant improvement in the overall average score of nurses' practice after implementation. The combination of the intervention's theoretical and practical training elements may be the cause of this improvement. It involved using multimedia aids, effective communication, demonstration, and providing the nurses with a colored booklet.

The current study was parallel to **Yilmaz and Sari(2021)** demonstrated that mean scores for total practice before intervention significantly decreased. However, a good improvement in the mean practice scores post-implementation of a fluid program was found.

In light of this research nurses' total degree of practice related to fluid therapy protocol. Results showed that most of nurses practiced at an inadequate level before the study. Contributing factors for these results may be Poor knowledge, a lack of nursing staff, an increase in workload, the absence of pre-employment orientation, and failure of the head nurses and nursing supervisor to evaluate nurses against

nursing practice standards to identify areas of strength and weakness. After the program was implemented, a good level of practice was seen in comparison to more than three-quarter

This finding matched with **Ahmed, Elmeghawry and Yassien (2021)** revealed that nearly all nurses performed below expectations. When they monitoring and treating fluid and electrolyte imbalances prior to program implementation

Regarding the correlation between total level of knowledge and total level of practice among the studied group, This result demonstrates a statistically significant association between the overall knowledge score of nurses under the study and their practice about fluid therapy post-program implementation. This can be justified by the direct impact of the fluid program, which enhances nurses' knowledge and practice among nurses which are highly and positive strong connected. This is good evidence of the effectiveness of fluid therapy protocol phases and guidelines.

This finding was supported by **Mohamed, Taha, and Bayomi (2021)** illustrated that a significant positive association between overall level of practice and overall knowledge level.

Relation between overall knowledge and sociodemographic characteristics, current research concluded that there was a statistically significant association between total knowledge and gender. This may be related to female in current study are high percentage also, it was noticed that there were no significant differences in the relationship between the age of the nurses under study and their mean score for overall knowledge, years of experience and educational attainment.

Pre-post-implementation of the fluid program, this result is inconsistent with **Musa and Mahmood (2023)** presented that there was no statistically significant difference between total nurses' knowledge and their gender group.

Relation between total practice mean score and sociodemographic characteristics. The present study demonstrated the educational attainment of nurses and their overall practice mean score were statistically correlated. This could be attributed to nurses with higher educational levels have stronger critical thinking and problem-solving abilities which contribute to the advancement of nursing practice.

Additionally, No statistically significant relation between nurses'

sociodemographic data, such as their age, gender and years of experience and their total practice mean score.

Similarly, Eta, Akong, Bassah, and Amahnui (2024) no statistically significant association between age, experience years, and practice

Conclusions

The knowledge and practice of nurses are improved by fluid therapy programs.

Recommendations

1-**For nurses**

-Regularly offering workshops and in-service nursing training programs on the management of critically sick patients, and emphasis on fluid therapy for updating their knowledge and practice at the intensive care unit.

2- **For Further Research**

-To assess the impact of implementing a fluid program on patients' outcomes.

- apply the current work to large probability sampling across other location to generalize the findings

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