Mansoura Nursing Journal (MNJ) Vol. 12. No. 2 – 2025 **Original Article**
Print ISSN: 2735 – 4121 Online ISSN : 2735 – 413X

Effect of Implementing an Educational Program about Post kidney Transplant Care on Critical Care Nurses' Knowledge

[1]Alaa Eid Alkharabsheh*,[2]Marwa Fathallah Mostafa, [3]Aida Faried Abd elwanees, [4]Asmaa Ibrahim Aboseda,
1 Staff Nurse - Critical Care Unit, Faculty of Nursing, Mansoura University, Egypt,
2 Assistant Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University.
3 Assistant Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University.
4 Assistant Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University.

ABSTRACT

Background: Critical care nurses (CCNs) play a pivotal role in post-kidney transplant care, necessitating a comprehensive understanding of transplantation procedures, complications, and patient management. So, any knowledge gaps among CCNs may impact the quality of care provide to kidney transplant program. **Aim:** This study aimed to assess the effect of implementing an educational program about post-kidney transplant care on critical care nurses' knowledge. **Methods:** A quasi-experimental study was conducted among 50 critical care nurses. A structured educational program was implemented, and nurses' knowledge was assessed pre- program, post- program, and three months follow-up. Data was collected using a kidney transplantation critical care nurse's knowledge questionnaire which covered key aspects of post-kidney transplant care. **Results:** Before the program, 80% of nurses had unsatisfactory knowledge, which significantly improved to 84% post- program and remained elevated at 76% at three months follow-up $p < 0.001$. The mean total knowledge score increased from 40.5 ± 6.1 pre- program to 53.1 ± 4.8 post- program, with a slight decline to 50.6 ± 5.2 at three months follow-up ($p < 0.001$). **Conclusion:** The educational program significantly improved critical care nurses' knowledge of post-kidney transplant care, with sustained benefits at three months follow-up. **Recommendation:** These findings highlight the importance of ongoing training programs to enhance nurses' knowledge about transplant patient management.

***Keywords*:** Critical Care Nurses, Educational Program, Kidney Transplant, Knowledge.

Introduction:

Chronic kidney disease (CKD) is increasingly becoming a global public health concern due to its exponentially increasing prevalence and incidence rate **(Axelrod et al., 2018)**. Chronic kidney disease as previously mentioned, is the irreversible damage of kidneys, is a major health concern, ranking as one of the leading causes of morbidity and mortality in the 21st century **(Kalantar-Zadeh, Jafar, Nitsch, Neuen, & Perkovic, 2021)**. So-called 'textbook' clinical and laboratory criteria define CKD and classify patient as an adult, for 3 months or more, has clinical signs of GFR ≤60 ml/min/1.73 m² or based on some histological evidence GFR is ≥60 ml/min/1.73 m² **(Vinters, Magaki, & Williams, 2021)**.

For a large number of patients with end-stage kidney disease (ESKD), renal transplantation was the best course of action due to the improved quality of life, increased independence from equipment dependency, freedom from nutritional supplements and fluid restrictions, restoration of sexual function, and fertility with the potential for parenthood **(Thurlow et al., 2021)**. When it comes to improving quality of life, avoiding problems, and making the required treatment adjustments, post transplant nursing intervention is just as crucial as pre transplant nursing support. Therefore, it is necessary to improve the quality of care following a transplant and provide standardized nursing support in order to minimize workloads and time commitments by guaranteeing that nurses employ integrative and methodical strategies **(Rocha et al., 2021)**.

In 2017, the number of people with CKD increased to around 843.6 million worldwide. This concerning number could result in diabetes and obesity, among additional associated problems **(Kovesdy, 2022)**. For the Middle East, which includes Iraq, Qatar, Lebanon, Syria, Yemen, Tunisia, Turkey, Egypt, and Iran, the prevalence of ESKD varied from 55 to 818 cases/1 million **(Malekmakan, Tadayon, Roozbeh, & Sayadi, 2018)**. In Africa, between 2000 and 2016, the overall prevalence of CKD stages 1–5 was 15.8%, while the prevalence of CKD stages 3–5 was 4.6% **(Kaze, Ilor, Jaar, & Echouffo-Tcheugui, 2018)**.

Nevertheless, post-transplant care is multifaceted and meticulous due to the need for managing immunosuppressive therapy, infection prevention protocols, fluid and electrolyte therapy, as well as early identification of complications such as graft rejection and opportunistic workloads **(Rocha et al., 2021)**. The role of critical care nurses is central to the effective management of post-transplant care by ensuring treatment compliance which involves the monitoring of complications and patient education for self-management over prolonged durations. Although nurses are the primary caregivers aimed at improving transplant outcomes, several studies have pointed out gaps in caregivers' knowledge pertaining to post kidney transplant care which has potential to deteriorate patient results **(Huang et al., 2024)**. This raises concerns regarding the lack of targeted instructional materials designed to help manage competencies aimed at post-transplant patients **(Fischer, 2024)**.

The nurses in critical care areas must have appropriate knowledge and skills to manage kidney transplant recipients **(Im & Jang, 2024)**. A kidney transplant recipient faces several post-transplant complications like acute rejection, infection, delayed graft function, and cardiovascular issues which all require prompt treatment and management. Nurses' lack of knowledge regarding immunosuppressive therapy, infection control, and possible complications following transplantation may contribute to inadequate timely intervention and poor patient results **(Chunyan & Zhuofeng, 2022)**.

In addition, nurses are considered as a primary source of information for patients and their families, and as such, they significantly contribute towards the long term success of kidney transplants. In the absence of training, nurses are likely to encounter difficulties in formulating cohesive comprehensive strategies educating patients with regards to adhering to prescribed medications, diet restrictions, and lifestyle changes vital for the success of the graft **(Hu, Yang, & Wang, 2024)**.

A few research works have highlighted the value of continuing education for healthcare professionals participating in transplant care **(Crawford, Low, Manias, & Williams, 2017; Rocha et al., 2021)**. The literature demonstrates that well-organized teaching strategies enhance nurses' self-efficacy, primary clinical skills, and resultant patient care standard **(Aliam, Mahmoud, Abo El-Fadl, & Mohamed, 2023; Hussein & Zatoon, 2019)**. Instructional programs specific to kidney transplant care address the advanced level concerning the management of immunosuppressive therapy, infection preventative and control measures, graft surveillance, and psychosocial support for transplant recipients. Such programs are suggested to improve the competencies of nurses, lessen complications associated with transplants, and enhance patients' compliance to long-term care plans **(Fischer, 2024)**.

Since the incidence ofkidneytransplants is o n the rise globally and there is greater complexity in post- transplantation care, it is essential to address the existing knowledge deficiency among critical care nurses **(Kim & You, 2017)**. The present research is proposed to assess the impact of an educational program on the knowledge of critical care nurses about the care of patients following kidney transplantation.

1.1. Significance of the study

The success of kidney transplantation is mostly attributable to the level of care post-transplantation, which calls for a multidisciplinary effort by healthcare providers, and the success of good patient outcomes relies heavily on critical care nurses **(Baek & Lee, 2023)**. Nurses play an integral role in closely observing the patients, identifying early warning signs of complications, and giving much- needed education to kidney transplant patients **(Nkadimeng, 2021)**. Yet, evidence revealed that nurses' insufficient knowledge regarding post- transplant care may result in delayed intervention, higher chances of complications, and adverse long-term graft survival **(Costa, Matias, & Aguiar, 2022)**. Through the development of an educational program specifically designed for post- kidney transplant care, this research seeks to improve nurses' knowledge and competencies, thereby ensuring better quality of care for transplant patients.

From a healthcare system perspective, enhancing nurses' competence in post kidney transplant care management can lead to improved patient outcomes, lower healthcare expenses, and minimization of healthcare institution workload. Prevention of post-transplant complications through early identification and proper interventions can potentially decrease the demands for prolonged hospitalization and expensive treatments. Furthermore, enhancing nurses' skills in this regard is also in line with worldwide healthcare objectives to heighten transplant success rates and provide patient-centered care **(Pedreira‐Robles et al., 2023)**.

Ongoing education and training programs are essential in ensuring high levels of nursing competency, particularly in highly specialized areas like organ transplantation. By way of a trial of the efficacy of an education program, this research has the potential to offer valuable information on the impact of structured training on nursing knowledge.

1.2 Aims of the study

The study aimed to investigate the effect of implementing an educational program about post-kidney transplant care on critical care nurses' knowledge.

1.3 Research Hypothesis

H1: Implementing an educational program will increase critical nurses' knowledge about post kidney transplant care.

2. Methods

2.1 Study Design

The current investigation employed a quasi-experimental research design. Quasi experimental investigations, also known as pre post intervention study, is a common technique in healthcare informatics to assess the advantages of particular strategies for intervention **(Campbell & Stanley, 2015)**.

2.2 Study Setting

The current investigation was performed at the surgical ICUs at governmental hospital in Jordan. The ICUs consists of 86 beds and well equipped with advanced technology (mechanical ventilators, monitors and suction machine). This ICU provides care to patients post kidney transplant. Also, this ICU provides care to patients post major surgeries. The nurse-patient ratio in the selected ICU is nearly 1:2.

2.3 Participants

A convenience sample of fifty nurses working in the previously selected ICUs was recruited for the current investigation. The sample size was calculated 46 based on data from literature **(Hussein & Zatoon, 2019).** With a 5% threshold of significance and an 80% power of research, using the equation below: 50 nurses

$$n = \frac{2\left(\frac{Z\alpha}{2} + Z\beta\right)^2 \times p(1-p)}{(d)^2}$$

where, Z_β = 0.84 (for 80% power of study), $Z_{\alpha/2}$ =1.96 (for 5% level of significance), d = expected difference in proportion of events, and p = pooled proportion obtained from previous study. Therefore,

$$n = \frac{2(1.96 + 0.84)^2 \times 0.825\,(1 - 0.175)}{(0.22)^2} = 46.3$$

Consequently, 46 nurses were the necessary sample size. Ten percent was added for better collection or drop out, so the sample size was 50 nurses.

2.4 Study Tools

One tool was used to collect data pertinent to the current study:

Tool I: Kidney Transplantation Critical Care Nurses' Knowledge Questionnaire:

This tool contained data about critical care nurses' demographic characteristics and knowledge post kidney transplant care. This tool consisted of two main parts: ***Part I: Critical Care Nurses' Demographic Characteristics***

This part contained data about critical care nurses' demographic characteristics to collect socio demographic features of critical care nurses. These features included age, gender, educational level, job title, years of working experience in ICU and attendance of previous educational programs about post kidney transplant care.

Part II: Critical Care Nurses' Knowledge Assessment Survey

This part was adapted by the researcher from previous literature **(Aliam et al., 2023; Muhamad, 2019; Muhammad et al., 2022)** to assess critical care nurses' knowledge about post kidney transplantation care. It included: post immediate nursing care. This section addressed a number of important nursing related topics for kidney transplant nursing support. Among the items were the following: the meaning (2 items), indication (5 items), prerequisites (8 items), patient preparation (12 items), indications of infection (8 items), indications of organ rejection (7 items), signs of shock (5 items), signs of bleeding (6 items), complications (8 items), and, lastly, requirements for kidney donation (8 items). The sum is (69 items).

Scoring System:

Each correct response was awarded 1 point, with a total possible score of 69. Nurses scoring ≥80% (≥55 points) were classified as having satisfactory knowledge, while those scoring <80% (<55 points) were categorized as having unsatisfactory knowledge **(Aliam et al., 2023)**.

2.5 Validity and Reliability Tools

Three experts from ICU in previous mentioned setting and five academic staff members from the critical care nurses and emergency department, Faculty of Nursing, Mansoura University evaluated and verified the tools' content related validity and extensive revisions were made. Using the Cronbach's alpha test, the total reliability of tools was determined to be 0.903. These findings suggest high reliability tools.

2.6 Pilot Study

A pilot study was conducted to ensure internal consistency of the research instruments. Following recommendations that pilot studies should include approximately 10% of the total study population, five nurses were selected and later excluded from the main study.

2.7 Data Collection Process

The primary investigator (PI) conducted face to face interviews with critical care nurses in ICU settings, explaining the study's purpose. Upon obtaining consent, data collection commenced. The educational program was implemented between February and July 2024 throughout four phases including the assessment, planning, implementation, and evaluation.

1. Assessment phase:

Ethical approval was secured before initiating the study. The PI introduced himself to the participants and explained the study's objectives. Informed consent was obtained from all participating nurses. Baseline assessment of nurses' knowledge was conducted using validated knowledge questionnaires. The pretest was administered before any educational program to avoid influencing responses. Each nurse was individually engaged to assess their baseline knowledge about post kidney transplantation care and to align the training program with their specific learning needs. The assessment tool was translated into Arabic for ease of understanding.

2. Planning phase:

The study's nature and purpose were clearly communicated to participants. Nurses were interviewed individually before implementing the educational program. A structured educational program on post kidney transplant care was designed based on a thorough review of relevant literature. Theoretical content was tailored to address knowledge gaps identified in the pretest.

3. Implementation stage:

The post kidney transplantation care program was delivered over three months, consisting of 10 theoretical sessions). Each week included three sessions, each lasting 15–20 minutes, with participants divided into 10 groups (5 nurses per group).

Theoretical sessions covered key aspects of post transplantation care, including indications, prerequisites, patient preparation, infection and rejection signs, complications, and donation criteria. Various instructional methods, including lectures, PowerPoint presentations, hands on demonstrations, and instructional videos, were used. Each nurse received an Arabic educational booklet on post kidney transplant care to enhance engagement and reinforce learning. Theoretical content was fully delivered by the end of the last session.

4. Evaluation stage:

Nurses were evaluated for the effect of educational program on their knowledge using part II of the tool. Nurses' knowledge was evaluated pre, immediately post implementation of the educational program, and three months follow up. Then association between socio demographic characteristics and critical care nurses' knowledge. .

2.8 Ethical Consideration

Mansoura University, faculty of nursing's research ethical committee granted ethical approval (No. 304) to the current research. After outlining the purpose and scope of the investigation, ethical approval was obtained from Institutional Review Board (IRB) sector of healthcare before data collection process. Nurses who participated gave their informed approval after being fully informed about the study's purpose, advantages, and dangers. Additionally, individuals were made aware of their freedom to leave the research at any moment and without consequence. Additionally, participants received assurances on the privacy of their personal data.

2.9 Data Analysis

Data were coded, computerized, and statistically analyzed using SPSS version 23. Qualitative variables were reported as frequency and percentage. Quantitative variables were expressed as mean ± standard deviation (SD). Statistical significance was set at $p \leq 0.05$, while $p > 0.05$ was considered non-significant **(Ranganathan, 2021)**.

3. Results

Table 1 illustrates the sociodemographic characteristics of the nurse participants. In terms of age distribution, 44% of critical care nurses were between the ages of 20 and 30, followed closely by 40% of them aged from 31 to 40, with 16% of nurses aged from 41 to 60. The mean age was 32.6 years. Regarding gender 60% of studied nurses were female, while 40% were male. In terms of education, 50% of the nurses had a bachelor's degree, 30% of them had a diploma, and 20% of them had a master's degree.

Regarding job titles, 50% of the critical care nurses were registered nurses, 30% were associate nurses, and 20% were specialized nurses. Experience in the ICU varied, with 46% of studied nurses having from 5 to 10 years of experience , 32% of them having less than 5 years of experience, and 22% having more than 10 years of experience; the average score of experience was 7.2 years. In terms of continuing education, 16% of nurses had attended workshops on post kidney transplant care, whereas the vast majority 84% had not.

Table 2 compares mean score of critical care nurses' knowledge about post kidney transplantation care at three time points: pre program, post program, and three months follow up. Regarding nurses' knowledge about definition of kidney transplantation, the mean score was 1.7 pre program while post program it was 2.0 and three months follow up it was 2.0 with statistical significant difference $P = 0.030$, indicating a sustained gain in knowledge about this fundamental concept. Similarly, Mean score of nurses' knowledge about kidney transplant indications increased considerably post program 3.9 compared to pre program 3.4 and maintained at three months follow up 3.8, with statistical significance difference $P = 0.020$ between pre program and post program and $P = 0.032$ between pre program and three months follow up.

The mean score of nurses' knowledge about signs of infection showed the most significant increase, from a pre program mean score of 4.0 to 6.2 post program and 6.0 at three months follow up with statistically significant difference $P < 0.001$, indicating that nurses maintained significant improvements in their knowledge. As regards to mean score of nurses' knowledge of identifying symptoms of organ rejection improved significantly, with pre program mean score 3.9 increasing to 5.4 post program and slightly declining to 5.0 at three months follow up with statistically significant difference $P < 0.001$. The mean score of nurses' knowledge regarding signs of shock, signs of bleeding, complications of kidney transplantation and prerequisites of kidney donation showed significant improvements post program and three months follow up with statistically significant P values below 0.05, confirming long term knowledge retention.

Table 3 displays critical care nurses total knowledge levels scores at three time points: pre program, post program, and three months follow up. At the pre program period 80% of the nurses exhibited unsatisfactory knowledge, while 20% showed satisfactory knowledge. Subsequent to the program, a notable improvement was observed with the percentage of nurse's knowledge rose to 84% post program, while those with unsatisfactory knowledge decreased to 16%. At the three months follow up, 76% of studied nurse's had satisfactory knowledge, while 24% of them had unsatisfactory knowledge with statistically significant difference $P < 0.001$ between pre program and post program and $P < 0.001$ between pre program and three months follow up.

The mean score rose significantly from 40.5 ±6.1 pre program to 53.1 ±4.8 post program, with statistically significant difference $P < 0.001$. At the three months follow up, the mean score slightly declined to 50.6±5.2 but continued to be substantially elevated compared to the pre program level with statistically significant difference $P < 0.001$.

Table 4 illustrates association between socio demographic characteristics and critical care nurses' knowledge at pre program. It was no statistically significant differences between socio demographic characteristics and critical care nurses' knowledge at pre program according to (age, gender, educational level, job title, years of working experience in ICU, attendance of training programs, attending previous educational programs about post kidney transplant care or workshop) since p value greater than 0.05.

Table 5 illustrates association between socio demographic characteristics and critical care nurses' knowledge at post program. It was a statistically significant differences between studied nurses' socio demographic characteristics and satisfactory, unsatisfactory knowledge at post program regarding (educational level, job title, years of work experience in the ICU) since p value <0.001. for educational level, 57.1% of studied nurses with satisfactory knowledge had a bachelor's degree, for job title, 57.1% of studied nurses' with satisfactory knowledge were registered nurses' and for years of work experience, 50.0% of studied nurses' with

satisfactory knowledge had from 5 years to 10 years of experience.

Table 6 illustrates association between socio demographic characteristics and critical care nurses' knowledge at three months follow up. It was noticed that there was statistically significant differences between studied nurses' socio demographic characteristics and satisfactory, unsatisfactory knowledge at three months follow up regarding (educational level, job title, years of work experience in the ICU) since p value <0.001. for educational level, 65.8% of studied nurses with satisfactory knowledge had a bachelor's degree, for job title, 65.8% of studied nurses' with satisfactory knowledge were registered nurses' and for years of work experience 50.0% of studied nurses' with satisfactory knowledge had from 5 years to 10 years of experience

Table 1. Distribution of the Socio Demographic Characteristics of the Critical Care Nurses' (n=50)

	n	%
Age (Years)		
20 – 30	22	44.0
31 – 40	20	40.0
41 – 60	8	16.0
Mean ±SD	32.6 ±6.2	
Gender		
Male	20	40.0
Female	30	60.0
Educational level		
Diploma	15	30.0
Bachelors	25	50.0
Master	10	20.0
Job title		
Associate Nurse	15	30.0
Registered Nurse	25	50.0
Specialized Nurse	10	20.0
Years of working experience in ICU		
< 5	16	32.0
5 – 10	23	46.0
> 10	11	22.0
Mean ±SD	7.2 ±3.5	
Attending previous educational programs about post kidney transplant care or workshop		
Yes	8	16.0
No	42	84.0

Table 2. Comparison of Means Score of Critical Care Nurses' Knowledge of Post Kidney Transplantation Care Pre Program, Post Program and 3 Months Follow Up

	Pre program	Post program	3 Months follow up	Significance test 1 Pre program and post program	Significance test 2 Pre program and 3 months follow up
	Mean ±SD	Mean ±SD	Mean ±SD		
Definition of kidney transplantation	1.7 ±0.5	2.0 ±0.9	2.0 ±0.9	T=2.198, P=0.030*	T=2.198, *P*=0.030*
Indication for kidney transplantation	3.4 ±1.2	3.9 ±0.9	3.8 ±0.5	T=2.357, P=0.020*	T=2.175, *P*=0.032*
Prerequisites for kidney transplantation	4.9 ±1.7	5.9 ±1.1	5.6 ±1.3	T=3.493, P<0.001**	T=2.312, *P*=0.022*
Preparation of patient for kidney transplantation	7.9 ±2.5	8.8 ±1.6	8.7 ±1.3	T=2.146, P=0.034*	T=2.007, *P*=0.047*
Signs of infection	4.0 ±1.4	6.2 ±1.0	6.0 ±1.2	T=9.309, P<0.001**	T=7.765, *P*<0.001**
Signs of organ rejection	3.9 ±1.2	5.4 ±0.9	5.0 ±1.0	T=6.869, P<0.001**	T=5.009, *P*<0.001**
Signs of shock	2.4 ±1.8	4.1 ±0.9	3.9 ±0.9	T=6.025, P<0.001**	T=5.331, *P*<0.001**
Signs of bleeding	3.5 ±1.6	4.4 ±1.0	4.1 ±1.0	T=3.461, P<0.001**	T=2.371, *P*=0.020*
Complication of kidney transplantation	4.4 ±1.8	6.2 ±1.1	5.8 ±1.1	T=5.890, P<0.001**	T=4.825, *P*<0.001**
Prerequisites of kidney donation	4.4 ±1.4	6.2 ±1.1	5.7 ±1.3	T=7.305, P<0.001**	T=4.900, *P*<0.001**

*: Statistically significant at $p \leq 0.05$

Significance test 1: student's t – test between pre program and post program, Significance test 2: student's t – test between pre program and 3 months follow up

Table 3. Comparison of Critical Care Nurses Total Level ' Knowledge Regarding Post Kidney Transplant

	Pre program		Post program		3 Months follow up		Significance test 1 Pre program and post program	Significance test 2 pre program and 3 months follow up
	n	%	n	%	n	%		
Critical care nurses' knowledge								
Unsatisfactory knowledge	40	80.0	8	16.0	12	24.0	X^2=41.026, *P*<0.001**	X^2=31.410, *P*<0.001**
Satisfactory knowledge	10	20.0	42	84.0	38	76.0		
Total knowledge score	40.5 ±6.1		53.1 ±4.8		50.6 ±5.2		T=11.478, *P*<0.001**	T=8.909, *P*<0.001**

*: Statistically significant at $p \leq 0.05$

Significance test 1: (student's t – test or chi – square / fisher's exact test) between pre program and post program, Significance test 2: (student's t – test or chi – square / fisher's exact test) between pre program and 3 months follow up

Table 4. Association Between Socio Demographic Characteristics and Critical Care Nurses' Knowledge at Pre Program

	Unsatisfactory knowledge (n=8)		Satisfactory knowledge (n=42)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	*P*
Age (Years)						
20 – 30	19	47.5	3	30.0		
31 – 40	15	37.5	5	50.0		
41 – 60	6	15.0	2	20.0	0.994	0.608
Gender						
Male	17	42.5	3	30.0		
Female	23	57.5	7	70.0	0.521	0.470
Educational level						
Diploma	13	32.5	2	20.0		
Bachelors	18	45.0	7	70.0		
Master	9	22.5	1	10.0	2.042	0.360
Job title						
Associate Nurse	13	32.5	2	20.0		
Registered Nurse	18	45.0	7	70.0		
Specialized Nurse	9	22.5	1	10.0	2.042	0.360
Years of working experience in ICU						
< 5	13	32.5	3	30.0		
5 – 10	19	47.5	4	40.0		
> 10	8	20.0	3	30.0	0.477	0.788
Attending previous educational programs about post kidney transplant care or workshop						
Yes	7	17.5	1	10.0		
No	33	82.5	9	90.0	0.335	0.563

Tests used: chi – square test / fisher's exact test

Table 5. Association Between Socio Demographic Characteristics and Critical Care Nurses' Knowledge at Post Program

	Unsatisfactory knowledge (n=8)		Satisfactory knowledge (n=42)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	*P*
Age (Years)						
20 – 30	5	62.5	17	40.5		
31 – 40	1	12.5	19	45.2		
41 – 60	2	25.0	6	14.3	3.024	0.221
Gender						
Male	5	62.5	15	35.7		
Female	3	37.5	27	64.3	2.009 #	0.156
Educational level						
Diploma	7	87.5	8	19.0		
Bachelors	1	12.5	24	57.1		
Master	0	0.0	10	23.8	15.079	<0.001**
Job title						
Associate Nurse	7	87.5	8	19.0		
Registered Nurse	1	12.5	24	57.1		
Specialized Nurse	0	0.0	10	23.8	15.079	<0.001**
Years of working experience in ICU						
< 5	6	75.0	10	23.8		
5 – 10	2	25.0	21	50.0		
> 10	0	0.0	11	26.2	8.511	0.014*
Attending previous educational programs about post kidney transplant care or workshop						
Yes	0	0.0	8	19.0		
No	8	100.0	34	81.0	1.814	0.178

Tests used: chi – square test

fisher's exact test.

Table 6. Association Between Socio Demographic Characteristics and Critical Care Nurses' Knowledge at 3 Months Follow Up

	Unsatisfactory knowledge (n=12)		Satisfactory knowledge (n=38)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	*P*
Age (Years)						
20 – 30	6	50.0	16	42.1		
31 – 40	4	33.3	16	42.1		
41 – 60	2	16.7	6	15.8	0.309	0.857
Gender						
Male	7	58.3	13	34.2		
Female	5	41.7	25	65.8	2.211	0.137
Educational level						
Diploma	10	83.3	5	13.2		
Bachelors	0	0.0	25	65.8		
Master	2	16.7	8	21.1	22.953	<0.001**
Job title						
Associate Nurse	10	83.3	5	13.2		
Registered Nurse	0	0.0	25	65.8		

Specialized Nurse	2	16.7	8	21.1	22.953	<0.001**
Years of working experience in ICU						
< 5	8	66.7	9	23.7		
5 – 10	4	33.3	19	50.0		
> 10	0	0.0	11	28.9	9.954	0.007*
Attending previous educational programs about post kidney transplant care or workshop						
Yes	0	0.0	8	21.1		
No	12	100.0	30	78.9	3.008 #	0.082

Tests used: chi – square test

fisher's exact test

4. Discussion

In the first half of the twentieth century, kidney transplantation was initially utilized to manage kidney failure with efficacy. The management of post kidney transplant patients requires specialized knowledge and skills to ensure optimal patient outcomes, especially in critical care settings **(Huang et al., 2024)**. Critical care nurses play a pivotal role in the recovery and long term health of kidney transplant recipients, but their ability to deliver high quality care is often influenced by their level of training **(Aliam et al., 2023).**

This study aimed to evaluate the impact of implementing an educational program about post kidney transplant care on critical care nurses' knowledge. The aim included assessing critical care nurses' baseline knowledge regarding post kidney transplant care, implement a tailored educational program to enhance their background, and evaluate the program's effectiveness by measuring changes in their knowledge immediately after the program and three months later.

Additionally, the study sought to identify associations between nurses' sociodemographic characteristics and their levels of knowledge pre and post program to determine factors influencing the effectiveness of the educational program. The study included 50 nurses working at Surgical Intensive Care Units (ICUs) at governmental hospital in Jordan, who had at least 1 year of experience in critical care nursing.

The age spectrum of the nurses in the present investigation revealed that nearly half of the critical care nurses were in the 20–30 age range, with over one third of them falling between the 31–40 age range. The mean age was 32.6 years. Also, additionally, women made up the vast bulk of the group, with men making up a smaller percentage.

The findings aligned with those of Aliam et al. (2023), who stated that the nurses involved in their research were married women, having a mean age of 31.30±8.10 years, and that half of them were in the 20–30 age range **(Aliam et al., 2023)**. Additionally, the findings align with Ahmed et al. (2020), who found that the male to female ratio was 1:11 among the 72 nursing staff members who got involved, with 8.3% of them being male and 91.3% being female. A large portion of the population surveyed was between the ages of 20 and 30 **(Ahmed et al., 2020)**.

This tendency might be the result of the nursing field's considerable mental and physical demands, which younger people may find more enticing or bearable. The study's gender breakdown illustrates how traditionally women have dominated the nursing field. The comparatively high percentage of male nurses in the current study, however, might point to a trend towards increased gender diversity in the industry, especially in critical care nursing, which could attract a greater number of male specialists due to its physically demanding work. This equilibrium demonstrates how gender roles in the healthcare industry are gradually evolving.

According to their educational backgrounds, half of the nurses in the current study have a bachelor's degree, one third have a diploma, and one quarter have master's degree. Experience in the ICU varied, with a third of the participants had fewer than five years of experience, nearly one quarter had more than ten years, and nearly half had between five and ten years of experience; the average score of experience was 7.2 years.

A study by **Ahmed et al. (2020)** supports the current findings which found that, the majority of nurses are licensed by a bachelor's degree in nursing. According to the same research, most of the participants had no more than five years of

employment history which disagreed with the current research. Also the current outcomes are in contrast with study by Shah and Qasim (2017) who showed that most nurses had completed nursing school with a diploma **(Shah & Qasim, 2017)**.

The educational distribution in the current study reflects the increasing emphasis on bachelor's and master's degrees in nursing, aligning with global trends promoting advanced education for improved patient outcomes. The variation in ICU experience highlights a balanced workforce comprising both newer nurses contributing fresh perspectives and seasoned nurses offering expertise, with an average of 7.2 years indicating a moderately experienced group capable of handling critical care demands.

In other hand in terms of continuing education in the current study, less than the quarter of nurses had attended workshops on post kidney transplant care, whereas the vast majority had not. Continuous education and training are essential, as evidenced by the demonstrated need for formal training to enhance nurses' knowledge in postoperative care for kidney transplant patients.

Astudy by **Ahmed et al. (2020)** partially agreed with the current findings and reported that 51.4% of the respondents, did not receive training, indicating that leadership have not recognized the significance of training and enhancing nursing staff practices for patients with renal transplants who have unique needs and considerations that could result in numerous complications **(Ahmed et al., 2020)**. These findings do not match with study findings by Hussein and Zatoon (2019), which revealed that more than half had a training course regarding managing patients with kidney transplantation **(Hussein & Zatoon, 2019)**.

According to Jamieson et al. (2016) study result showed, the healthcare professionals need continuous education to assist them take on the duty of serving in critical units and understand the regulations and duties because these seminars and in-service training programs have a positive impact on nurses' self-confidence (Jamieson et al., 2016).

In the current study, the critical care nurses' mean score of knowledge after kidney transplantation, showed significant improvement post program, followed by a little decline at three months follow up in knowledge in relation to the following knowledge items (definition of kidney transplantation, indication for kidney transplantation, understanding of kidney transplant prerequisites, signs of infection, symptoms of organ rejection, signs of shock, signs of bleeding, complications of kidney transplantation, and prerequisites of kidney donation) and highlights the significant effect of educational program strategies.

The absence of regular training sessions may account for inadequate knowledge. Additionally, factors such as increased workload and reduced enrolment of nurses in the kidney transplantation unit may limit their ability to participate in scheduled training sessions. These results underscore the importance of regular educational training for nurses, particularly those working in critical care settings, to enhance their knowledge and competency in specialized areas such as post operative kidney transplant care.

Also, the slight decline in knowledge scores observed during three months follow up highlights the importance of sustained educational efforts to preserve the initial improvements achieved through program. . Professional development initiatives, such as refresher courses or advanced training programs, are critical for improving knowledge retention and ensuring that nursing staff remain up to date with advancements in transplantation care.

The current findings align with the study conducted by Hussein and Zatoon (2019), which identified knowledge among the studied nurses the mean score of knowledge after kidney transplantation, raised post program, followed by a little decline at the three months follow up **(Hussein & Zatoon, 2019)**.

The educational program's success is attributed to structured educational content and the engagement of nurses in learning activities tailored to their needs. Moreover the current study findings, aligns with previous studies' findings that emphasize the importance of structured educational programs in increasing knowledge and awareness about kidney transplantation among healthcare workers, particularly nurses **(Okpere & Anochie, 2014; Rocha et al., 2021; Muhammad et al., 2022)**. Also, current findings align with Kanchan et al. (2018), who reported significant improvements in nurses' knowledge following targeted educational interventions about "A comparative survey of knowledge of antiseptic and disinfectant use and effect of the intervention on medical and surgical staff nurses in a tertiary care hospital" and the positive impact of educational initiatives on nursing competencies, emphasizing the necessity of periodic training to sustain these gains **(Kanchan, Sangeeta, & Balasaheb, 2018)**.

Also the result was consistent with Ahmed et al. (2017), who found a substantial difference in knowledge scores before and after educational

programs in their study about "Impact of Self Learning Package on the Patient's Performance Undergoing Kidney Transplantation" **(Ahmed, 2017)**.

The present results were consistent with the research conducted by Ahmed et al. (2020) about "The effectiveness of a training program on nurses' knowledge and practice regarding postoperative nursing care of renal transplanted patients", which discovered that nurses' knowledge was limited to 2.4% in the pre educational plan and 73.2% in the post pre educational plan, which was significantly difference with $p<0.000$. **(Ahmed et al., 2020)**.

Regarding total level of critical care nurses' knowledge after kidney transplantation, it was noticed the most nurses exhibited unsatisfactory knowledge at the pre program period. Immediately post implementing the program, a notable improvement was observed with total level of nurse's knowledge, followed by a little decline at three months follow up.

Similar conclusions were reached by Hussein & Zatoon (2019), who discovered that around two thirds of the nurses under study had inadequate knowledge at the pre intervention stage, while during the immediate post intervention and follow up stages, nurses' knowledge greatly enhanced, where the average score of their overall knowledge increased from 41.9744±3.63 during the pre intervention stage to 66.2564±1.787 and 64.6750±2.70221 during the immediate post intervention and follow up stages **(Hussein & Zatoon, 2019)**.

However the present research results disagreed with that of Aliam et al. (2023), who discovered that 37.5% of critical care nurses total level knowledge of kidney transplants had inadequate knowledge before an implementation educational intervention, while his study agree with the current study that the majority of critical care nurses had adequate knowledge after the intervention.

Limitations

The study was also limited by several factors, namely the selection of the participant from one sector of healthcare, which restricted the applicability of its results to other settings. Additionally, time and participant pool constraints could have affected the extent of the findings' comprehensiveness.

Conclusion

Implementation of an educational program significantly enhanced the knowledge of critical care nurses regarding post kidney transplant care. The findings revealed improvement in knowledge immediately after the program, minimal loss of knowledge at three months follow-up, but overall retention was significantly greater than pre-program.

The study highlights the importance of ongoi ng education and training programs to guarantee that nurses possess current knowledge necessary to deliver effective post-kidney transplant care.

Recommendations

- Regular workshops and refresher courses should be implemented to sustain and enhance nurses' knowledge over time.
- Future research should include a larger and more diverse sample across multiple healthcare institutions to improve generalizability.
- Incorporating digital educational tools, such as e-learning courses and simulation based training, could provide more accessible and flexible learning opportunities for nurses.
- Healthcare institutions should consider making post kidney transplant care education a mandatory component of critical care nurse training programs.

References

Ahmed, H, Fadlalmola, H, Elsanousi, O, Abdullah, I, Yousif, K, Elrufarei, S, & Osman, M. (2020). The effectiveness of a training program on nurses' knowledge and practice regarding postoperative nursing care of renal transplanted patients. *Pak-Euro Journal of Medical and Life Sciences*, *3*(3), 89-96.

Ahmed, S. T. R. S. (2017). Impact of Self Learning Package on the Patient's Performance Undergoing Kidney Transplantation. *Port Said Scientific Journal of Nursing*, *4*(1), 156-181.

Aliam, H., Mahmoud, M., Abo El-Fadl, N., & Mohamed, R. (2023). Effect of Educational Intervention on Nurses' Performance Post Renal Transplantation. *Journal of Nursing Science Benha University*, *4*(1), 24-34.

Axelrod, D., Schnitzler, M., Xiao, H., Irish, W., Tuttle‐Newhall, E., Chang, S., Kasiske, B., Alhamad, T., & Lentine, K. (2018). An economic assessment of contemporary kidney transplant practice. *American Journal of Transplantation*, *18*(5), 1168-1176.

Baek, Y. J., & Lee, G.-R. (2023). A scoping review on educational programs provided to kidney transplant patients in Korea. *Journal of Industrial Convergence*, *21*(11), 85-95.

Campbell, D. T., & Stanley, J. C. (2015). *Experimental and quasi-experimental designs for research*. Ravenio books.

Chunyan, L., & Zhuofeng, Y. (2022). The experience of adults patients in daily life after kidney transplantation: A descriptive literature review.

Costa, D., Matias, J., & Aguiar, F. (2022). The Dialogue between the Patient's Educational Needs and the Knowledge Transmitted by Nurses: The Case of the Transplanted Renal Patient. In *Nursing-New Insights for Clinical Care*. IntechOpen.

Crawford, K., Low, J. K., Manias, E., & Williams, A. (2017). Healthcare professionals can assist patients with managing post-kidney transplant expectations. *Research in Social and Administrative Pharmacy*, *13*(6), 1204-1207.

Fischer, R. (2024). *Reducing Kidney Transplant Rejection Rates Through Medication Adherence Education Post-Transplant: A Quality Improvement Project* Jacksonville University].

Hu, N., Yang, Z., & Wang, A. (2024). Early Post-Transplant Adaptation Experience in Young and Middle-Aged People With Kidney Transplant in China: A Qualitative Study. *Western journal of nursing research*, *46*(5), 356-365.

Huang, X., Xi, B., Xuan, C., Bao, Y., Wang, L., & Peng, F. (2024). Knowledge, attitude, and practice toward postoperative self-management among kidney transplant recipients. *BMC Medical Education*, *24*.

Hussein, E. E., & Zatoon, H. K. (2019). Nursing interventions program on nurses' knowledge and practices post kidney transplantation. *Journal of Nursing and Health Science*, *8*(2), 65-74.

Im, H., & Jang, H.-Y. (2024). Predictors of self-care in kidney transplant patients according to preoperative dialysis: A comparative study. *Heliyon*, *10*(24).

Jamieson, N., Hanson, C., Josephson, M., Gordon, E., Craig, J., Halleck, F., Budde, K., & Tong, A. (2016). Motivations, challenges, and attitudes to self-management in kidney transplant recipients: a systematic review of qualitative studies. *American Journal of Kidney Diseases*, *67*(3), 461-478.

Kanchan, C., Sangeeta, D., & Balasaheb, G. (2018). A comparative survey of knowledge of antiseptic and disinfectant use and effect of the intervention on medical and surgical staff nurses in a tertiary care hospital. *Asian J Pharm Clin Res*, *11*(1), 120-123.

Kaze, A. D., Ilori, T., Jaar, B. G., & Echouffo-Tcheugui, J. B. (2018). Burden of chronic kidney disease on the African continent: a systematic review and meta-analysis. *BMC nephrology*, *19*, 1-11.

Kim, S. H., & You, H. S. (2017). The effects of an empowerment education program for kidney transplantation patients. *Journal of Korean Academy of Nursing*, *47*(4), 445-455.

Kalantar-Zadeh, K., Jafar, T. H., Nitsch, D., Neuen, B. L., & Perkovic, V. (2021). Chronic kidney disease. *The Lancet*, *398*(10302), 786-802.

Kovesdy, C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. *Kidney International Supplements*, *12*(1), 7-11.

Malekmakan, L., Tadayon, T., Roozbeh, J., & Sayadi, M. (2018). End-stage renal disease in the Middle East: a systematic review and meta-analysis. *Iranian journal of kidney diseases*, *12*(4), 195.

Muhamad, L. E. A. (2019). *Assessment Of Nurse's Knowledge regarding postoperative renal surgery complication in El Gazira Hospital for renal surgery and Disease* Higazi Mohammed Ahmed Abdallah].

Muhammad, F., Khan, A., Muhammad, D., Arif, I., Saleem, M., Ali, M., & Sadiq, T. (2022). Knowledge Regarding Post-Operative Care of Patients with Kidney Transplantation among Nurses in Peshawar, Pakistan. *Journal of Gandhara Nursing and Allied Health Sciences*, *2*(1), 30-34.

Nkadimeng, M. C. (2021). *Kidney transplant related knowledge and health education needs of patients with chronic kidney failure in two academic hospitals in Gauteng*

Okpere, A., & Anochie, I. (2014). Knowledge and attitude of healthcare workers towards kidney transplantation in Nigeria. *Nigerian Journal of Paediatrics*, *41*(1), 48-53.

Pedreira‐Robles, G., Garcimartín, P., Bach‐Pascual, A., Giró‐Formatger, D., Redondo‐Pachón, D., & Morín‐Fraile, V. (2023). Creating the nursing care map in the

evaluation of kidney transplant candidates: A scoping review and narrative synthesis. *Nursing open*, *10*(10), 6668-6689.

Ranganathan, P. (2021). An introduction to statistics: choosing the correct statistical test. Indian journal of critical Care Medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine, 25(2), S184.

Rocha, C. C. T., Neto, A. V. d. L., da Silva, A. B. P., Farias, V. A. S., D'Eca Junior, A., & Silva, R. A. R. d. (2021). Nursing care for kidney transplant patients: a scoping review. *Aquichan*, *21*(3).

Shah, M., & Qasim, M. (2017). Practice of nursing care for central venous catheter among ICUs nurses in private tertiary care hospital Peshawar, KP. *JOJ Nursing & Health Care*, *2*(2), 37-40.

Thurlow, J. S., Joshi, M., Yan, G., Norris, K. C., Agodoa, L. Y., Yuan, C. M., & Nee, R. (2021). Global epidemiology of end-stage kidney disease and disparities in kidney replacement therapy. *American journal of nephrology*, *52*(2), 98-107.

Vinters, H. V., Magaki, S. D., & Williams, C. K. (2021). Neuropathologic findings in chronic kidney disease (CKD). *Journal of Stroke and Cerebrovascular Diseases*, *30*(9), 105657