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Effect Of A Nursing Health Education Program On Kidney Recipients' Knowledge And Practice

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Abstract
Background: *Renal transplantation is considered the first-choice method of renal replacement therapy for end-stage renal disease patients who have no physical or psychological contraindications.*
The aim of this study*: was to assess the effect of a nursing health education program on kidney recipients' knowledge and practice*
Subject and methods*: The study was carried out using quasi-experimental research*
Design: *with pre-post test at the kidney transplantation outpatient clinics at Nasr City Health Insurance Hospital.*
Tools*: a transcription form; and an environment assessment checklist**.** The researcher designed a health education program according to patient's needs, delivered it in small group sessions. The effectiveness of the program was assessed through post and 3-month follow-up tests. The fieldwork was from January 2014 to August 2014.*
Results*: The age of the studied sample ranged between 8 to 54 years with a mean 35.4±11.1. The study findings revealed that patients' pre-intervention knowledge and infection control and self-care practices are deficient. The implementation of the educational program was effective in improving patients' knowledge, practice of infection control and self-care skills**.***
Conclusion*: Renal transplant patients' knowledge and infection control and self-care practices are deficient. The implementation of the educational program is effective in achieving significant improvements in their knowledge, reported practice of infection control, and total practice of self-care skills.*
Recommendation*: The study recommends implementation of the educational program in the study setting and in similar settings, with longer follow-up evaluation. The renal transplant patients need to receive more full instructions, taking into consideration their socio-demographic and health characterize.*
Key words: *Nursing , Health Education , Kidney Recipients.*

I. Introduction

End-stage organ failure is a terminal illness; and a fine line exists between the need for an organ transplant and palliative care. Organ transplantation is widely considered to be the best treatment option for end-stage organ failure. End-stage organ failure is a medical condition in which a person's organs do not function adequately (Hagen et al., 2007; Williamson et al., 2010).

Organ transplantation has the potential to rapidly restore the health and wellbeing of individuals experiencing end-stage organ failure. Organ transplantation is not considered a cure for end-stage organ failure, but an alternative form of treatment that unfortunately presents ongoing medical and psychosocial challenges for transplant patients (Jenkins et al., 2008).

Previous review in the field of renal diseases has mainly focused on patient education prior to the transplantation (Mason, 2008). Besides medications adherence, knowledge about signs of graft loss and the benefits of specific lifestyle behaviors may be of great importance (Beblister et al., 2009). Patient education is known to have many positive effects on patients with life-threatening illnesses, including increased knowledge retention, improved pain management, decreased length of hospitalization, and improved patient adherence to the medical regimen. Describing the experience from the patient's point of view in unambiguous, concrete and objective terms facilitates coping by decreasing the differences between expectations and actual experience and by increasing the patients understanding of the experience (Wiegand, 2011).

In preoperative education the nurse describes to the patient and family the planned preoperative events and what will be expected during postoperative period (Dew et al., 2012). Like the therapeutic management, it is individualized for each patient with renal transplant (Ghezelijeh and Emami, 2009). The community health nurse engages the nursing process to develop a comprehensive care plan specific to the needs of the patient. The

nurse seeks to understand the individual with respect to health status, abilities, and priorities. The nursing process begins with holistic assessment of the patient's physical and psychosocial health. The nurse interprets these cumulative data to identify diagnoses and expected outcomes (Wang et al., 2013).

Significance of the study

Renal transplantation is considered the best therapy of renal failure as it is less expensive after the first year of transplantation than the hemodialysis, and it avoids the physiological changes and complications of dialysis. Kidney recipients must have a basic understanding of transplant-related concepts and of the terms concerning their condition and treatment. Hence, patient education is essential for this patient group. The study was carried for investigating the effect of a patient education program on kidney recipient's knowledge and practice.

Aim of the study

The aim of this study was to assess the effect of a nursing health education program on kidney recipients' knowledge and practice. The research hypothesis was that the implementation of a health education program tailored to renal transplant recipients' needs will lead to statistically significant improvements in their related knowledge and practice.

II. Subjects And Methods

Research design and setting: This study was carried out in the kidney transplantation outpatient clinics at Nasr City Health Insurance Hospital using a quasi-experimental design with pre-post-follow-up assessments.

Subjects: A consecutive sample of 77 patients attending the study setting during the time of the study was recruited with inclusion criteria: age 20 to 50 years, within one year of the date of the kidney transplantation surgery, and currently taking immunosuppressant. Patients residing outside greater Cairo or physically or mentally unable to participate in the study were excluded. The sample size was calculated to detect an expected improvement in patients' knowledge or practice by 50% or more from a baseline level of 50% or less, at 95% confidence level and 80% study power. Using the sample size equation for a difference between two proportions (Schlesselman, 1982), and after compensation for a dropout rate of approximately 15%.

Data collection tools and scoring system: The researcher used an interview questionnaire form and a transcription form. The interview form comprised a section for patient's socio-demographic data: such as patient age, sex, marital status, level of education, etc. The second section was for medical history such as illness duration, related hospital admission/surgeries, and history of chronic diseases, smoking and family history. The third section was for assessment of patient's knowledge of renal diseases and management. It consisted of 25 open-ended questions covering the areas of kidney anatomy/physiology, renal failure, body weight, fluids, laboratory tests, infection control, medications, daily life activities, and warning signs. For each of the knowledge items, a totally correct response was scored 2, a correct incomplete response was scored 1, and the incorrect zero. For each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. Knowledge was considered satisfactory if the percent score was 50% or more, and unsatisfactory if less than 50%.

The last section included a group of 20 patient's reported infection control practices as hand hygiene, isolation/barriers, personal hygiene, disinfection, vaccination, and wound care. It also included a second group of 11 self-care skills practices covering measurement of respiratory rate, urine volume, blood pressure, weight, calculating 24-hr fluids, follow-up, and dental, ENT and ophthalmic checkups, monitoring blood urea, and recording renal function tests, blood sandemion, vital signs, and weight. The items of the two groups had a 3-point Likert scale: "always," "sometimes," and "never," scored 2, 1, and 0, respectively. For each area or skill, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. The reported infection control or self-care practices were considered adequate if the percent score was 60% or more and inadequate if less than 60%.

Transcription form: The researcher prepared this form to abstract the data required for the study from patient's medical file such as vital signs, and the results of laboratory investigations such as kidney and liver function tests, complete blood count, and cyclosporine level in the blood.

The preliminary tools were validated through experts' opinions. A pilot study was carried out on ten patients to test tools' applicability and clarity. The time for filling-in the tools was 25-30 minutes for the interview questionnaire sheet for each patient. The filling of the transcription took from 15 to 25 minutes. Based on the results of the pilot study, the necessary modifications were done and the finalized forms were developed. The patients in the pilot sample were not included in the sample of the main research work.

Fieldwork

The fieldwork was from the January to August 2014. The work was done through assessment, planning, implementation, and evaluation phases.

Assessment phase: The researchers first met with the patients and explained the purpose of the study. Individual interviewing was done after obtaining patient consent to participate. Each interview took 30 to 45. The data collected at this phase were considered as pre-program database information used to identify the educational needs of the patients.

Planning phase: Based on the assessment findings, in addition to pertinent literature, the researchers designed the health education program according to patient's knowledge needs. The educational health program was then finalized and a booklet prepared for use by participants. The general objective was to improve the knowledge and practice of patients with renal transplantation. It covered the anatomy and physiology of the urinary system, causes of renal failure, related laboratory investigations, immunosuppression drugs and their complications, site and importance of transplanted kidney, signs and symptoms of rejection, avoidance of exposure to infection, prescribed nutrition and intake and output, and allowed life activity and times of follow-up visits.

Implementation phase: The researchers delivered the educational program in the study settings. The study sample was divided into 11 groups of 7 patients each. The program was divided into 5 sessions 45 minutes each. Various teaching methods were used in administering the educational program such as mini-lectures, open discussions, questions and answering, role-playing, and simulations.
Evaluation phase: The effectiveness of the educational program was evaluated through immediate posttest and follow-up test after 3 months using the same data collection tools.

Administrative design and ethical issues: The researchers secured the necessary official approvals from the concerned authorities through official letters from the Dean of the Faculty of Nursing at Port Said University. The research protocol was approved by the research and ethics committee of the Faculty. Informed consents were obtained from every patient and family caregiver before inclusion after clear and simple explanation of the study objectives and procedures. They were informed about their rights to refuse or withdraw at any time with no reasons and with no consequences. They were also reassured that all the gathered information would be confidential and used for research purpose only. The study maneuver could not inflict any harmful effects on participants.

Statistical analysis: Data entry and statistical analysis were done using SPSS 16.0 statistical software package. Quantitative continuous data were compared using the non-parametric Kruskal-Wallis tests. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In order to identify the independent predictors of knowledge and practice scores, multiple regression analysis was used, and analysis of variance for the full regression models were done. Statistical significance was considered at p-value <0.05.
Study limitations: The researchers were faced with logistic problems during the implementation phase due to overcrowding in outpatient clinic. Sometimes the educational sessions were postponed due to lack of suitable, which prolonged the time of fieldwork.

III. Results

Table (1) shows that the patients' age ranged between 8 and 54 years with a mean 35.4 years. The majority was males (81.8%), married (66.2%), working (71.1%), and having sufficient income (79.2%). Slightly less than half of the patients had intermediate education (48.1%), while 35.1% had university education. The sample was almost equally distributed in rural (51.9%) and urban (48.1%) residence. Slightly less than two-thirds (61%) of the patients were living in houses with crowding index less than 2 persons per room. Only 20.4% of the patients were exerting physical types of effort.

Concerning the medical history of the patients, Table (2) illustrates that a majority had their graft for one or more months (77.9%), with a median of 1 month. Also, the majority had previous hospitalization (87%) and surgery for their renal disease (77.9%) which was all for renal transplantation. Slightly more than half of the patients had concomitant chronic diseases (54.5%), mostly hypertension (50.6%) and diabetes (24.7%). Only a few of the patients had family history of similar disease (5.2%), and only 1 (1.3%) of renal transplantation. As regards the smoking habit, only 5.2% of the patients were current smokers, while the majority (72.7%) was non-smoking.

Table (3) describes the changes in patients' knowledge throughout the intervention phases. It shows variable percentages of satisfactory knowledge at the pre-intervention phase with the lowest being regarding knowledge about renal failure (37.7%) and renal anatomy and physiology (45.5%). At the other extreme, the majority of the patients (93.5%) had satisfactory knowledge about the daily life activities (DLA). At the post-intervention phase, statistically significant improvements were shown in all areas of knowledge. The only exception was concerning the DLAs, which improved but not significantly. The improvements continued at the follow-up

phase with very slight non-significant declines in some areas. In total, there were statistically significant ($p<0.001$) improvements in patients' knowledge throughout the study phases. Less than half of them (45.5%) had satisfactory knowledge at the pre-intervention phase. This increased to 96.1% at the post-intervention phase, and declined to 90.9% at the follow-up phase.As regards patients' reported practices of infection control, Table (4) indicates variable levels of adequate practice at the pre-intervention phase. The percentages of patients with adequate practice varied between 40.3% for vaccination to 85.7% for personal hygiene. The table demonstrates statistically significant improvements in all areas at the post-intervention phase, and this continued throughout the follow-up phase. The only area which did not significantly improve was that of personal hygiene, which was already high at the pre-intervention phase. The table demonstrates statistically significant ($p<0.001$) improvements in total patients' reported practice of infection control throughout the study phases. Thus, 72.7% of them had adequate reported practice at the pre-intervention phase, and this increased to 97.4% at the post-intervention and follow-up phases.

Table (5) shows that the adequacy of practice of skills by the patients at the pre-intervention phase was generally high in many of the areas such as measuring blood pressure (85.7%), follow-up (84.8%), and recording. On the contrary, it was low regarding measuring respiratory rate (23.4%), and ENT (45.5%), ophthalmic (46.8%) and dental (48.1%) checkups. The table indicates statistically significant improvements in all skills at the post-intervention phase except for the two areas with high pre-intervention percentages of adequate practice. The follow-up phase demonstrated declines in almost all skills, but the levels were still statistically significantly higher compared to pre-intervention levels in the skills of measuring respiratory rate, urine volume, and calculating 24-hr urine volume. Overall, statistically significant ($p<0.001$) improvements were depicted in patients' total practice of skills throughout the study phases. While slightly more than half of them (51.9%) had total adequate practice at the pre-intervention phase, this rose to 89.6% at the post-intervention phase, and declined to 80.5% at the follow-up phase.As regards patients' clinical findings and laboratory results throughout the study phases, Table (6) illustrates no statistically significant changes in any. The only exception was with the WBC count, which increased at the post-intervention phase, but dropped again in the follow-up phase, with a statistically significant difference ($p=0.04$).

Table (7) indicates that the study intervention, as well as patient's age and income are the statistically significant independent predictors of patients' knowledge score. The intervention is the most influential factor as indicated by its standardized beta coefficient. The model explains 57% of the variation in the knowledge score.
As regards the infection control practice score, the table demonstrates that the study intervention, as well as patient's education, working status, and knowledge score are the statistically significant independent predictors of this score. On the other hand, the married status and having chronic diseases are negative predictors. The knowledge score and the intervention are the most influential factor as indicated by their standardized beta coefficient. The model explains 27% of the variation in the infection control As for patients' skills practice score, the study intervention, knowledge score, as well as patient's education and chronic disease state are the statistically significant independent positive predictors of this score. Meanwhile, the married state is a negative predictor. The intervention and the knowledge score are the most influential factor as indicated by its standardized beta coefficient. The model explains 28% of the variation in the skills practice score.

Table 1: Socio-demographic characteristics of patients in the study sample (n=77)

Socio-demographic characteristics	Frequency	Percent
Age:		
<40	44	57.1
40+	33	42.9
Rang	8.0-50.0	
Mean±SD	35.4±11.1	
Median	37.0	
Gender:		
Male	63	81.8
Female	14	18.2
Marital status:		
Unmarried	26	33.8
Married	51	66.2
Education:		
Basic	13	16.9
Intermediate	37	48.1
University	27	35.1
Job:		
Unemployed	23	29.9
Working	54	70.1
Effort type:		
Mental	43	79.6
Physical	11	20.4

Live with family	77	100.0
Residence:		
Rural	40	51.9
Urban	37	48.1
Income:		
Insufficient	16	20.8
Sufficient	61	79.2
Crowding index;		
<2	47	61.0
2+	30	39.0

Table 2: Medical and family history of patients in the study sample (n=77)

Medical and family history	Frequency	Percent
Duration of graft (months):		
<1	17	22.1
1+	60	77.9
Range	<1-6	
Mean±SD	1.0±0.9	
Median	1	
Previous history of:		
Hospitalization	67	87.0
Surgery for renal disease	60	77.9
Renal transplantation	60	100.0
Have chronic diseases	42	54.5
Diseases:[@]		
Hypertension	39	50.6
Diabetes	19	24.7
Hepatic	7	9.1
Psoriasis	1	1.3
Number of diseases		
Range	0-3	
Mean±SD	0.9±0.9	
Median	1	
Smoking;		
None	86	72.7
Ex-smoker	17	22.1
Current	4	5.2
Family history of:		
Similar disease	4	5.2
Renal transplant	1	1.3

(@) Not mutually exclusive

Table 3: Patients' knowledge about renal disease and management throughout intervention

Satisfactory knowledge (50%+)	Time						X^2 (P-value) Pre-post	X^2 (P-value) Pre-FU
	Pre (n=77)		Post (n=77)		FU (n=77)			
	No.	%	No.	%	No.	%		
Anatomy/physiology	35	45.5	60	77.9	61	79.2	17.17(<0.001*)	18.70(<0.001*)
Renal failure	29	37.7	66	85.7	61	79.2	37.61(<0.001*)	27.38(<0.001*)
Body weight	37	48.1	67	87.0	57	74.0	26.65(<0.001*)	10.92(0.001*)
Fluids	57	74.0	76	98.7	76	98.7	19.90(<0.001*)	19.90(<0.001*)
Lab tests	46	59.7	73	94.8	70	90.9	26.95(<0.001*)	20.12(<0.001*)
Infection control	37	48.1	70	92.2	72	93.5	35.83(<0.001*)	38.46(<0.001*)
Medications	60	77.9	74	96.1	72	93.5	11.26(0.001*)	7.64(0.006*)
Daily life activities	72	93.5	76	98.7	75	97.4	Fisher (0.21)	Fisher(0.44)
Warning signs	59	76.6	76	98.7	74	96.1	17.35(<0.001*)	12.41(<0.001*)
Total knowledge:								
Satisfactory	35	45.5	74	96.1	70	90.9	47.75	36.67
Unsatisfactory	42	54.5	3	3.9	7	9.1	<0.001*)	(<0.001*)

(*) Statistically significant at $p<0.05$

Table 4: Patients' reported practice of infection control (IC) throughout intervention

Adequate practice of infection control (IC):	Time						X^2 (P-value) Pre-post	X^2 (P-value) Pre-FU
	Pre (n=77)		Post (n=77)		FU (n=77)			
	No.			%	No.	%		
Hand hygiene	62	80.5	77	100.0	77	100.0	16.62(<0.001*)	16.62 <0.001*)
Isolation/barriers	50	64.9	70	90.9	73	94.8	15.10(<0.001*)	21.37(<0.001*)
Personal hygiene	66	85.7	69	89.6	68	88.3	0.54(0.46)	0.23(0.63)
Disinfection	40	51.9	69	89.6	68	88.3	26.40(<0.001*)	24.30(<0.001*)
Vaccination	31	40.3	56	72.7	61	79.2	16.51(<0.001*)	24.30(<0.001*)
Wound care	41	53.2	60	77.9	62	80.5	10.39(0.001*)	12.93(<0.001*)
Total IC practice:								
Adequate	56	72.7	75	97.4	75	97.4	18.45	18.45
Inadequate	21	27.3	2	2.6	2	2.6	(<0.001*)	(<0.001*)

(*) Statistically significant at p<0.05

Table 5: Patients' practice of skills throughout intervention

Adequate practice of skills:	Time						X^2(P-value) Pre-post	X^2(P-value) Pre-FU
	Pre (n=77)		Post (n=77)		FU (n=77)			
	No.			%	No.	%		
Measure respiratory rate	18	23.4	33	42.9	33	42.9	6.60(0.01*)	6.60(0.01*)
Measure urine volume	39	50.6	73	94.8	67	87.0	37.85(<0.001*)	23.73(<0.001*)
Calculate 24 hr fluid	52	67.5	77	100.0	67	87.0	29.84(<0.001*)	8.32(0.004*)
Measure blood pressure	66	85.7	73	94.8	67	87.0	3.62(0.06)	0.06(0.81)
Measure weight	61	79.2	72	93.5	67	87.0	6.67(0.01*)	1.67(0.20)
Follow-up	65	84.8	72	93.5	62	80.5	3.24(0.07)	0.40(0.52)
Dental checkup	37	48.1	55	71.4	49	63.6	8.75(0.003*)	3.79(0.051)
ENT checkup	35	45.5	54	70.1	46	59.7	9.61(0.002*)	3.15(0.08)
Ophthalmic checkup	36	46.8	54	70.1	48	62.3	8.66(0.003*)	3.77(0.052)
Monitor blood urea	56	72.7	71	92.2	65	84.4	10.10(0.001*)	3.12(0.08)
Record:								
Renal function tests	63	81.8	73	94.8	69	89.6	6.29(0.01*)	1.91(0.17)
Blood sandemion	65	84.4	73	94.8	70	70.9	4.46(0.03*)	1.50(0.22)
Vital signs	63	81.8	74	96.1	70	90.9	8.00(0.005*)	2.70(0.10)
Weight	62	80.5	74	96.1	70	90.9	9.06(0.003*)	3.39(0.07)
Total skills practice:								
Adequate	40	51.9	69	89.6	62	80.5	26.40	14.05
Inadequate	37	48.1	8	10.4	15	19.5	(<0.001*)	(<0.001*)

(*) Statistically significant at p<0.05

Table 6: Patients' clinical and laboratory tests results throughout intervention

Clinical and laboratory tests	Time						Kruskal Wallis test	p-value
	Pre (n=77)		Post (n=77)		FU (n=77)			
	Mean±SD	Median	Mean±SD	Median	Mean±SD	Median		
Pulse	74.2±6.8	74.0	74.2±6.5	74.0	74.8±6.2	74.0	0.61	0.74
Temperature	37.0±0.2	37.0	37.0±0.2	37.0	37.0±0.2	37.0	0.29	0.86
Systolic BP	129.5±16.3	130.0	127.9±16.5	130.0	126.4±17.9	130.0	0.67	0.71
Diastolic BP	80.5±10.7	80.0	80.8±9.2	80.0	95.7±9.8	80.0	0.74	0.69
Respiration	16.9±1.4	16.0	16.9±1.4	16.0	16.9±1.5	17.0	0.21	0.90
Blood urea	42.2±18.1	39.0	39.7±16.2	37.0	41.6±16.4	40.0	0.75	0.69
s. Creatinine	1.2±0.5	1.1	1.1±0.5	1.10	1.2±0.5	1.0	0.02	0.99
ALT	22.2±15.2	19.0	22.4±13.8	19.0	28.0±24.5	20.0	1.86	0.39
AST	25.8±24.3	17.0	23.9±27.3	18.0	23.7±19.6	17.0	0.07	0.96
Cyclosporin	136.0±114.6	116.0	144.8±149.8	108.0	138.6±135.1	118.0	0.04	0.98
Platelets	248.3±81.3	238.0	245.4±80.4	236.0	240.0±65.5	235.0	0.27	0.87
WBC	10.2±12.8	9.0	13.1±25.1	9.0	9.7±13.0	8.0	6.41	0.04*
RBC	4.8±2.3	4.0	4.9±2.5	5.0	6.6±9.5	4.0	0.42	0.81
Hemoglobin	12.3±2.6	13.0	12.6±2.2	13.0	12.6±2.3	13.0	0.35	0.84

(*) Statistically significant at p<0.05

Table 7: Best fitting multiple linear regression model for the knowledge and practice scores

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Knowledge score							
Constant	-16.679	7.439		-2.242	0.026	-31.378	-1.981
Intervention	32.629	2.447	0.706	13.333	<0.001	27.793	37.464
Age	0.409	0.112	0.195	3.661	<0.001	0.188	0.63
Income	10.599	3.035	0.186	3.492	0.001	4.602	16.596
r-square=0.57 Model ANOVA: F=68.87, p<0.001 Variables entered and excluded: gender, education, marital status, job, residence, smoking, duration of illness, chronic diseases, previous surgery, family history							
Reported infection control practice score							
Constant	64.81	5.16		12.559	<0.001	54.612	75.008
Intervention	4.774	2.216	0.218	2.155	0.033	0.395	9.154
Married	-4.659	2.318	-0.201	-2.01	0.046	-9.24	-0.078
Education	2.559	0.975	0.193	2.625	0.01	0.632	4.485
Working	5.536	2.25	0.231	2.46	0.015	1.089	9.984
Chronic disease	-5.187	1.701	-0.235	-3.05	0.003	-8.548	-1.826
Knowledge Score	0.137	0.05	0.289	2.764	0.006	0.039	0.235
r-square=0.27 Model ANOVA: F=10.60, p<0.001 Variables entered and excluded: age, gender, residence, smoking, duration of illness, previous surgery, family history							
Self-care skills practice score							
Constant	55.506	7.068		7.853	0	41.538	69.474
Married	-7.593	2.587	-0.227	-2.936	0.004	-12.704	-2.481
Education	4.529	1.399	0.236	3.238	0.001	1.766	7.293
Chronic disease	5.124	2.433	0.161	2.106	0.037	0.316	9.931
Knowledge score	0.187	0.071	0.273	2.634	0.009	0.047	0.328
Intervention	6.497	3.178	0.205	2.044	0.043	0.217	12.778
r-square=0.28 Model ANOVA: F=13.02, p<0.001 Variables entered and excluded: age, gender, residence, job, smoking, duration of illness, previous surgery, family history							

IV. Discussion

The study tested the hypothesis that the implementation of a health education program tailored to renal transplant recipients' needs will lead to statistically significant improvements in their related knowledge and practice. The study findings revealed a generally positive impact of the educational program on patients' knowledge as well as their reported and actual practices, leading to acceptance of the hypothesis.

The present study findings demonstrated that patients' pre-intervention knowledge was deficient. This was particularly evident as regards the knowledge about renal failure and renal anatomy and physiology. This might be attributed to that the instructions they receive are focused more on the operation and related post-operative care. In agreement with this, a study in Morocco showed that the patients with ESRD and those who are candidate for renal transplantation were in need for more basic information concerning their illness and the different approaches for management (Laouad et al, 2011).

After implementing the intervention, the present study results showed significant improvements in almost all areas of patients' knowledge. This improvement continued and even increased at the follow-up phase. The findings point to success of the intervention in achieving its objective of improving patients' knowledge, which was further confirmed by multivariate analysis that identified the intervention as the most influential positive predictor on patient's score of knowledge. A similar success of a patient education intervention in improving the knowledge of renal transplant patients was reported in a study in the United States (Waterman et al, 2010). More recently, the same authors planned a clinical trial to confirm the findings of their previous study (Waterman et al, 2014). On the same line, White et al (2009) in a study reported that kidney transplant recipients' knowledge improved after educational program, and during follow-up.

The current study intervention was also aimed at improving renal transplant patients' practices. This was assessed through patient's reporting as well as by observation of some skills. Before the intervention, patients' reported practices concerning infection control were high in the areas of hand and personal hygiene, but low in other areas especially vaccination and disinfection. This is quite conceivable since personal hygiene is critical in case of organ transplantation to avoid infections and their potentially disastrous consequences. In agreement with this, Graf et al (2013) in a study in Germany emphasized the importance of hand hygiene compliance in transplant and other immune-compromised patients.

The implementation of the present study intervention led to significant improvements in almost all areas of infection control practices reported by patients. This was noticed at the post-intervention phase, and continued without obvious declines at the follow-up phase. This reflects the effectiveness of the intervention in

achieving its objective of improving patients' infection control practices. The finding is in agreement with those of a study carried out in Canada to determine the effectiveness of a structured educational session for kidney transplant candidates (Barnieh et al, 2011).

The positive effect of the present study intervention on patients' practice of infection control was confirmed through multivariate analysis, which identified the intervention as an important positive predictor of the score of infection control practice. However, the knowledge score had a stronger influence on this practice score in the regression model. Thus, the improvement of patients' practice of infection control was based on the improvement in their knowledge. This might be attributed to the fact that the information included in the program was focused on applied rather than theoretical knowledge. In agreement with this, a study in Taiwan reported the effectiveness of multidisciplinary care for ESRD patients, where a 3-year follow-up demonstrated a significant reduction in the rates of infections due to improved patients' practice of infection control (Chen et al, 2013).

On the same line, Siegel et al (2009) demonstrated the effectiveness of using a guideline for isolation precautions in preventing transmission of infectious agents in health care settings, with significant differences between pre and post guidelines distribution, and during the follow-up. Nonetheless, the present study findings concerning patients' practices of infection control should be taken with cautious since they are based on reporting from patients rather than direct observations. Hence, they might be biased by over-reporting from the side of the patients in order to please the researcher.

However, to overcome this foregoing limitation of reported practice, the present study has also assessed the effect of the intervention on the practice of some self-care skills. The results demonstrated variability of patients' practice at the pre-intervention phase, with some skills adequately practiced such as measuring blood pressure, follow-up, and recording, while on the other hand other skills were less adequately practiced as measuring respiratory rate and various checkups. The high rate of adequate practice of measuring blood pressure compared with measuring respiratory rate might be explained by the availability of affordable and user-friendly blood pressure measuring equipment. In congruence with this, a study in the United States demonstrated the utility of new technology equipment such as smart phones in controlling blood pressure in renal transplant patients (McGillicuddy et al, 2013).

The present study patients' practice of various skills demonstrated significant improvements after implementation of the intervention phase in all areas; the only exceptions were for those of measuring blood pressure and follow-up, which were already high in the pre-intervention phase. The improvements were retained in the follow-up phase although they showed some insignificant declines. A similar success of an evidence-based educational program for patients in improving the practice and adherence of renal transplant patient was reported in a study in Germany (Schmid-Mohler et al, 2013).

The effectiveness of the present study intervention in improving patients' skills' practices was confirmed through multivariate analysis. Similar to the model for reported practice, the intervention was a significant independent positive predictor of the practice score, but the effect of the knowledge score was higher. This is again explained by the practical component of the intervention, which was focused on training the patients in actual application of the skills. The similarity of the regression models of reported infection control and self-care practice skills regarding the effect of the intervention and the knowledge score add to the validity of the results, and reduces the possibility of the bias of "reported" practice. Nonetheless, the value of patient-reported outcome measures has been recently stressed (Santana et al, 2015).

The effectiveness of the current study intervention was also evaluated through assessment of some objective measures as the clinical signs and laboratory results. The study results could not reveal any significant changes in patients' clinical and laboratory results throughout the study phases. This lack of significant changes is certainly attributed to the short time of follow-up. Moreover, the majority of the patients had their vital signs and laboratory tests' values within the normal limits at the pre-intervention phase; hence, no changes are expected to occur.

V. Conclusion and recommendations

In conclusion, renal transplant patients' knowledge and infection control and self-care practices are deficient. The implementation of the educational program is effective in achieving significant improvements in their knowledge, reported practice of infection control, and total practice of self-care skills. The study recommends implementation of the educational program in the study setting and in similar settings, with longer follow-up evaluation. The renal transplant patients need to receive more full instructions, taking into consideration their socio-demographic and health characteristics. The community health nurse has a pivotal role in training patient and family members in self-care skills at home. Further research is suggested to apply this educational program in a randomized clinical trial design in order to achieve higher level of evidence.

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