

# EFFECT OF EMPOWERMENT PROGRAM ON CAREGIVERS' ADHERENCE TO THERAPEUTIC REGIMEN OF THEIR CHILDREN AFTER KIDNEY TRANSPLANTATION

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### Abstract

Empowering caregivers' adherence to therapeutic regimen after children kidney transplantation play role in graft survival and improving quality of life of children and their families. **Aim of the study:** To evaluate the effect of empowerment program on caregivers' adherence to therapeutic regimen of their children after kidney transplantation. **Design:** Quasi-experimental design. **Sample:** A convenient sample consisted of 60 caregivers of children aged ranges from 6-18 years divided into two groups; study and control. **Setting:** The study was carried out at the kidney transplantation outpatient clinic at Al- Monira Pediatric Hospital which affiliated to Cairo-University Hospitals. Tools for data collection: Data collected using five tools including structured interview questionnaire, caregivers' adherence to therapeutic regimen and its related knowledge, observational checklist (oral medications, hand wash, oral care, skin care, and care of fever), laboratory investigations record and self-efficacy scale. **Results:** The mean age of children among study and control groups were thirteen years and more, the majority of caregivers were children's mothers, less than three fifths of children had less than two years duration after KT, all children were hospitalized after KT due to abnormal laboratory investigations. After the program the caregivers total mean scores of knowledge's, practices, self-efficacy, and adherence among the study group improved in posttest and follow-up than before. Also, significant positive correlation was detected between them **Conclusion:** The current study concluded that, the empowerment program improves significantly the total scores of caregivers' knowledge, practices, self-efficacy and the adherence to therapeutic regimen. **Recommendation:** It was recommended that to integrate the empowerment program for caregivers to the routine care of children post KT.

**Keywords:** Empowerment Program, Therapeutic Regimen, Adherence, Kidney Transplantation, Adolescent, Knowledge, Practice, Self-Efficacy.

### INTRODUCTION

Kidney Transplantation (KT) has become the preferred treatment for children with end stage renal failure because of better quality of life (Melk & Erlangga, 2022). It had great importance in prolonging a pediatric patient's life expectancy, for improvements of children health and allograft outcomes advancements (Meena et al., 2018).

National Kidney Foundation (2021) reported that “for managing child health after transplantation, KT recipients and/or their caregivers ought to be adhered to a therapeutic regimen that includes lifelong immune suppression, hygiene, follow prescribed diet, exercise, laboratory testing, and frequent clinic visits”. After pediatric KT children and their caregivers must agree to follow a care, this is called therapeutic regimen which consist of five domains (follow up and laboratory investigations regimens considered as one domain) all of domains are interrelated and act as building, so each regime is important to each other (Varnell et al., 2017).

Immunosuppressive drug regimens are modified as the risk of acute rejection and allograft loss varies to optimize allograft, patient survival and reduce drug adverse effects (McDonald, 2021). Despite the great survival benefits offered by KT, one third of transplanted grafts fail within 5 years with no appreciable improvements despite highly effective immunosuppression. Late rejection due to medication non-adherence is recognized as a major contributor to graft loss beyond the first post-transplant year (Serper et al., 2021).

In order to prevent infections in children post KT that considered as a major obstacles after children KT, for that hygienic regimen adherence include; frequent hand washing and/or carrying hand sanitizer at all times, avoiding being in crowded areas like parties, avoiding crowded buses, wearing masks and avoiding the sharing of personal items such as towel and continuous cleaning of teeth (Sinclair-Marantz, 2021).

Healthy eating pattern after children KT has proven to lower the risk of metabolic and cardiovascular diseases. It is challenging for children’ caregivers to understand and implement specific dietary recommendations. The most beneficial dietary patterns to children post KT focusing on less meat and processed foods, while increasing the intake of fresh foods and plant-based choices (Cyrino et al., 2021).

After successful transplant, children are encouraged to return to “normal life,” with participation in age-appropriate physical activities. Physical activity is a proven tool in decreasing surrogate markers of this risk, but conflicting advice and opinions exist regarding type and participation in physical activity. In general, a program of rehabilitation and increased physical activity has been shown to be safe and effective for most pediatric KT recipients (Bobrowski, 2021).

Prevention of several adverse post-transplant outcomes such as cardiovascular disease, dyslipidemia, new onset diabetes after transplantation, and even bone loss can be achieved through adherence to recommended diet and exercise. Although numerous studies report weight gain after KT, there are limited guidelines addressing diet or physical activity for this population to deter this unwanted gain (Nolte Fong & Moore, 2018).

All pediatric patients were followed at weekly intervals for the first 3 months, every 2 weeks for the next 3 months, monthly for the next 6 months, and at 1–3 monthly intervals thereafter. On every visit, complete blood counts, renal function tests, and urine examination were done, and ultrasound Doppler studies and immunosuppression levels

were performed as per requirement. In the follow up the physician gives the instructions, describe medications, follow up for the child and caregiver's adherence to the other treatment regimens (Vala et al., 2020). Therapeutic regimens adherence required to avoid significant negative health consequences (Cushman et al., 2020). Poor adherence can lead to medical complications such as acute rejection, graft loss, and mortality (Kraenbring, Zelikovsky & Meyers, 2019), Cushman et al., (2020) added frequent hospitalizations.

Empowerment in pediatrics requires high levels of familial involvement and the family environment plays an important role in adolescent adherence. Yet, there has been little attention to family variables that may contribute to health behaviors, such as affective involvement, communication, responsibilities, behavioral control, and problem-solving, particularly in pediatric renal transplant patients (Kraenbring et al., 2019). One of the major factors acting on graft survival, prevention of transplant rejection, and the achievement of low mortality and morbidity rates after KT is the training of transplant patients about therapeutic regimen adherence in the post-transplantation period (Karaman et al., 2021).

Studies in nonadherence after pediatric KT have reported prevalence rates in pediatric KT recipients are strikingly high, with prevalence rates ranging from 30% to 80% (Sandal et al., 2021), nonadherence is reported to increase up to 43% during adolescence (Varnell et al., 2022). Chhiba et al., (2022) revealed that the causes of non-adherence in adolescent as they may be ill-prepared to assume responsibility for their own health and medical condition. Yet with the transition into adulthood, adolescents move from child-friendly pediatric environments into busy and unfamiliar adult units, where they are expected to become more independent and take on increased responsibility for their health.

Suspected nonadherence contributes to approximately 44% of graft losses and 23% of late acute rejection episodes reported in the literature for adolescent kidney transplant recipients (Winterberg & Garro, 2019). Also, the adolescent age window constitutes a high-risk period for graft loss irrespective of other donor or recipient factors, adolescent particularly in high-risk populations because they are at risk for non-adherence to therapeutic regimen (Ehlayel & Ashoor, 2021).

Non-adherence to therapeutic regimens has significant implications for kidney transplant patients, including increased healthcare utilization, medical complications, allograft rejection and loss, and patient death. Non-adherence leads to unnecessary tests, additional treatments, procedures, surgeries, clinic visits, and hospitalizations. Research demonstrates that a 10% decrement in adherence is associated with an 8% higher hazard of graft failure and mortality. Focus has begun to shift from patient factors that impact adherence to the contributing healthcare and systems factors (Steinberg et al., 2018). The studies reported that long-term success of KT depends on reducing postsurgical complications, also assured carefully balancing the risks and benefits of immunosuppression over time, and assented for developing strategies that ensure long-

term adherence of children caregivers to KT therapeutic regimen (Puttarajappa et al., 2021).

A meta-analysis in 2010 found that family functioning, particularly greater parental distress, and lower family cohesion, was significantly related with poorer adherence across pediatric KT groups. Thus, literature provides evidence that the family environment plays an important role in adolescent adherence. Yet, there has been little attention to family variables that may contribute to health behaviors, such as affective involvement, communication, responsibilities, behavioral control, and problem-solving, particularly in pediatric renal transplant patients (Kraenbring, Zelikovsky & Meyers, 2019).

Nurses with empowerment-based education can alleviate the stress of caregivers and improve their adherence to treatment regimen by establishing caring relationships, sharing knowledge and information, paying attention to support psychologically and physically, involving them in decision-making, and empowering them in care (Bahramnezhad et al., 2021).

The goal of empowerment program among KT adolescents is to decrease uncertainty and an improvement in self-care ability and compliance (Kim & You, 2017). The goal of caregivers' empowerment is to enhance children's health and wellbeing. Empowerment aims to develop or strengthen pediatric patients' physical, mental, or social skills to reach self-management of diseases and treatment, it emphasizes self-efficacy, make informed choices about treatment and care, have a better relationship with health professionals, are committed to adhering to treatment, are willing and able to take more responsibility for care, providing support and integrating resources to reach that goal (Bailo et al., 2019).

Empowerment emphasized that the appropriate treatment relation and interaction between the family and the medical team at the hospital is one of the fundamental components of care, also there is strong evidence, across all contexts, that interventions that seek to empower patients, caregivers and families can promote better care, including healthier behaviors, enhanced patient experience, more effective utilization of health services, reduced costs and improved outcomes (Bennett et al., 2020). The interaction between healthcare professionals and caregivers, bring about a sense of control over family life and leads to positive changes that improve the strengths, abilities, and skills of the patient' caregivers. Altogether, the empowerment program can be helpful for children and his/her parents to contract more efficiently with KT and its complications to achieve a higher level of good care and good life (Minooei et al., 2016).

Abdelhady, El samman, Attia, and Ahmed, (2018) in the study titled "Factors affecting caregivers' adherence to therapeutic regimens for their children after kidney transplantation" held in Al-Monira Pediatric Hospital which affiliated to Cairo University Hospitals (Egypt) through the period from 2016-2017 who found that 80% of caregivers not adhered to their children' therapeutic regimen post KT, and recommend the implementation of an empowerment program to those caregivers to maximize their level of adherence. The information about the effect of empowerment program on caregivers'

adherence to the therapeutic regimen of their children after KT help in increasing family control over the consequences after children KT, improve the welfare of children and add evidence-based research study to body of knowledge in pediatric medicine nursing.

## **AIM OF THE STUDY**

The aim of this study was to evaluate the effect of empowerment program on caregivers' adherence to therapeutic regimen of their children after kidney transplantation.

## **Research Hypotheses**

- 1- Caregivers who will receive the empowerment program will have higher total scores of knowledge than the control group.
- 2- Caregivers who will receive the empowerment program will have higher total scores of practices than the control group.
- 3- Caregivers who will receive the empowerment program will have higher total score of self-efficacy than the control group.
- 4- Caregivers who will receive the empowerment program will have higher total scores of adherence than the control group.

## **METHODS**

### **Research Design**

A quasi-experimental research design was utilized to achieve the aim of the current study.

### **Setting**

The study was carried out at the kidney transplantation outpatient clinic which allocated in 7<sup>th</sup> floor at Al-Monira Pediatric Hospital which is affiliated to Cairo-University Hospitals. It consisted of four rooms, two of them for examination and follow-up, a room for lab investigation, and a room for data entry and files storage which was used to interview the caregivers in the presence of their children.

### **Sample**

A convenient sample consisted of 60 caregivers of children aged ranges from 6-18 years who had kidney transplantation over 6 months period. This sample was divided into two equal groups. The first 30 caregivers and their children were included in the control group who received the hospital routine care in the clinic. The second 30 caregivers and their children were considered as a study group and subjected to the empowerment program.

## DATA COLLECTION TOOLS

The required data were collected through the following tools: -

**Tool 1. Structured Interview Questionnaire:** It was developed by the researcher based on an extensive literature review; it contained 20 questions and consisted from three parts as the following:

**Part I.** It included 4 questions related to the personal data of children after kidney transplantation: age of the child, gender, level of education, and rank within the family.

**Part II.** It included 11 questions related to the past and present medical history of the child: family history of kidney transplantation, date of transplantation, donor, previous hospitalization, frequency of hospital admission, causes of admission, duration of the last hospitalization, current child weight, body temperature, and blood pressure.

**Part III.** It included 9 questions related to personal data about caregivers of children who had kidney transplantation: consanguinity, age, educational level, occupation, residence, number of family members, sun entry, number of house rooms, and sanitation.

**Tool 2. Caregivers' Adherence to Therapeutic Regimen and its Related Knowledge:** It was adapted from Abdelhady, El Samman, Attia, and Ahmed, (2018), it consisted from 7 parts (52 questions) as follows:

**Part 1.** It related to caregivers' knowledge assessment about therapeutic regimens after kidney transplantation, it included 2 questions related to ways to protect transplanted kidney of children and the importance of adherence to therapeutic regimens after kidney transplantation.

### **Part 2. Medication regimen**

Knowledge about immunosuppression medications (14 questions): "names, aim, times, methods of giving, action if forgetting doses, methods of remembering, precautions before giving, side effects and storage of medications".

Adherence to immunosuppression medications (6 questions) "giving medication on time, don't forget to give medication on time before, methods to remember time of medication, follow precautions before giving medication, actions when side effect appeared, methods of saving medications."

### **Part 3. Diet regimen**

Knowledge about eating snacks between meals and methods of cooking (5 questions).

Adherence to eating recommended diet, following certain precautions before preparing food to the child, reducing salt in food, giving preserved foods, skimmed milk, method of cooking, giving high sugar food, and giving nuts" (8 questions)

### **Part 4. Hygiene regimen**

Knowledge about hand washing, and times of teeth brushing (2 questions).

Adherence to hand washing, avoiding infection in crowdedness areas, showering, reporting to the dentist, informing the nephrologist about dentist instructions about any other medications, and having own towel (7 questions)

#### **Part 5. Exercise regimen**

Knowledge about participating in exercises and recommended exercises (2 questions).

Adherence to recommended exercise, warm up, duration of exercises, and preventing aggressive exercise (5 questions).

#### **Part 6. Follow-up regimen**

Knowledge about how to follow up (1 question).

Adherence to follow-up on time, a reason to call the nephrologist, and frequency of follow-up schedule (4 questions).

#### **Part 7. Laboratory investigations regimen**

Knowledge about types of laboratory investigations (1 question).

Adherence to doing laboratory investigations on time and follow-up laboratory investigations results (3 questions).

**Part 8.** Knowledge about complications, and signs and symptoms of rejection after kidney transplantation (3 questions).

#### **Scoring System**

- A- Regarding knowledge, for part 1 and part 2 (16 questions) the complete answer was scored by two (2), partial complete was scored by one (1), and inaccurate was scored by zero (0). The total score of knowledge ranged between 0-32 converted to percent out of 100 and then categorized as follows; the score from 70% to 100% was satisfactory, and less than 70% was unsatisfactory.
- B- Regarding adherence, for parts 3-8 (36 questions) all the time response scored by two, sometimes was scored by one and never response was scored by zero. The total score of adherence range between 0-72 converted to percent out of 100 and then categorized as follows; the score of adherence from 70% to 100% is considered as adhered, and less than 70% is considered as not adhered.

**Tool 3. Observational Checklists:** It assessed caregivers' practice related to care of their children after kidney transplantation, it consisted of the following procedures.

- 1- Administering oral medications: it was adopted from Patricia and Ladewig, (2012). It consisted of 10 items.
- 2- Hand washing: it was adopted from WHO, (2020), and it consisted of 11 items. It is a standardized tool.

- 3- Oral care: it was adopted from James, Nelson, and Ashwill, (2014), and it consisted of 8 items.
- 4- Skin care: it was adopted from (National Kidney Foundation) NKF, (2020), and it consisted of 6 items.
- 5- Care of fever: it was adopted from James et al., (2014), it consisted of 10 items for measuring oral temperature and 10 items of measuring axillary temperature and 10 items of cold compresses.

N.B, all the practices (administering oral medications, oral care, skin care, and care of fever) were presented in the form of a checklist by the researcher.

**Scoring system.** Done step gain 1 score, and not done step gain zero. The total score 95 scores classified as follows:

- Satisfactory when the caregiver's scores more than 70%.
- Unsatisfactory when caregiver's scores less than or equal 70%.

**Tool 4. Laboratory Investigations Record:** It was developed by the researcher after reviewing related literature, to record the actual laboratory investigations' results. It contained the level of immunosuppression drugs in the blood, kidney function tests (sodium, potassium, and creatinine level), and lab investigations for sepsis screen (WBCs, blood and urine culture). It was recorded as normal and abnormal. The references of laboratory investigations adopted from Nelson and Ashwill, (2014).

**Tool 5. Self-efficacy Scale:** It adapted from family empowerment scale adopted from Koren, DeChillo and Friesen, (1992), to assess caregivers' self-efficacy (sense of personal competence across situations), it consists of ten (10) questions about actions in case of problems arise, feeling of confidence, can seek help from others, ability of decision making, understanding child disease, having the right to accept services, proper communication with health care team, value of my decision, share decision, participation in care.

**Scoring System:** Each item has a score ranging from 1 to 5. Where, never = 1, seldom = 2, sometimes = 3, often = 4, very often = 5.

The total scores range between 1-50 and are converted to percent out of 100 and the total score is classified into:

- Satisfactory when the caregiver score is more than 70%.
- Unsatisfactory when caregiver score is less than or equal to 70%.

## Validity

Content validity of caregivers' adherence to therapeutic regimen and its related knowledge (tool 2), the adapted observational checklists (tool 3) including administering oral medications, oral care, skin care, and care of fever procedure, the laboratory



investigations record (tool 4) assured through panel of three experts in the field of pediatric medicine nursing and pediatrics. The tools were examined for content coverage, clarity, relevance, and applicability. The experts agreed on the content of the tools but recommended minor questions changes that would make the information clear and more precise, such as rephrasing and rearranging some sentences. The observational checklist of hand wash (tool 3) and the self-efficacy scale (tool 4) is a standardized tools that adopted as it is.

### **Reliability**

Reliability of tool performed to confirm its consistency by using alpha-coefficient test. alpha-coefficient test for caregivers' adherence to therapeutic regimen and its related knowledge tool was (0.69), observational checklists tools was (0.79), laboratory investigations record was (0.75), self-efficacy scale was (0.81) which means high internal consistency, and consequently high reliability for all tools.

### **Empowerment Program**

It was developed by the researcher after extensive reviewing of the related literature about care of children after kidney transplantation. It is prepared in the form of handout to suit the caregivers' level of understanding; it includes colorful pictures and simple statement in Arabic language. The main goal of the empowerment program is to maximize the caregivers' control over situations and consequences after kidney transplantation of their children. The program included the theoretical part about medication, hygiene, diet, exercise, laboratory investigations, and follow-up regimens and the practical part about administering of oral medication, hand washing, skin care, oral care, and care of fever procedures.

### **Procedure**

Final approval was obtained from the research ethical committee, Faculty of Nursing, Cairo-University. Official letter sent from Faculty of Nursing, Cairo-University to the director of Al-Monira Hospital and head of kidney transplantation outpatient clinic after explaining the aim and nature of the study. The researcher introduced himself to the child and the caregiver who provided care for his/her child after kidney transplantation. The written informed consent obtained from each caregiver and oral assent from the child according to age after explanation the purpose, nature of the study, children's and caregiver's rights. The researcher interviewed each caregiver with their children at a special quiet room (one of clinic rooms or the data entry room) at the outpatient clinic to keep privacy of them. Data for the control group were collected before the study group and received routine care in the clinic.

The total program sessions were eight; two sessions for pretest for study and control group (session 1 and 2), the next four sessions given over one month used for implementing the empowerment program for the study group only. One session/ week for four consecutive weeks, each session took about 30-45 minutes, the session divided into

two parts one theoretical and another practical, The third session about medication regimen and administration of oral medication procedure. The fourth session was about hygiene regimen, hand washing, care of fever and skin care procedures. The fifth session was about diet regimen, and oral care procedure, the sixth session about exercise, laboratory investigations, and follow up regimens. Followed by session seven for immediate posttest and session eight for follow-up one month after the end of the program. The control group had been left to the routine care provided for these patients in outpatient clinic. Also, session 7 and 8 for posttest and follow-up were done for the control group.

## RESULTS

Table (1) shows that the vast majority (93.3%) and the majority (86.7%) of children in the study and control group their age ranged from 12 to 18 years. Regarding gender, four-fifths (80 %) and less than three-quarters (73.3 %) of the children in both groups were males. As regards educational level, more than three-fifths (63.3%) and two (66.7%) of the children in the two groups had primary and preparatory education. In relation to children rank, more than two-fifths (43.3%) and less than one half (46.7%) of the children in both groups ranked third or more. There were no statistically significant differences between both groups regarding all the personal data.

It is evident from table (2) that four-fifths (80%) of children' caregivers were the mothers in both groups, regarding to age of caregivers, the mean age was  $45.43 \pm 5.61$  and  $46.13 \pm 5.48$  years for the study and control groups respectively. In relation to caregivers' education, more than two-fifths (43.3%) and less than one third (30%) of both groups respectively had secondary education. As regard work of mothers, more than three-quarters (76.7%) and less than three-quarters (73.3%) of mothers in the two groups were housewives. The majority (86.7%) and vast majority (93.3%) of fathers were working. Regarding residence, less than three-quarters's (73.3%) and more than half (56.7%) of caregivers in both groups were from rural areas. There were no statistically significant differences between the two groups regarding caregivers' personal data.

It is clear from table (3) that all (100%) children in both groups had no family history of KT. Regarding the period after KT, less than two-fifths (36.7%) had less than one year or more than two years in the study group while more than two-fifths (43.3%) of children in the control group did the transplantation from two years ago. Three-fifths (60%) and more than three-fifths (63.3%) of donors were the children's mothers in both groups. All children (100%) in both groups were hospitalized after KT for one to five times among the highest percentage of the study and control groups (83.3%, 70% respectively), the causes of hospitalization were abnormal laboratory investigations followed by another health problems among the study group (40% and 33.3% respectively) vice versa among the control group (43.3% and 36.7% respectively). The duration of last hospitalization was less than one week among the highest percentage of both groups (83.3% and 73.3 %

respectively). There were no statistically significant differences between both groups regarding children's medical history.

As shown from table (4) in pretest, there were no statistically significant differences between caregivers of the study and control groups concerning the total mean scores in all items of knowledge. After the program, the same table clarified that there were highly statistically significance differences between caregivers of the study and control group about the total mean scores of knowledge's in posttest and follow-up in all items except laboratory and follow-up regimen knowledge ( $p \leq 0.001$ ).

It is evident from table (5) that there were no statistically significant differences between the two groups of caregivers' total mean scores of adherences regarding to dimensions of adherence to therapeutic regimens in pretest in study and control group, while after the program, there were highly statistically significant differences between caregivers' total mean scores of adherences regarding to dimensions of adherence to therapeutic regimens in study and control group in posttest and follow-up ( $p \leq 0.001$ ). As the highest total mean scores were detected among the study group regarding diet regimen ( $11.10 \pm 1.85$ ,  $11.06 \pm 1.43$  respectively), and the lowest total mean scores about laboratory investigations regimen ( $3.62 \pm 0.19$ ,  $3.62 \pm 0.19$  respectively) in the posttest and follow-up.

Obviously, from table (6), there were no statistically significant differences between the two groups of caregivers' total mean scores about administering oral medication, hand wash, oral care, skin care, oral temperature, axillary temperature, cold compresses, and total practice in pretest, after the program there were highly statistically significant differences between caregivers' total practice mean scores about all practices in posttest and follow-up ( $p \leq 0.001$ ). As the highest total mean scores were detected among the study group regarding hand wash ( $9.11 \pm 0.44$ ,  $9.21 \pm 0.34$  respectively), and the lowest total mean scores about skincare ( $5.7 \pm 0.10$ ,  $5.51 \pm 0.09$  respectively) in the posttest and follow-up.

Evidently, table (7) declares that that total mean score of self-efficacies among the study group was  $34.76 \pm 2.55$  in pretest, which improved in posttest and follow-up to  $42.65 \pm 2.23$ ,  $43.29 \pm 2.50$  respectively. In the other hand, the control group reveals that there were no obvious changes between total mean score of knowledge in pretest, posttest and follow up  $35.11 \pm 2.39$ ,  $35.21 \pm 2.4$ , and  $35.24 \pm 2.31$  respectively.

Table (8) shows that there are negative correlations were detected between total mean score of knowledge, practice, self-efficacy, adherence and age of caregivers in posttest and follow-up in the study group. The same table reflected that there are positive correlations were detected concerning mean score of knowledge, practice, self-efficacy, adherence and education, residence and work of the mothers among the study group in posttest and follow-up ( $p > 0.05$ ).

Table (9) clarifies that there was significant positive correlation detected between total mean score of knowledge, practice, self-efficacy, and adherence in posttest and follow-up in the study group.

It is obvious from table (10) that illustrates that vast majority (93.3%) of caregivers of the study group had unsatisfactory level knowledge in pretest, improved to more than three-quarters (76.7%) and four-fifths (80%) had satisfactory level of knowledge in posttest and follow-up respectively. As regards adherence, more than four-fifths (83.3%) of caregivers in pretest had unsatisfactory level of adherence, improved to two-thirds (66.7%) and less than two-thirds (63.3%) had satisfactory level of adherence in posttest and follow-up respectively. Regarding practice, more than three-fifths (63.3%) of caregivers in pretest had unsatisfactory level of practice, improved to all (100%) and most (96.7%) had satisfactory level of practice in posttest and follow-up respectively.

Regarding self-efficacy, three-fifths (60%) of caregivers in pretest had satisfactory level of self-efficacy, improved to more than four-fifths (83.3%) and majority (86.7%) of in posttest and follow-up respectively. There were statistically differences between total knowledge, adherence, practice and self-efficacy in pretest posttest and in pretest follow-up in study group ( $p \leq 0.05$ ), while the table shows that there were no statistically differences between total knowledge, adherence practice and self-efficacy in posttest and follow-up in study group ( $p > 0.05$ ).

The same table illustrated that vast majority (93.3%) and four fifths (80%) of caregivers of the control group had unsatisfactory level knowledge and adherence in pretest, posttest and follow-up, less than three fifths (56.7%) and more than one half (53.3%) of them had unsatisfactory level of practice in pretest, posttest and follow-up respectively, while two thirds (66.7%) of them had satisfactory level of self-efficacy in pretest, posttest and follow-up. There were no statistically differences between total knowledge, adherence, practice and self-efficacy in pretest posttest, in pretest follow-up and in posttest follow-up in control group ( $p > 0.05$ ).

**Table 1: Personal Data of Children among Study and Control Group (n=60)**

Items	Study (n=30)		Control (n=30)		X <sup>2</sup> /t	P
	n	%	n	%		
<b>Age / years</b>						
6 - ≤ 12	2	6.7	4	16.7	0.38	0.78
12-18	28	93.3	26	86.7		
<b>Mean ±SD</b>	13.53± 1.54		13.22± 1.96		t= 0.68	0.49
<b>Gender</b>						
Male	24	80	22	73.3	0.37	0.54
Female	6	20	8	26.7		
<b>Educational level</b>						
Do not read or write	9	30	5	16.7	2.33	0.67
Primary and Preparatory	19	63.3	20	66.7		
Secondary	2	6.7	5	16.7		
<b>Rank</b>						
1	5	16.7	6	20	5.46	0.24
2	12	40	10	33.3		
3+	13	43.3	14	46.7		

\* Significant at  $p \leq 0.05$

**Table 2: Personal Data of Children' Caregivers among Study and Control Group (n=60)**

Items	Study (n=30)		Control (n=30)		X <sup>2</sup> /t	P
	n	%	n	%		
Caregiver of the child						
Mother	24	80	24	80	0.0	1
Father	6	20	6	20		
Age/years						
≤ 40	7	23.3	10	33.3	0.77	0.68
40-50	20	66.7	17	56.7		
> 50	3	10	3	10		
Mean ±SD	45.43±5.61		46.13±5.48		t=0.49	0.62
Education						
Do not read or write	9	30	7	23.3	4.99	0.29
Primary and preparatory	3	10	7	23.3		
Secondary	13	43.3	9	30		
Higher education	5	16.7	7	23.3		
Work of mother						
Working outside home	7	23.3	8	26.7	0.09	0.76
Housewives	23	76.7	22	73.3		
Work of father						
Working	26	86.7	28	93.3	0.74	0.38
Not working	4	13.3	2	6.7		
Residence						
Urban	8	26.7	13	43.3	1.83	0.18
Rural	22	73.3	17	56.7		

\* Significant at  $p \leq 0.05$

**Table 3: Children' Medical History among Study and Control Group (n= 60)**

Items	Study (n=30)		Control (n=30)		X <sup>2</sup> /t	P
	n	%	n	%		
Family history of KT						
No	30	100	30	100	0.0	1
The period after Kidney Transplantation						
Less than one year	11	36.7	8	26.7	0.69	0.70
1-2 years	8	26.7	9	30		
More than two years	11	36.7	13	43.3		
Donor						
Mother	18	60	19	63.3	1.19	0.75
Father	6	20	7	23.3		
Sibling	1	3.3	0	0		
External donor	5	16.7	4	13.3		
Previous hospital admission after KT						
Yes	30	100	30	100	0	1
Number of previous hospitalizations						

1-5	25	83.3	21	70	t=1.55	0.47
6-10	4	13.3	7	23.3		
More than 10	1	3.3	2	6.7		
Mean $\pm$ SD	4.61 $\pm$ 3.34		4.69 $\pm$ 3.68			
Causes of previous hospitalization						
Abnormal laboratory investigations	12	40	11	36.7	1.43	0.69
Rejection	3	10	1	3.3		
Another health problem (cold flu)	10	33.3	13	43.3		
More than one cause	5	16.7	5	16.7		
Duration of last hospitalization						
Less than one week	25	83.3	22	73.3	0.88	0.34
More than one week	5	16.7	8	26.7		

\* Significant at  $p \leq 0.05$

**Table 4: Comparison of Caregivers' Total Means Scores of Knowledge's in Pre, Posttest and Follow-up among Study and Control Group**

Knowledge	Pretest		t	p	Posttest		t	p	Follow-up		t	p
	Study (n=30)	Control (n=30)			Study (n=30)	Control (n=30)			Study (n=30)	Control (n=30)		
- Therapeutic regimen	2.32±.15	2.40±0.26	1.46	0.14	3.66±0.25	2.40±0.26	19.13	0.001**	3.86±0.13	2.70±0.21	25.72	0.001**
- Complications and symptoms of rejection	1.17±0.89	1.1±0.32	0.41	0.68	2.56±0.64	1.1±0.32	11.17	0.001**	2.45±0.33	1.16±0.34	14.91	0.001**
- Medication regimen	6.67±1.09	6.99±0.87	1.26	0.21	11.57±1.4	7.02±0.90	14.97	0.001**	11.76±1.1	7.45±1.3	13.86	0.001**
- Diet regimen	1.92±0.56	2.16±0.61	1.58	0.11	3.40±0.24	2.21±0.57	6.42	0.001**	3.39±0.39	2.21±0.57	6.63	0.001**
- Hygiene regimen	2.75±0.86	2.68±0.73	0.34	0.73	4.03±1.20	2.68±0.73	5.26	0.001**	4.12±1.15	2.77±0.91	5.04	0.001**
- Exercise regimen,	1.54±0.64	1.62±0.56	0.69	0.61	3.39±0.46	1.62±0.56	13.37	0.001**	3.29±0.53	1.64±0.46	13.03	0.001**
- Laboratory and follow up regimen	3.07±0.88	2.97±1.06	0.79	0.69	3.08±0.88	2.99±1.01	0.25	0.71	3.03±0.89	3.01±1.06	0.26	0.93
Total mean score of knowledge	19.44±3.88	19.92±4.31	0.45	0.65	31.33±5.27	20.02±4.28	9.12	0.001**	31.46±4.47	20.93±4.94	8.65	0.001**

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 5: Comparison of Caregiver's Total Mean Scores of Therapeutic Regimen Adherence in Pre, Posttest and Follow-up among Study and Control Group**

Therapeutic regimen adherence total mean score	Pretest				Posttest				Follow-up		Test	
	Study (n=30)	Control (n=30)	t	p	Study (n=30)	Control (n=30)	t	p	Study (n=30)	Control (n=30)	t	p
- Medication	5.74±0.98	5.67±0.87	0.29	0.77	8.70±1.34	5.71±0.76	10.63	0.001**	9.45±0.98	5.82±0.89	15.01	0.001**
- Diet	7.89±1.43	7.66±1.33	0.64	0.52	11.10±1.85	8.03±1.52	7.02	0.001**	11.06±1.43	8.12±1.77	6.92	0.001**
- Hygiene	5.66±.88	5.64±0.79	0.09	0.92	8.99±0.86	5.87±0.92	13.57	0.001**	9.43±0.94	5.91±0.89	13.56	0.001**
- Exercise	2.65±0.47	2.69±0.54	0.31	0.76	4.25±0.42	2.72±0.59	11.57	0.001**	4.22±0.53	2.73±0.44	11.84	0.001**
- Follow-up	4.33±0.68	4.42±0.71	0.51	0.61	4.98±0.78	4.34±0.69	3.36	0.002*	4.88±0.81	4.34±0.69	2.78	0.007*
- Laboratory investigation	3.12±0.29	3.20±0.39	0.91	0.37	3.62±.19	3.18±0.25	7.67	0.001**	3.62±0.19	3.13±0.33	7.05	0.001**
Total	30.34±2.56	30.09±2.66	0.37	0.71	41.46±4.01	30.70±2.67	12.23	0.001**	41.88±3.91	30.77±2.59	12.97	0.001**

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 6: Comparison of Caregiver's Total Practice Means Scores in Pre, Posttest and follow-up among Study and Control Group**

Total mean score	Pretest				Posttest				Follow-up		t	p
	Study (n=30)	Control (n=30)	t	p	Study (n=30)	Control (n=30)	t	P	Study (n=30)	Control (n=30)		
- Oral Medication Administration	4.33±.94	4.25±0.88	0.34	0.73	7.89±0.67	4.34±.91	17.21	0.001*	7.45±0.54	4.30±.63	20.79	0.001*
- Hand Wash	5.56±.93	5.49±0.85	0.35	0.72	9.11±0.44	5.73±.90	18.48	0.001*	9.21±0.34	5.74±.91	20.29	0.001*
- Oral care	3.32±.42	3.44±0.51	0.98	0.32	6.7±0.48	3.47±.52	24.99	0.001*	6.63±0.61	3.42±.61	20.38	0.001*



- Skin Care	3.34±.63	3.12±0.54	1.4 5	0.1 5	5.7±0.10	3.21±.42	30.8 9	0.001* *	5.51±0.09	3.39±.53	20.6	0.001* *
- Oral temperature	3.32±.08	3.38±0.23	1.3 5	0.1 8	7.63±0.98	3.43±.36	22.0 3	0.001* *	7.55±0.63	3.23±.43	31.0 2	0.001* *
- Axillary Temperature	2.89±.54	2.99±0.63	0.6 6	0.5 1	6.81±1.21	2.91±.53	16.1 7	0.001* *	6.78±1.11	3.01±.71	15.6 7	0.001* *
- Cold Compresses	4.86±.44	4.96±0.74	0.6 4	0.5 2	8.63±.35	5.03±.88	19.1 9	0.001* *	8.54±0.47	4.98±.66	24.0 6	0.001* *
Total practice	29.66±2.3 0	30.43±2.4 1	1.2 7	0.2 1	52.78±3.4 2	30.91±2.3 3	28.9 4	0.001* *	51.88±3.6 1	31.12±2.1 9	26.9 3	0.001* *

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 7: Comparison of Caregivers' Self-efficacy in Pre, Posttest and Follow-up among Study and Control Group (N=60)**

Total mean score	Pretest				Posttest				Follow-up			
	Study (n=30)	Control (n=30)	t	p	Study (n=30)	Control (n=30)	t	p	Study (n=30)	Control (n=30)	t	p
Mean ±SD	34.76±2.55	35.11±2.39	0.61	0.54	42.65±2.23	35.21±2.4	12.61	0.001*	43.29±2.50	35.24±2.31	13.97	0.001**

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 8: Correlation between the Total Mean Score of Knowledge, Practice, Self-Efficacy and Adherence of Caregivers and Their Selected Personal Data of the Study Group**

Study group		Total mean score of Knowledge		Total mean score of practice		Total mean score of Self-efficacies		Total mean score of adherences	
		r	p	r	p	r	p	r	p
Age of caregivers	Post test	- 0.43	0.016*	- 0.36	0.03*	- 0.34	0.04*	- 0.43	0.016*
	Follow-up	- 0.41	0.021*	- 0.36	0.03*	- 0.38	0.03*	- 0.51	0.002*
Education of caregivers	Post test	0.40	0.024*	0.51	0.002*	0.42	0.020*	0.51	0.002*
	Follow-up	0.41	0.021*	0.43	0.011*	0.39	0.026*	0.51	0.003*
Residence	Post test	0.49	0.006*	0.42	0.020*	0.37	0.048*	0.53	0.001**
	Follow-up	0.49	0.006*	0.39	0.026*	0.37	0.049*	0.43	0.011*
Work of mother	Post test	0.32	0.061	0.33	0.060	0.35	0.040*	0.09	0.308
	Follow-up	0.30	0.066	0.30	0.066	0.36	0.035*	0.09	0.310

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 9: Correlation between the Total Mean Score of Knowledge, Practice, Self-Efficacy and Adherence of Study Group**

Study group Total	Pearson Correlation	Total Knowledge		Total Practice		Total Self-efficacy		Total Adherence	
		r	p	r	p	r	p	r	P
Knowledge	Post test	1	0	0.860	0.001**	0.476	0.008*	0.728	0.001**
	Follow-up	1	0	0.790	0.001**	0.384	0.036*	0.677	0.001**
Practice	Post test			1	0	0.361	0.050*	0.610	0.001**
	Follow-up			1	0	0.585	0.001**	0.476	0.008**
Self-efficacy	Post test					1	0	0.529	0.003**
	Follow-up					1	0	0.476	0.008**
Adherence	Post test							1	0
	Follow-up							1	0

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

**Table 10: Comparison between caregivers' level of Knowledge, Practice, Self-Efficacy and Adherence of The Study and Control Group**

Study group	Pretest		Posttest		Follow-up		Pretest & Posttest		Pretest & Follow-up		Posttest & Follow-up	
	N	%	N	%	N	%	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P
Total knowledge												
- Satisfactory	2	6.7	23	76.7	24	80	30.24	0.001**	32.85	0.001**	0.09	0.75
- Unsatisfactory	28	93.3	7	23.3	6	20						
Total adherence												
- Satisfactory	5	16.7	20	66.7	19	63.3	15.42	0.001**	13.61	0.001**	0.07	0.78
- Unsatisfactory	25	83.3	10	33.3	11	36.7						
Total practice												
- Satisfactory	11	36.7	30	100	29	96.7	27.81	0.001**	24.30	0.001**	1.01	0.31
- Unsatisfactory	19	63.3	0	0	1	3.3						
Total self-efficacy												
- Satisfactory	18	60	25	83.3	26	86.7	4.03	0.04*	5.45	0.02*	0.13	0.71

-	Unsatisfactory	12	40	5	16.7	4	13.3						
<b>Control group</b>													
Total knowledge													
-	Satisfactory	2	6.7	2	6.7	3	10	0	1	.21	.64	.21	.64
-	Un satisfactory	28	93.3	28	93.3	27	90						
Total adherence													
-	Satisfactory	6	20	6	20	6	20	0	1	0	1	0	1
-	Un satisfactory	24	80	24	80	24	80						
Total practice													
-	Satisfactory	13	43.3	14	46.7	14	46.7	.06	.79	.06	.79	0	1
-	Un satisfactory	17	56.7	16	53.3	16	53.3						
Total self-efficacy													
-	Satisfactory	20	66.7	20	66.7	20	66.7	0	1	0	1	0	1
-	Un satisfactory	10	33.3	10	33.3	10	33.3						

\* Significant at  $p \leq 0.05$

\*\* highly significant at  $p \leq 0.01$

## DISCUSSION

The current study indicated that the vast majority of children in the study and majority of them in the control group their age was from 12 to 18 years, these results were congruent with Chen et al., (2017) in the study titled "Severe intellectual disability is not a contraindication to kidney transplantation in children" who reported that less than two third of children were adolescents. The study and control groups mean age of children in the current study were  $13.53 \pm 1.54$ ,  $13.22 \pm 1.96$  years respectively. These results agreed with Varnell et al., (2017) in the study about "Assessing barriers to adherence in routine clinical care for pediatric kidney transplant patients" who found that children's mean age was 13.8 years.

Regarding gender, four fifths and less than three quarters of the children in the study and control groups were males. These results in accordance with the study that held in Egypt by Fadel et al., (2020) about "Pediatric kidney transplantation in Egypt: Results of 10-year single-center experience" who found that more than two third of the children in the study were males. Also, congruent with Arafa et al., (2021) in a study about "Glucose tolerance in a cohort of Egyptian children after kidney transplantation" who found that more than two thirds of children were males.

Concerning the educational level, more than three fifths and two thirds of the children in the study and control group had primary and preparatory education. These results in accordance with Duvant et al., (2021) in the study titled "Quality of life of transplanted children and their parents: a cross-sectional study" who found that more than two-thirds of children had primary and preparatory education. From the researcher point of view this education congruent with distribution of education in Egypt.

In relation to children rank, more than two fifths and less than one half of the children in the study and control groups ranked as the third or more. These results agreed with Abdelhady, El Samman, Attia and Ahmed (2018) in a study about "Factors affecting caregivers' adherence to therapeutic regimens for their children after kidney

transplantation" who found that less than one third of children were ranked as third child or more.

The study results revealed that there were no statistically significant differences between study and control group regarding children' personal data, these results in accordance with Fadel et al., (2022) in the study of 40 child had KT about "Hearing assessment in Egyptian children with chronic renal failure on regular hemodialysis and renal transplantation children" who reported that there were no statistically significant differences between the study and control groups regarding age and gender.

The current study findings detected that four-fifths of children' caregivers were the children' mothers in the study and control groups, these results were congruent with Duvant et al., (2021) who found that more than three quarters of children' caregivers were the children' mothers. From the researcher's point of view, the mother in our community had many responsibilities, especially which related to children health.

The current study results reflect that the mean age of caregivers of the study and control groups were  $45.43 \pm 5.61$  and  $46.13 \pm 5.48$  years respectively. These study results are supported with the study of Hamasaki et al., (2018) about "Change in the quality of life of caregivers of pediatric department patients undergoing kidney transplantation: a single-center prospective study" who concluded that vast majority of caregivers their age ranged from 24 to 50 years whose child had KT. Also, incongruent with Abdelhady, El Samman, Attia and Ahmed (2018) who found that age of the caregivers in their study was  $38.3 \pm 10.5$  years.

The current study findings illustrated that more than two fifths and less than one third of caregivers had secondary education in study and control group with no statistically significant differences. These results go in line with Pais et al., (2021) in a study titled "Low renal transplantation rates in children with end-stage kidney disease: a study of barriers in a low-resource setting" who found that more than two-thirds of fathers and less than three quarters of mothers had secondary education.

The study results are in accordance with Eidivandi, Rostami, Dashtbozorghi and Haghizadeh (2020) in the study titled "The effect of blended instruction on improving knowledge and practice of parents of children with chronic kidney disease in the therapeutic care of children" who found that less than two fifths and less than one third of caregivers in the study and control groups had middle education with no statistically significant differences between caregivers' education in the study and control groups.

As regard work of mothers, more than three-quarters and less than three quarters of mothers in the study and control group were housewives, while the majority of fathers were working. These results were in congruent with Pais et al., (2021) who founded that the majority of mothers not working outside the home, while most of the fathers working.

Less than three quarters and less than three fifths of caregivers were from rural areas in study and control group respectively. These results congruent with Sinada et al., (2021)

in the study about "Kidney transplantation in children in KwaZulu-Natal, South Africa" who reported that children and their caregivers were from a rural setting. Also with Chen, Luo and Peng, (2015) in the study of "Anxiety and decreased social support underline poorer quality of life of parent living kidney donors" who confirmed that the majority of caregivers had rural residency. From the researcher point of view El-Monira Cairo-University pediatric hospital serve all over Egypt governorates, also the reputation of this place makes rural people to search for this hospital services.

Also, the study results illustrated that the mean members of family members were  $5.20 \pm 1.24$  and  $4.97 \pm 1.20$  members in the study and control groups respectively. These results were congruent with Cruz et al., (2015) in a study about "Family experience in the kidney transplant process from a living donor" who found that children included in the study live with at least three family members. Also, these results go in accordance with Abdelhady, El Samman, Attia and Ahmed (2018) who found that more than half of families' members were five or more. From the researcher point of view, parents prefer to have three or more children especially in rural setting in Egypt.

The current study results indicated that there were no statistically significant differences between the study and control groups about the personal data of children's caregivers about age, educational level, and work. These results go in line with study of Gutierrez-Colina et al., (2017) titled "Transition readiness, adolescent responsibility, and executive functioning among pediatric transplant recipients: Caregivers' perspectives" who found that there were no significant differences between the study and control groups regarding caregivers age and educational level. Also, the study results congruently with Duvant et al., (2021) who add occupation.

In relation to the family history among children with KT there was no family history among the study and control group. These results are in congruent with the results of Abdelhady, El Samman, Attia and Ahmed, (2018) who found that there is no family history to KT among children included in the study. Also, these results were in line with Ahmed, (2017) in a study titled "Impact of self-learning package on the patient's performance undergoing kidney transplantation" who found no family history among children with KT among the study and control group.

The current study results showed that less than two fifths and more than two fifths of children had KT for more than two years in the study group and control group. These results are in accordance with Fadel et al., (2022) who reported that children in the study had KT for more than two years post KT. Also, this in line with Abdelrahman et al., (2022) in the study about "Effect of pre and post-transplant body mass index on pediatric kidney transplant outcomes" who found that the duration after children's KT was  $4.66 \pm 1.83$  years. And congruent with Arafa et al., (2021) who reported that post kidney transplant duration of children was 4 years.

Three-fifths and more than three-fifths of donors were the children's mothers in the study and control groups. These results were congruent with Chandar et al., (2021) in a study about "Donor considerations in pediatric kidney transplantation" who concluded that the donors for children are mainly parents, with mothers constituting more than half. Also, this is in line with Abdelhady, El Samman, Attia and Ahmed, (2018) who found that mothers represent two thirds of donors in their study. From the researcher's point of view that mothers can do anything for their children health especially when there were tissue matching for KT with their children.

The results showed that all children in the study and control group admitted to the hospital after their KT, these results were in accordance with the results of Cushman et al., (2021) about "Caregiver-reported outcomes of pediatric transplantation: Changes and predictors at 6 months post-transplant" who reported that majority of children were admitted to the hospital post KT. From the researcher's point of view that a lot of challenges and health problems that face any child after KT which indicate admission to hospital for management.

Regarding the frequency of hospitalization after KT, more than two-thirds of children admitted to hospital from one to five times in study and control group. These results in congruent with Sgambat et al., (2019) in the study titled "The prevalence and outcome of children with failure to thrive after pediatric kidney transplantation" who illustrated that the majority of children admitted to hospital from one to five times post KT. From the researcher's point of view that the children in the study had KT for more than two years post KT, and they were faced a lot of health problems like flu, infections, diarrhea, dehydration, and abnormal laboratory investigations.

Two fifths and less than two fifths of children hospitalization were due to abnormal laboratory investigations and infections (cold flu) in the study and control groups. These results are in line with Neu, (2006) in the study titled "Special issues in pediatric kidney transplantation" who concluded that viral and bacterial infections are the major causes for hospitalization in pediatric kidney-transplant recipients. From the researcher's point of view that the children had low immunity plus immunosuppression medications, so they easily catch infections.

It is evident from the study results that there were no statistically significant differences between caregivers' total mean scores in all items of knowledge between the study and the control group in the pretest. While after the program there were highly statistically significant differences in the posttest and follow-up. These results emphasize the study hypothesis that assumed caregivers who will receive the empowerment program will have higher total scores of knowledges than the control group. These results supported by Eidivandi et al., (2020) in the study titled "The effect of blended instruction on improving knowledge and practice of parents of children with chronic kidney disease in the therapeutic care of children" who found that there was no significant difference in the mean scores of parental knowledge before the intervention; while after the intervention, there was an essential difference in the mean scores of the parental knowledge.

The results of the current study illustrated that there were no statistically significant differences between caregivers' total mean scores of adherences regarding to dimensions of adherence to therapeutic regimen (medication, diet, hygiene, exercise, follow-up, and laboratory investigation regimen) in pretest between the study and control groups. While after implementation of empowerment program, there were statistically significant improvements among the study group in posttest and in follow-up. These results emphasize the study hypothesis that assumed caregivers who will receive the empowerment program will have higher total scores of adherences than the control group. From the researcher's point of view these results are due to the effect of the program on the caregivers which is essential to enable and empower them to care for their children during the critical time after KT.

The study finding revealed that there were no statistically significant differences between the study and control groups of caregivers' total mean scores of practices in pretest, after the program there were highly statistically significant differences between caregivers' total practice mean scores in posttest and follow-up. These results emphasize the study hypothesis that assumed caregivers who will receive the empowerment program will have higher total scores of practices than the control group. These results go in line with Hassan and Mahmoud, (2019) in a study about "The effect of empowerment program for mothers of children undergoing hemodialysis on arteriovenous fistula care" who reported that the total mean scores of practice post empowerment program were more than before with statistically significant differences.

The current study results showed that there was no statistically significant difference between the two groups in the pretest about the total mean score of self-efficacy, while improved in the study group in posttest and follow-up as there were statistically significant difference between the two groups. These results emphasize the study hypothesis that assumed Caregivers who will receive the empowerment program will have higher total score of self-efficacies than the control group. These results go in accordance with Nikoogoftar, and Shahini, (2021) in the study of "The effects of resilience training on self-efficacy, empowerment, and social adjustment of renal transplant patients" who showed that the mean score of self-efficacy is almost the same in the control and experimental groups in the pretest, and it has been enhanced in the posttest of the experimental groups with statistically significant differences between both groups.

The finding of the current study illustrates that vast majority of caregivers of the study group had unsatisfactory level knowledge in pretest, improved significantly to more than three quarter and four fifths of them had satisfactory level of knowledge in posttest and follow-up respectively. These results are congruent with Okby and Mohsen, (2017) who found that the majority of caregivers had unsatisfactory level of knowledge in preintervention of the educational program, while after intervention more than two third of them had satisfactory level of knowledge. This finding reflects the effect of the educational program in improving caregivers' knowledge.

Regarding adherence to therapeutic regimen, more than four fifths of caregivers in pretest had unsatisfactory level of adherence, improved to two thirds and less than two thirds of them had satisfactory level of adherence among the study group in posttest and follow-up respectively. These results were congruent with Abdelhady, El Samman, Attia and Ahmed, (2018) who found that four fifths of caregivers had unsatisfactory level of adherence, also with Zhu et al., (2017) in the study titled “Efficacy of interventions for adherence to the immunosuppressive therapy in kidney transplant recipients: a meta-analysis and systematic review” who found that significant improvements were detected post interventions regarding adherence to therapeutic regimen after kidney transplantation.

Concerning practice, more than three fifths of caregivers in pretest among the study group had unsatisfactory level of practice, improved to most of them had satisfactory level of practice in posttest and follow-up respectively. These results go in accordance with Chandar et al., (2019) who found that total practice level improved significantly after implementation of teach back program regarding care after children kidney transplantation.

Regarding self-efficacy, among the study group, three fifths of caregivers in pretest had satisfactory level of self-efficacy, improved significantly to more than four fifths and majority of in posttest and follow-up respectively. There were statistically significant differences between total knowledge, adherence, practice and self-efficacy in posttest and follow-up in study group, These results in accordance with Urstad et al., (2021) in the study “Renal recipients’ knowledge and self-efficacy during first year after implementing an evidence based educational intervention as routine care at the transplantation clinic” who found significant improvement in the study group self-efficacy post educational intervention, also these results in accordance with Singer, (2023) who concluded that there were statistically significant differences between total knowledge, adherence, practice and self-efficacy after implementation of a designed educational program for children and their caregivers after children kidney transplantation.

## **CONCLUSION**

The empowerment program improves significantly the total mean scores of knowledge, practices, self-efficacy and the adherence to therapeutic regimen among the study group in posttest and follow-up. Also, positive significant correlations were detected between them.

## **Recommendations**

Based on the results of the current study, it was recommended that:

- Integrate the empowerment program for caregivers to the routine care of children post KT.
- Training sessions and educational classes should be planned for caregivers’ prior children KT, after surgery and post KT period.



- Outreach multi-disciplinary services must be carried out for caregivers of KT children in their remote area to enhance their adherence to different regimens.

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